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List of Causes of Fungous and Bacterial Plant Diseases in Maine to 1936 Inclusive

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BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

MAINE

COUNTIES, PRINCIPAL CITIES, AND RIVERS

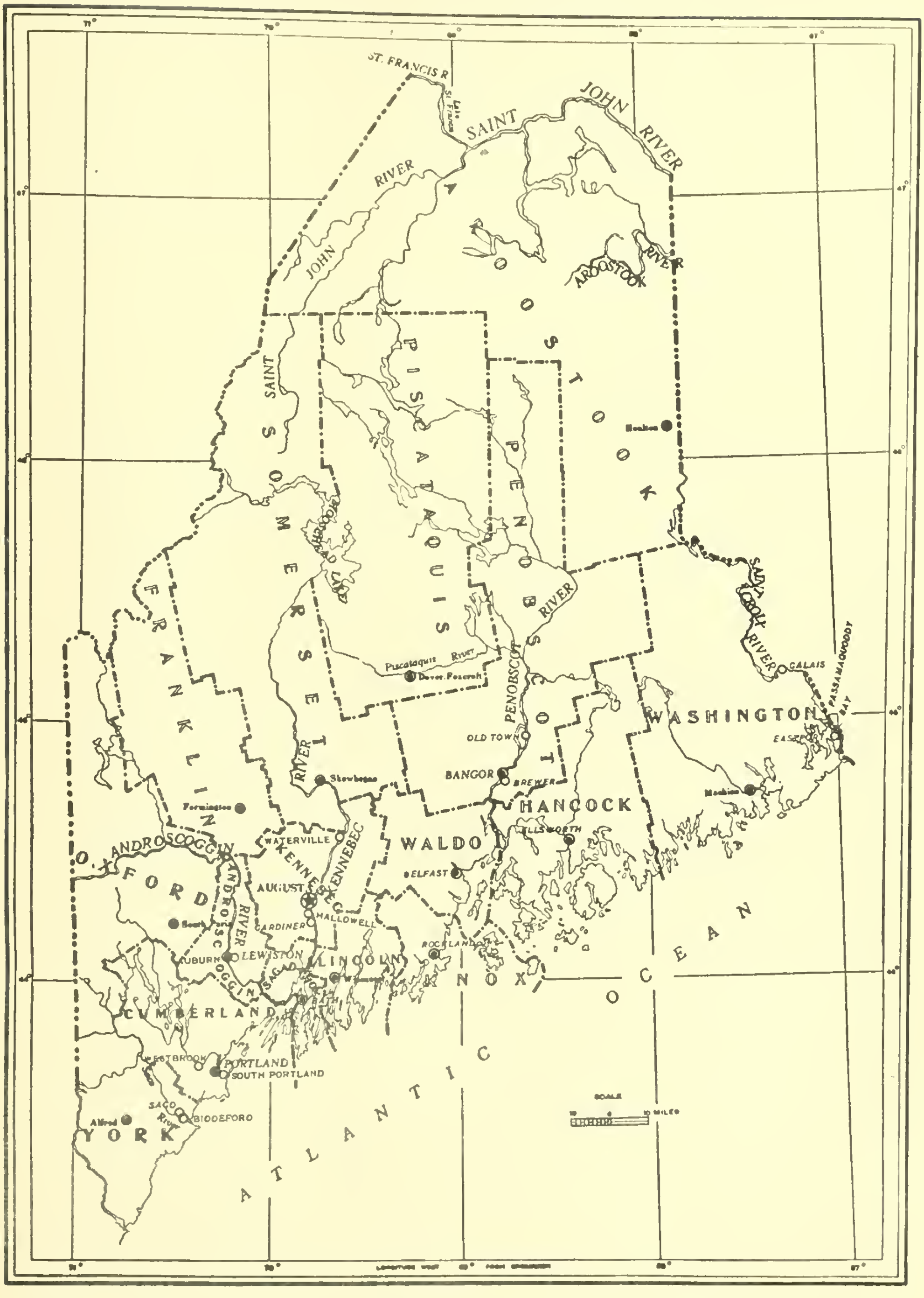

Figure 1.

LIST OF CAUSES OF FUNGOUS AND BACTERIAL PLANT DISEASES IN MAINE TO 1936 INCLUSIVE

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The only previous list of Maine fungi was published in 1902 by P. A. Ricker. Other references to the fungi of Maine are few and are scattered in literature that is not easily available to plant pathologists. Since 1902 much unpublished information has been accumulated. The present list was compiled with two objectives in view: (1) to record every known fungous and bacterial disease of green plants and their parts as grown in Maine, excluding those imported for sale only, and (2) to indicate the geographic distribution, prevalence, and possible economic importance of such diseases.

The data upon which this list is based have come from varied sources. These are indicated in the list by key letters whose meaning is as follows:

A = J. C. Arthur, "Manual of the Rusts in United States and Canada", Purdue Research Foundation, 1934.
B = U. S. Dept. Agric. Bull. 1366, "Check List of Diseases of Economic Plants in the United States", by Paul J. Anderson et al. 1926.
C = card in the file of disease records of the Department of Plant Pathology of the Maine Agricultural Experiment Station.
H = herbaria of the Department of Botany, University of Maine, and the private herbaria of interested botanists at the University.
L = a letter, or other correspondence.
P = Plant Disease Reporter, or supplements and special reports of the Plant Disease Survey as indicated.
R = P. L. Ricker, "A Preliminary List of Maine Fungi", Univ. of Maine Studies, No. 3, 1902.

After each scientific name of a fungus there are given the sources of information, i.e., C, L, P, etc., noted above; the first known date of occurrence or report of the disease; the location; and, sometimes, the name of the person making the identification. The location is given as the name of the county in which the collection was made, where this is known. (See Fig. 1 for map showing counties). No date except that of the first report is given after the key letter C if more than four reports occur, and in such a case the phrase "general" or "general over the range of the host" is added. If the fungus has been reported from both Ricker and some other source the Ricker citation is omitted.

An attempt has been made to have the scientific names of fungi conform with the International Rules of Nomenclature. For this, the preferred references are A. B. Seymour's "Host Index of the Fungi of North America", a work which is host-indexed, as the name indicates, but not cross-indexed for the fungi, and "Enumeratio Systematica Fungorum" by C. A. J. A. Oudemans, which is indexed for both pathogen and host. For bacterial names use was made of Bergey's Manual, 4th edition. The "Check List of Diseases of Economic Plants in the U. S.", U. S. Dept. of Agric. Bull. 1366, was used to increase uniformity in the abbreviations of the authorities of scientific names. J. C. Arthur's "Manual of the Rusts in United States and Canada" is cross-indexed and indicates the preferred names. Gray's "Manual of Botany", Rehder's "Manual of Cultivated Trees and Shrubs", and other works on botany have been used to correlate the common and scientific names of hosts.

Credit is due to various present and former members of the Maine Agricultural Experiment Station who have contributed to this list while on the Station staff. These are: W. J. Morse, C. E. Lewis, M. Shapovalov, G. B. Ramsey, Donald Folsom, Reiner Bonde, and T. T. Ayers. A. E. Prince of the Department of Botany, University of Maine, has contributed data on the genus Gymnosporangium, and Fay Hyland of the same department has checked the names of the woody plants where questions of nomenclature arose. C. E. Ogden of the Gray Herbarium, Harvard University, has been very kind in checking names of some of the herbaceous plants where questions of nomenclature were involved.

The list is intended to be complete up to December 31, 1936. It includes 281 hosts in addition to 90 which are referred to only by Ricker, and 398 pathogens in addition to 332 which are referred to only by Ricker. However, the writers readily admit that the list is only preliminary. No extensive or intensive surveys have been made in Maine except with reference to some particular research project. With no extension plant pathologist stationed here except for a year or so about twenty years ago, no effort has been made even to increase the number of inquiries and specimens from growers. The present list may stimulate an interest in making our information more complete as to the number and distribution of plant diseases in Maine.

LISTING PRIMARILY BY HOSTS

ABIES BALSAMEA (L.) Mill. FIR

*Bertia moriformis (Tode) DeNot.[1/] 1895 Penobscot. 1896 Androscoggin.
*Chilonectria cucurbitula (Curr.) Sacc. (Nectria cucurbitula of R). York.
*Dasyscypha agassizii (Berk. & Curt.) Sacc. 1896 Penobscot, 1898 Cumberland.
*Dasyscypha calycina (Schum.) Fckl. 1896 Penobscot, 1898 Cumberland.
*Discosia artocreas (Tode) Fr. 1900 Penobscot.
*Fomes pini (Thore) Lloyd (Polystictus piceinus of R). 1897 York.
Lenzites trabea (Pers.) Fr. P 1936.
Melampsorella cerastii (Pers.) Schroet. A Maine. C 1927 Kennebec.
Milesia fructuosa Faull. A Maine.
Milesia polypodophila (Bell) Faull. A Maine.
*Polyporus abietinus (Dicks.) Fr. (Polystictus abietinus of R). 1857 Cumberland.
*Polyporus resinosus (Schrad.) Fr. 1893 Penobscot.
*Polyporus vaporarius (Pers.) Fr. (Poria vaporaria of R). 1857 Cumberland, 1896 Penobscot.
Poria undata Pers. P 1936.
Pucciniastrum goeppertianum (Kühn) Kleb. (Calyptospora columnaris Kühn). P 1931.
Stereum purpureum (Pers.) Fr. P 1936 (first report on a coniferous substratum anywhere).
*Stictis hysterina Fr. (Xylogramma hysterinum of R). 1860 York.
*Tympanis laricina (Fckl.) Sacc. 1897 Androscoggin.
Uredinopsis mirabilis (Pk.) Magn. A Maine.
?*Valsa abietis Fr. 1897 Penobscot.
*Valsa colliculus (Wormsk.) Berk. 1857 Cumberland.

ACER sp. MAPLE

*Cenangium prunastri (Pers.) Fr. 1859 Cumberland.
*Chilonectria cucurbitula (Curr) Sacc. 1896 Penobscot.
*Chlorosplenium versiforme (Pers.) DeNot. 1859 Cumberland.
*Coryne sarcoides (Jacq.) Tul. 1856 Cumberland.
*Daedalea confragosa (Bolt.) Fr. 1858 Cumberland.

1/ Citations marked with an asterisk (*) are from Ricker only; the inclusion of such names seems desirable in view of the fact that his list is not generally available. Such citations preceded by "?" are of species not found in the standard references listed in the introduction. When different spellings of a name are given in Ricker's text and index and one is correct, the correct one is used here. As far as noticed, incorrect spelling in Ricker is corrected here.

ACER sp. (continued)
*Diatrype obesa Berk. & Curt. (Valsaria quadrata (Berk.) Sacc. of R). 1887 Penobscot.
*Eutypa spinosa (Pers.) Tul. Cumberland.
Fomes applanatus (Pers.) Wallr. P 1921.
Gloeosporium sp. C 1928 Hancock, 1935 Cumberland.
Gloeosporium apocryptum Ell. & Ev. C 1928 Hancock. P 1919 Suppl. 11. L 1924 Cumberland, 1927 Lincoln.
*Hypoxylon perforatum (Schw.) Fr. 1888 Penobscot.
*Hysterium pulicare Pers. 1859 Cumberland.
*Massaria inquinans (Tode) Fr. 1892 Penobscot.
*Melanomma pulvis-pyrius (Pers.) Fckl. Cumberland.
Nectria sp. C 1929 Sagadahoc. P 1927.
*Ophiobolus porphyrogonus (Tode) Sacc. Cumberland, Penobscot.
Polyporus abietinus (Dicks.) Fr. H 1934 Penobscot.
*Polyporus adustus (Willd.) Fr. 1897 Penobscot, Androscoggin.
*Polyporus lacteus Fr. Cumberland.
?*Polyporus resinosus incurvuus Pk. 1896 Penobscot.
*Poria ferruginosa (Schrad.) Fr. 1895 Penobscot.
*Quaternaria persoonii Tul. 1859 Cumberland, Penobscot.
Rhytisma acerinum (Pers.) Fr. C 1910 Kennebec, 1913 York.
*Xylaria polymorpha (Pers.) Grev. 1899 Cumberland.

Acer dasycarpum. See A. SACCHARINUM.

ACER NEGUNDO L. BOX ELDER
Phyllosticta negundinis Sacc. & Speg. B Maine.

ACER PENNSYLVANICUM L. STRIPED MAPLE
Polyporus pargamenus Fr. P 1936.
*Septoria acerina Pk. 1899 Penobscot.
*Trametes mollis (Sommerf.) Fr. 1895 Piscataquis.

ACER PLATANOIDES L. NORWAY MAPLE
Gloeosporium apocryptum Ell. & Ev. B Maine.

ACER RUBRUM L. RED MAPLE
*Cytospora exasperans Ell. & Ev. (Cytispora exasperans of R). 1896 Penobscot.
Daedalea confragosa (Bolt.) Fr. P 1936.
*Diatrype platystoma (Schw.) Curt. 1892 Penobscot.
*Eutypella corynostoma (Berk. & Rav.) Sacc. 1896 Penobscot.
*Fomes connatus (Weinm.) Gill. 1897 Hancock, Penobscot.
Fomes scutellatus (Schw.) Cke. P 1936.
*Hymenochaete rubiginosa (Schrad.) Lév. 1898 Penobscot.
Hymenochaete tabacina (Fr.) Lév. P 1936.
*Hypoxylon coccineum Bull. 1887 Penobscot.
*Hypoxylon fuscum (Pers.) Fr. 1897 Cumberland, Penobscot.

ACER RUBRUM L. (continued).
*Hypoxylon rubiginosum (Pers.) Fr. 1897 Penobscot, Androscoggin.
*Hysterium pulicare Pers. 1897 Androscoggin.
Nectria sp. P 1934.
*Phyllosticta acericola Ell. & Ev. 1899 Cumberland, 1900 Penobscot.
Polyporus versicolor (L.) Fr. P 1936.
*Rhytisma acerinum (Pers.) Fr. 1900 Penobscot.
*Sphaeronema acerinum Pk. 1900 Penobscot.
*Steganosporium piriforme (Hoffm.) Cda. 1896 Cumberland.
*Trichoderma lignorum (Tode) Harz. 1897 Cumberland, Penobscot.
?*Trichothecium roseum (Pers.) Link. 1887 Cumberland, Penobscot.
*Uncinula circinata Cke. & Pk. 1889 Penobscot.

ACER SACCHARINUM L. SILVER MAPLE
(A. dasycarpum Ehrh. of R.)
*Bulgaria inquinans (Pers.) Fr. 1857 Cumberland.
*Rhytisma acerinum (Pers.) Fr. 1897 Penobscot.
*Septoria saccharina Ell. & Ev. 1899 Penobscot.

ACER SACCHARUM Marsh. SUGAR MAPLE
Armillaria mellea (Vahl) Quél. H 1936 Penobscot.
Fomes tenuis Karst. P 1936.
Gloeosporium apocryptum Ell. & Ev. P 1928.
Pestalozzia sp. C 1928 Hancock.
Phyllosticta minima (Berk. & Curt.) Ell. & Ev. P 1928.
Polyporus albellus Pk. P 1936.
Polyporus dichrous Fr. P 1936.
Poria viticola Schw. P 1936.
Taphrina sp. B Maine.

ACER SPICATUM Lam. MOUNTAIN MAPLE
Panus stipticus Bull. P 1936.
*Rhytisma punctatum (Pers.) Fr. 1898 Piscataquis.
Stereum hirsutum Fr. P 1936.

ACONITUM sp. MONKSHOOD
Mycosphaerella pachyasca (Rostr.) Vestergren. C 1932 York.

ACORUS CALAMUS L. SWEET FLAG
Uromyces pyriformis Cke. A Maine.

AESCULUS HIPPOCASTANUM L. HORSE-CHESTNUT
Phyllosticta sp. C 1915 York.
Phyllosticta paviae Desm. C 1914 Penobscot. P 1920.
Phyllosticta sphaeropsoidea Ell. & Ev. C 1912 Cumberland.

AGRIMONIA STRIATA Michx. AGRIMONY
Pucciniastrum agrimoniae (Schw.) Tranz. A Maine.

AGROPYRON REPENS (L.) Beauv. QUACK GRASS
Puccinia graminis Pers. A Maine. C 1918 Aroostook. P 1919.

AGROSTIS ALBA L. WHITE BENT GRASS
Puccinia graminis Pers. A Maine.

AGROSTIS HYEMALIS (Walt.) B.S.P. HAIR GRASS
Puccinia graminis Pers. A Maine.
Puccinia rubigo-vera impatientis (Arth.) Mains. A Maine.

AGROSTIS PERENNANS (Walt.) Tuckerm. THIN GRASS
Puccinia graminis Pers. A Maine.
Puccinia rubigo-vera impatientis (Arth.) Mains. A Maine.

ALLIUM sp.
Uromyces bicolor Ell. A Maine.

ALLIUM CEPA L. ONION
Botrytis squamosa Walker. C 1928 Piscataquis.
Fusarium sp. C 1935 Androscoggin.
Peronospora destructor (Berk.) Caspary (P. schleideni Ung.) P 1919.
Urocystis cepulae Frost. P 1917.

ALNUS sp. ALDER
*Anthostoma ellisii Sacc. York.
*Anthostoma microsporum Karst. 1896 York.
*Calocera cornea Fr. Cumberland.
*Cenangium furfuraceum (Roth) DeNot. 1897 Penobscot.
*Cenangium tuberculiforme Ell. & Ev. 1896 Penobscot.
*Corticium auberianum Mont. Cumberland.
*Diaporthe leiphaema (Fr.) Sacc. 1857 Cumberland.
*Diatrype nigro-annulata (Grev.) Cke. 1859 Cumberland.
*Fomes scutellatus (Schw.) Cke. 1859 Cumberland, Penobscot.
*Grandinia corrugata Fr. 1892 Penobscot.
*Helminthosporium macrocarpum Grev. 1859 Somerset.
*Hydnum fusco-atrum Fr. Cumberland.
*Hydnum ochraceum Pers. 1876 Cumberland.
*Hypocrea contorta (Schw.) Berk. & Curt. 1859 Cumberland.
*Hypoxylon fuscum (Pers.) Fr. Cumberland.
*Hypoxylon morsei Berk. & Curt. Maine.
*Lasiosphaeria mutabilis (Pers.) Fckl. 1859 Cumberland.
*Massariella scoriadea (Fr.) Sacc. 1860 York.
*Merulius haedinus Berk. & Curt. 1876 Cumberland, York.
*Polyporus arcularius (Batsch) Fr. Cumberland.
*Polyporus lacteus Fr. 1858 Cumberland.
*Polyporus radiatus (Sow.) Fr. (Polystictus aureo-nitens of R). 1898 Penobscot.
?*Polystictus virgineus Schw. 1896 Androscoggin.

ALNUS sp. (Continued)
*Pseudovalsa lanciformis (Fr.) Ces. & DeNot. Cumberland, York.
*Tympanis alnea Pers. 1859 Cumberland.
*Valsa alni Pk. 1880 York.

ALNUS INCANA (L.) Moench. HOARY ALDER
Daedalea unicolor (Bull.) Fr. P 1936.
*Diatrypella tocciaeana DeNot. var. subeffusa Ell. & Ev. York.
Erysiphe aggregata (Pk.) Farl. B Maine.
*Exidia glandulosa (Bull.) Fr. 1895 Cumberland, 1896 Penobscot.
*Exoascus alni-incanae (Kühn) W.A.Orton. 1900 Cumberland, Penobscot.
Irpex cinnamomeus Fr. P 1936.
*Kneiffia setigera Fr. 1898 Penobscot.
*Microsphaera penicillata (Wallr.) Lév. 1900 Penobscot.
*Scorias spongiosa (Schw.) Fr. 1898 Penobscot.
Stereum fasciatum Schw. P 1936.
*Tympanis alnea Pers. 1899 Penobscot.

ALNUS RUGOSA (Duroi) Spreng. SMOOTH ALDER
(A. serrulata Willd. of R).
*Cyphella ravenelii Sacc. 1859 York, 1898 Penobscot.
Exoascus tosquinetii Sacc. B Maine.
?*Fomes obliquus (Pers.) Fr. 1896 Penobscot.

Alnus serrulata. See A. RUGOSA.

ALTHAEA ROSEA Cav. HOLLYHOCK
Puccinia malvacearum Bertero. A Maine. C 1910 (general). P 1918.

AMELANCHIER CANADENSIS (L.) Medic. SHADBUSH
*Dimerosporium collinsii (Schw.) Thüm. 1859 York, 1897 Penobscot.
Gymnosporangium biseptatum Ell. H 1936 Penobscot.
Gymnosporangium clavipes Cke. & Pk. A Maine.
Gymnosporangium corniculans Kern. A Maine.
Gymnosporangium nidus-avis Thax. H 1936 Penobscot.

AMELANCHIER INTERMEDIA Spach.
Gymnosporangium clavipes Cke. & Pk. A Maine.

AMELANCHIER OBLONGIFOLIA (T. & G.) Roem.
Gymnosporangium clavariaeforme (Jacq.) DC. A Maine.
Gymnosporangium clavipes Cke. & Pk. A Maine.

Amelanchier rotundifolia. See A. SANGUINEA.

AMELANCHIER SANGUINEA (Pursh) DC.
(A. rotundifolia Roem.).
Gymnosporangium clavipes Cke. & Pk. A Maine.
Gymnosporangium nidus-avis Thax. H 1936 Penobscot.

AMELANCHIER STOLONIFERA Wiegand.
Gymnosporangium nidus-avis Thax. H 1936 Penobscot.

Ampelopsis quinquefolia. See PARTHENOCISSUS QUINQUEFOLIA.
Ampelopsis tricuspidata. See PARTHENOCISSUS TRICUSPIDATA.

AMPHICARPA MONOICA (L.) Ell. HOG PEANUT
(In R. as Amphiocarp monoica).
*Synchytrium decipiens Farl. 1899 Penobscot.

ANDROMEDA GLAUCOPHYLLA Link. BOG ROSEMARY
(A. polifolia L. of R).
Exobasidium vaccinii (Fckl.) Wor. P 1931.
*Rhytisma andromedae (Pers.) Fr. 1899 Penobscot.

Andromeda ligustrina. See LYONIA LIGUSTRINA.
Andromeda polifolia. See A. GLAUCOPHYLLA.

ANDROPOGON sp. BEARD GRASS
Balansia hypoxylon Atk. C 1915 Oxford.

ANEMONE RIPARIA Fernald. ANEMONE
Puccinia anemones-virginianae Schw. A Maine.

ANEMONE VIRGINIANA L. ANEMONE
*Puccinia anemones-virginianae Schw. Cumberland.

ANTHOXANTHUM ODORATUM L. SWEET VERNAL GRASS
Puccinia graminis Pers. A Maine.
Puccinia poae-sudeticae (Westend.) Jørstad. A Maine.

ANTIRRHINUM MAJUS L. SNAPDRAGON
Phyllosticta antirrhini Syd. C 1927 Penobscot. P 1927.
Puccinia antirrhini Diet. & Holw. A Maine. C 1917 York. L 1917 Knox.
Sclerotinia sclerotiorum (Lib.) DBy. (S. libertiana Fckl.). C 1910 Hancock.
Verticillium sp. C 1932 Penobscot. P 1932.

Apargia autumnalis. See LEONTODON AUTUMNALIS.

APIUM GRAVEOLENS L. CELERY
Cercospora apii Fres. C 1908 (general over range of host).
Sclerotinia sp. C 1929 Penobscot.
Septoria apii Rostr. C (general over range of host). P 1919.
Septoria petroselini Desm. var. apii Berk. & Curt. C 1935 York.

ARALIA NUDICAULIS L. WILD SARSAPARILLA
Nyssopsora clavellosa (Berk.) Arth. A Maine.

ARALIA SPINOSA L. HERCULES CLUB
*Hypoderma commune (Fr.) Duby. 1899 Penobscot.

ARCTIUM LAPPAE L. BURDOCK
*Phyllosticta lappae Sacc. Maine 1900.

ARCTOSTAPHYLOS UVA-URSI (L.) Spreng. BEARBERRY
?*Phacidium vaccinii Fr. 1880 York.

ARENARIA GROENLANDICA (Retz.) Spreng. MOUNTAIN SANDWORT
*Ustilago violacea (Pers.) Fckl. 1897 Franklin.

Arenaria lateriflora. See MOEHRINGIA LATERIFLORA.

ARISAEMA TRIPHYLLUM (L.) Schott. INDIAN TURNIP
Uromyces caladii (Schw.) Farl. A Maine.

ARONIA sp. CHOKEBERRY
Gymnosporangium clavipes Cke. & Pk. (G. germinale (Schw.) Kern). B Maine.
Gymnosporangium davisii Kern. B Maine.

ARONIA ARBUTIFOLIA Elliot var. ATROPURPUREA Britt. (A. floribunda Elliot, Pyrus arbutifolia L.).
Gymnosporangium clavipes Cke. & Pk. A Maine.
Gymnosporangium davisii Kern. A Maine.
Gymnosporangium transformans (Ell.) Kern. H 1936 Knox.

Aronia floribunda. See A. ARBUTIFOLIA var. ATROPURPUREA.

ARONIA MELANOCARPA (Michx.) Ell.
Gymnosporangium clavipes Cke. & Pk. A Maine.
Gymnosporangium davisii Kern. A Maine.
Gymnosporangium transformans (Ell.) Kern. H 1936 Knox.

ARONIA MONSTROSA Zabel
Gymnosporangium clavipes Cke. & Pk. A Maine.

ASCLEPIAS sp. MILKWEED
*Uromyces asclepiadis (Schw.) Cke. Maine.

ASPARAGUS OFFICINALIS L. ASPARAGUS
*Pleospora asparagi Rabh. York.
Puccinia asparagi DC. C 1907 Penobscot.

Asplenium filix-femina. See ATHYRIUM ANGUSTUM.

ASTER sp. ASTER
*Puccinia asteris Duby. 1859 Cumberland.
Puccinia extensicola Plowr. A Maine.

ASTER LINDLEYANUS T. & G. ASTER
*Coleosporium solidaginis (Schw.) Thüm. 1900 Penobscot.

ASTER MACROPHYLLUS L. ASTER
*Erysiphe cichoracearum DC. 1899 Penobscot.
*Puccinia asteris Duby. 1895 Somerset, 1898 Cumberland.

ASTER NOVI-BELGII L. ASTER
*Entyloma compositarum Farl. 1899 Cumberland.

Aster umbellatus. See DOELLINGERIA UMBELLATA.

ATHYRIUM ANGUSTUM (Willd.) Presl.
(Asplenium filix-femina (L.) Bernh. of Arthur).
Uredinopsis struthiopteridis Störmer. A Maine.

Atriplex hastata. See A. PATULA.

ATRIPLEX PATULA L. ORACH
(A. hastata of Arthur).
Puccinia aristidae Tracy. A Maine.

AVENA SATIVA L. OATS
Helminthosporium sp. L 1925 Hancock.
*Helminthosporium inconspicuum Cke. & Ell. var. britannicum Grove.
1894 Kennebec, Penobscot.
Puccinia coronata Cda. C 1903 Hancock. P 1927. A Maine.
Puccinia graminis Pers. C (general over range of host). A Maine.
Ustilago sp. C (general over range of host). P 1917.
Ustilago avenae (Pers.) Jens. C (general over range of host).
Ustilago levis (Kellerm. & Sw.) Magn. C 1914 Somerset. L 1933 Maine.

BERBERIS VULGARIS L. COMMON BARBERRY
*Cucurbitaria berberidis (Pers.) S. F. Gray. Wells.
Puccinia graminis Pers. C (general).

BETA VULGARIS L. Beet
Actinomyces scabies (Thax.) Güssow. C 1931 York.
Cercospora beticola Sacc. C 1913 Oxford.
Phoma betae Frank. C 1915 Penobscot.

BETA VULGARIS var. CICLA L. CHARD
Cercospora beticola Sacc. C 1913 Penobscot.

BETULA sp. BIRCH
*Anthostoma microsporum Karst. 1880 York.
*Bombardia fasciculata Fr. 1858 Cumberland.
*Coccomyces dentatus (Schum.) Sacc. 1898 Penobscot.
*Daedalea unicolor (Bull.) Fr. 1896 Cumberland.
*Dermatea fusispora Ell. & Ev. 1892 Penobscot.
*Diatrype stigma (Hoffm.) Fr. 1857 Cumberland.
*Diatrypella verruciformis (Ehrhart) Nits. Cumberland.
Dothidea sp. C 1918 Hancock. P 1918.
*Hypoxylon morsei Berk. & Curt. 1880 York.
*Irpex lacteus Fr. 1897 Penobscot.
*Polyporus brumalis (Pers.) Fr. 1897 Penobscot.
*Polyporus elegans (Bull.) Fr. 1858 Cumberland.
*Poria ferruginosa (Schrad.) Fr. 1859 Cumberland.
*Stereum hirsutum Fr. 1898 Cumberland.
*Trametes suaveolens (L.) Fr. 1896 Penobscot.

Betula alba papyrifera. See B. PAPYRIFERA.

BETULA LENTA L. SWEET BIRCH
Polyporus elegans (Bull.) Fr. P 1936.
Polyporus radiatus (Sow.) Fr. P 1936.

BETULA LUTEA Michx. f. YELLOW BIRCH
Fomes applanatus (Pers.) Wallr. B Maine.
Fomes fomentarius (L.) Gill. H 1936.
*Fomes salicinus (Pers.) Cke. 1896 Penobscot.
*Guepinia spathularia (Schw.) Fr. 1897 Cumberland.
*Hypoxylon multiforme Fr. 1859 Cumberland.
Melampsoridium betulinum (Pers.) Kleb. A Maine.
*Rosellinia desmazierii (Berk. & Br.) Ell. & Ev. Cumberland.
Stereum murrayi (Berk. & Curt.) Burt. P 1936.

BETULA PAPYRIFERA Marsh. WHITE BIRCH
(B. alba papyrifera (Marsh) Spach.).
Fomes applanatus (Pers.) Wallr. B Maine.
Fomes fomentarius (L.) Gill. P 1936.
Fomes igniarius (L.) Gill. P 1936.
Fomes nigricans (Fr.) Gill. P 1936.
Melampsoridium betulinum (Pers.) Kleb. (M. betulae Arth.). A Maine. B Maine.
Nectria sp. P 1934.
*Polyporus pargamenus Fr. (Polystictus pergamenus of R.) 1895 Cumberland.
Poria laevigata (Fr.) Sacc. P 1936.
*Stereum pulverulentum Pk. 1892 Penobscot.

BETULA POPULIFOLIA Marsh. GRAY BIRCH
*Bulgaria rufa Schw. 1887 Penobscot.
*Calosphaeria ciliatula (Fr.) Karst. Penobscot.
*Diatrypella betulina (Pk.) Sacc. 1899 Penobscot.
*Discosia artocreas (Tode) Fr. 1857 Cumberland.
*Dothidella betulina (Fr.) Sacc. 1859 Cumberland.
Fomes connatus (Weinm.) Gill. P 1936.
Fomes fomentarius (L.) Gill. B Maine.
*Libertella betulina Desm. 1894 Penobscot.
Melampsoridium betulinum (Pers.) Kleb. A Maine.
*Melanconium bicolor Nees. Cumberland.
*Naemaspora crocea (Bon.) Sacc. 1880 York.
Phlebia strigosa-zonata (Schw.) Burt. P 1936.
Polyporus betulinus (Bull.) Fr. P 1936.
*Polyporus radiatus (Sow.) Fr. (Polystictus aureo-nitens of R.). 1896 Androscoggin.
Poria ferruginosa (Schrad.) Fr. P 1936.
*Stereum ochraceoflavum Schw. 1898 Penobscot.
*Venturia ditricha (Fr.) Karst. 1900 Penobscot.

BIDENS CERNUA L. STICK-TIGHT
*Sphaerotheca castagnei Lév. 1900 Penobscot.

BRASSICA sp. MUSTARD, TURNIP
Alternaria brassicae (Berk.) Sacc. L 1920 Knox.
Plasmodiophora brassicae Wor. L 1922 Washington. C 1934 Washington.

BRASSICA CAMPESTRIS L. RUTABAGA
*Periola tomentosa Fr. Cumberland.
Plasmodiophora brassicae Wor. C 1934 Washington.

BRASSICA OLERACEA L. CABBAGE
Alternaria brassicae (Berk.) Sacc. C (general over range of host).
Corticium vagum Berk. & Curt. C 1915 Penobscot.
Fusarium conglutinans Woll. P 1919.
Phytomonas campestris (Pam.) Bergey et al. (Bacterium campestre (Pam.) EFS). C 1932 York, Penobscot. P 1919.
Plasmodiophora brassicae Wor. C (general over range of host). P 1919.

BRASSICA OLERACEA BOTRYTIS L. CAULIFLOWER
Alternaria brassicae (Berk.) Sacc. L 1920 Knox.
Erwinia carotovora (Jones) Holland (Bacillus carotovorus L. R. Jones). C 1908 Penobscot. B Maine.
Phytomonas campestris (Pam.) Bergey et al. (Bacterium campestre (Pam.) EFS). C 1933 York.
Plasmodiophora brassicae Wor. C 1908 general.

BRASSICA RAPA L. TURNIP
Alternaria brassicae (Berk.) Sacc. C 1920 Knox.
Fusarium sp. C 1915 Penobscot.
Phytomonas campestris (Pam.) Bergey et. al. (Pseudomonas campestris (Pam.) EFS). C 1917 York.
Plasmodiophora brassicae Wor. C 1920 Washington. L 1922 Washington.
*Stilbum vulgare Tode. Cumberland.

CALAMAGROSTIS CANADENSIS (Michx.) Beauv. BLUE JOINT GRASS
*Claviceps purpurea (Fr.) Tul. 1892 Penobscot.

CALENDULA OFFICINALIS L. POT MARIGOLD
Sclerotinia sp. C Penobscot.

CALLISTEPHUS CHINENSIS Nees. CHINA ASTER
Corticium vagum Berk. & Curt. B Maine.
Fusarium conglutinans Woll. var. callistephi Beach. C 1929 Aroostook. P 1918. L 1925 Oxford.
Rhizoctonia sp. C 1908 Hancock.
Sclerotinia sclerotiorum (Lib.) DBy (S. libertiana Fckl.). C 1910 Hancock.

CAMPANULA MEDIUM L. CANTERBURY BELLS
Sclerotinia sp. C 1929 Piscataquis.

CAPSELLA BURSA-PASTORIS (L.) Medic. SHEPHERD'S PURSE
*Albugo candida (Pers.) Kuntze (Cystopus candidus (Pers.) Lév. of R.). 1898 Penobscot.

CAPSICUM FRUTESCENS L. PEPPER
Sclerotinia sp. C 1915 Cumberland.

CAREX BROMOIDES Schkuhr. SEDGE
*Puccinia caricis (Schum.) Schroet. 1899 Penobscot.

CAREX CRINITA Lam. SEDGE
*Puccinia caricis (Schum.) Schroet. 1899 Cumberland.

Carex debilis var. rudgei. See C. FLEXUOSA.

CAREX FLEXUOSA Muhl.
(C. debilis Michx. var. rudgei Bailey)
Puccinia caricis uniporula (C. R. Orton) Arth. A Maine.

CAREX PALLESCENS L.
Puccinia caricis uniporula (C. R. Orton) Arth. A Maine.

CAREX PAUPERCULA Michx.
Puccinia karelica Tranz. A Maine.

CAREX PEDUNCULATA Muhl.
*Phyllachora caricis (Fr.) Sacc. 1896 Penobscot.
*Ustilago caricis (Pers.) Fckl. 1896 Penobscot.

CAREX RETRORSA Schwein.
*Puccinia caricis (Schum.) Schroet. 1895 Penobscot.

CAREX ROSTRATA Stokes.
*Puccinia caricis (Schum.) Schroet. 1895 Penobscot.

CAREX SCOPARIA Schkuhr.
Puccinia extensicola euthamii Arth. A Maine.

CARYA sp. HICKORY
*Phyllosticta caryae Pk. 1888 Maine.

Cassandra calyculata. See CHAMAEDAPHNE CALYCULATA.
Castalia odorata. See NYMPHAEA ODORATA.

CASTANEA DENTATA (Marsh.) Borkh. CHESTNUT
Endothia parasitica (Murrill) P. J. & H. W. Anderson. P 1920.
Marssonia ochroleuca (Berk. & Curt.) Humph. B Maine.

CELASTRUS SCANDENS L. BITTERSWEET
*Asterina celastri Ell. & Kellerm. 1892 Penobscot.
*Phyllactinia suffulta (Reb.) Sacc. 1892 Penobscot.

CHAMAECYPARIS THYOIDES (L.) BSP WHITE CEDAR
Gymnosporangium biseptatum Ell. P 1936.
Gymnosporangium ellisii (Berk.) Farl. P 1936.

CHAMAEDAPHNE CALYCULATA (L.) Moench. LEATHER LEAF
(Cassandra calyculata of R.).
Chrysomyxa cassandrae (Pk. & G. W. Clinton) Tranz. A Maine.
*Venturia pulchella Cke. & Pk. 1897 Cumberland.

Chamaenerion spicatum. See EPILOBIUM ANGUSTIFOLIUM.

CHELONE GLABRA L. BALMANY
*Septoria wilsonii G.W. Clinton. 1899 Franklin.

CHENOPODIUM ALBUM L. LAMB'S QUARTERS
*Leptosphaeria doliolum (Pers.) DeNot. 1899 Penobscot.

CHRYSANTHEMUM MORIFOLIUM Ram. FLORISTS' CHRYSANTHEMUM
(C. sinense Sabine).
*Oidium chrysanthemi Rabh. 1898 Penobscot.

Chrysanthemum sinense. See C. MORIFOLIUM.
Circaea alpina. See C. LUTETIANA.

CIRCAEA LUTETIANA L. ENCHANTER'S NIGHTSHADE.
(C. alpina L. of R.).
Puccinia circaeae Pers. A. Maine.

CIRSIUM ARVENSE (L.) Scop. CANADA THISTLE
Puccinia obtegens (Link) Tul. A Maine.

CIRSIUM LANCEOLATUM (L.) Mill. BULL THISTLE
Puccinia cnici Martius. A Maine.

CLEMATIS VIRGINIANA L. VIRGIN'S BOWER.
*Cercospora squalidula Pk. (C. squalida of R.). 1900 Penobscot.
*Erysiphe communis (Wallr.) Fr. 1899 Penobscot.
Puccinia rubigo-vera agropyri (Erikss.) Arth. A Maine.

Comptonia asplenifolia. See MYRICA ASPLENIFOLIA.

COPTIS TRIFOLIA (L.) Salisb. GOLDTHREAD
*Sphaeria coptis Schw. 1898 Penobscot.
*Vermicularia coptina Pk. 1898 Penobscot.

CORNUS sp. CORNEL, DOGWOOD
*Myxosporium nitidum Berk. & Curt. 1857 Cumberland.
Septoria cornicola Desm. C 1933 York.

CORNUS ALTERNIFOLIA L. DOGWOOD
*Fracchiaea callista (Berk. & Curt.) Sacc. Cumberland.
*Myxosporium nitidum Berk. & Curt. 1898 Piscataquis.

CORNUS CANADENSIS L. DWARF CORNEL
*Glomerularia corni Pk. 1898 Penobscot.
Puccinia porphyrogenita Curt. A Maine.

CORNUS STOLONIFERA Michx. RED OSIER DOGWOOD
*Phyllactinia suffulta (Reb.) Sacc. 1898 Penobscot.

CORYLUS sp. HAZELNUT, FILBERT
Gloeosporium coryli (Desm.) Sacc. B Maine.

CORYLUS CORNUTA Marsh. BEAKED HAZELNUT
(C. rostrata Ait.).
*Gnomonia coryli (Batsch) Auersw. 1859 Cumberland.
*Phyllactinia suffulta (Reb.) Sacc. 1900 Penobscot.

Corylus rostrata. See C. CORNUTA.

CRATAEGUS sp. HAWTHORN
Erwinia amylovora (Burr.) Winslow et al. (Bacillus amylovorus (Burr.) Trev.). C 1931 York.

CRATAEGUS COCCINEA L.
(C. modesta Sarg.).
Gymnosporangium clavipes Cke. & Pk. A Maine.

CRATAEGUS HOLMESIANA Ashe.
(C. tenuifolia Britt.).
Gymnosporangium clavipes Cke. & Pk. A Maine.

CRATAEGUS JONESAE Sarg.
Gymnosporangium clavipes Cke. & Pk. A Maine.

CRATAEGUS MACRACANTHA Ladd.
(C. macrantha of R.).
*Gymnosporangium clavipes Cke. & Pk. 1901 Cumberland.

Crataegus modesta. See C. COCCINEA.

CRATAEGUS ROTUNDIFOLIA Moench.
Gymnosporangium clavipes Cke. & Pk. A Maine.

Crataegus tenuifolia. See C. HOLMESIANA.

CRATAEGUS TOMENTOSA L.
Gymnosporangium clavipes Cke. & Pk. A Maine.
Gymnosporangium globosum Farl. A Maine.

CUCUMIS SATIVUS L. CUCUMBER
Alternaria sp. C 1914 Penobscot.
Cladosporium cucumerinum Ell. & Arth. C (general over range of host). P 1919.
Colletotrichum lagenarium (Pass.) Ell. & Hals. C 1917 Cumberland. P 1917.
Erwinia tracheiphila (EFS) Holland (Bacillus tracheiphilus EFS). P 1928. C (general over range of host).
Fusarium sp. C 1915 Kennebec. C 1934 York and Cumberland.
Pseudoperonospora cubensis (Berk. & Curt.) Rostew. C (general over range of host).

CUCUMIS MELO L. MUSKMELON
Pseudoperonospora cubensis (Berk. & Curt.) Rostew. C 1915 Cumberland.

CUCURBITA MAXIMA Duchesne SQUASH
Cladosporium cucumerinum Ell. & Arth. B Maine.
Erwinia tracheiphila (EFS) Holland (Bacillus tracheiphilus EFS). C 1914 Hancock, York.
Mycosphaerella citrullina (C. O. Smith) Gross. L 1925 York.
Sclerotinia sp. C 1928 Penobscot. P 1928.

CUCURBITA PEPO L. PUMPKIN
Erysiphe cichoracearum DC. C 1928 Penobscot. P 1928.

CUCURBITA PEPO CONDENSA L. SUMMER SQUASH
Botrytis sp. C 1910 Penobscot.
Cladosporium cucumerinum Ell. & Arth. C 1934 Penobscot. B Maine.

CYDONIA JAPONICA Pers. FLOWERING QUINCE
Gymnosporangium clavipes Cke. & Pk. B Maine.

CYDONIA OBLONGA Mill. QUINCE
(C. vulgaris (L.) Pers.).
Gymnosporangium sp. C (general over range of host).
Gymnosporangium clavariaeforme (Jacq.) DC. B Maine. A Maine.
Gymnosporangium clavipes Cke. & Pk. C 1930 Sagadahoc.

Cydonia vulgaris. See C. OBLONGA.

DACTYLIS GLOMERATA L. ORCHARD GRASS
Scolecotrichum sp. C 1913 Penobscot.

DAHLIA sp. DAHLIA
Sclerotinia sclerotiorum (Lib.) DBy. P 1925.

DALIBARDA REPENS L. DALIBARDA
*Septoria dalibardae Pk. 1898 Androscoggin.

DANTHONIA SPICATA (L.) Beauv. WILD OAT GRASS
Balansia hypoxylon Atk. L 1915 Oxford.
*Phyllachora graminis (Pers.) Fckl. 1895 Penobscot.

DELPHINIUM sp. LARKSPUR
Erysiphe polygoni DC. C 1933 Somerset. B Maine.
Phytomonas delphinii (EFS) Bergey et al. (Bacterium delphinii (EFS) Bryan). C 1927 Knox. P 1927. B Maine.

DELPHINIUM ELATUM L. LARKSPUR
*Erysiphe communis (Wallr.) Fr. 1857 Cumberland.

DENTARIA DIPHYLLA Michx. TOOTHWORT, PEPPER-ROOT
*Albugo candida (Pers.) Kuntze (Cystopus candidus (Pers.) Fr. of R.). Maine.

DIANTHUS CARYOPHYLLUS L. CARNATION
Alternaria sp. L 1925 Androscoggin.
Fusarium sp. L 1925 Androscoggin.
Uromyces caryophyllinus (Schrank) Wint. C 1908 Penobscot. P 1926. A Maine.

DIAPENSIA LAPPONICA L.
*Mycosphaerella pachyasca (Rostr.) Vestergren (Sphaerella pachyasca Rostr. of R.). 1898 Mt. Katahdin.

DIERVILLA LONICERA Mill. BUSH-HONEYSUCKLE
(D. trifida Moench.).
*Cercospora diervillae Ell. & Ev. 1900 Penobscot.
*Ramularia diervillae Pk. 1897 Cumberland.
*Septoria diervillicola Ell. & Ev. 1897 Cumberland.

Diervilla trifida Moench. See D. LONICERA.

DIRCA PALUSTRIS L. LEATHERWOOD
Puccinia extensicola hydnoidea (Berk. & Curt.) Arth. A Maine.

DISTICHLIS SPICATA (L.) Greene SPIKE GRASS
Puccinia aristidae Tracy. A Maine.

DOELLINGERIA UMBELLATA (Mill.) Nees.
(Aster umbellatus Mill.).
Coleosporium solidaginis (Schw.) Thüm. A Maine.
Puccinia extensicola Plowr. A Maine.

DRYOPTERIS INTERMEDIA (Muhl.) Gray SHIELD FERN, WOOD FERN
Milesia fructuosa Faull. A Maine.

ELEOCHARIS TENUIS (Willd.) Schultes. SPIKE RUSH
Puccinia eleocharidis Arth. A Maine.

EMPETRUM NIGRUM L. BLACK CROWBERRY
Chrysomyxa empetri (Pers.) Schroet. A Maine. H 1929 Head Light Island.

EPILOBIUM ADENOCAULON Haussk. WILLOW-HERB
Pucciniastrum pustulatum (Pers.) Diet. A Maine.

EPILOBIUM ANGUSTIFOLIUM L.
(Chamaenerion spicatum (Lam.) S. F. Gray).
Pucciniastrum pustulatum (Pers.) Diet. A Maine.

ERIGERON sp. FLEABANE
*Septoria erigerontea Sacc. 1899 Cumberland.

ERIOPHORUM TENELLUM Nutt. COTTON GRASS
Puccinia angustata Pk. A Maine.

ERIOPHORUM VIRGINICUM L. COTTON GRASS
Puccinia angustata Pk. A Maine.

EUPATORIUM PERFOLIATUM L. THOROUGHWORT
Puccinia eleocharidis Arth. A Maine.

Euphorbia cyparissias. See TITHYMALUS CYPARISSIAS.
Euthamia graminifolia. See SOLIDAGO GRAMINIFOLIA.

FAGUS sp. BEECH
*Diaporthe syngenesia (Fr.) Fckl. Cumberland.
*Hydnum ochraceum Pers. 1858 Cumberland.

Fagus atropunicea. See F. GRANDIFOLIA.
Fagus ferruginea. See F. GRANDIFOLIA.

FAGUS GRANDIFOLIA Ehrh. BEECH
(F. atropunicea Sudw.).
(F. ferruginea Ait.).
*Claudopus nidulans (Fr.) Pk. 1898 Penobscot.
*Diatrype disciformis (Hoffm.) Fr. Cumberland.
*Dichaena faginea (Pers.) Fr. 1897 Penobscot.
*Durella compressa (Pers.) Tul. 1857 Cumberland.
*Endobotryon elegans Berk. & Curt. Cumberland.
*Favolus boucheanus Klotzsch. 1858 Cumberland.
*Favolus europaeus Fr. 1899 Penobscot.
Fomes conchatus (Pers.) Gill. P 1936.
*Fomes fomentarius (L.) Gill. 1896 Penobscot.
Fomes igniarius (L.) Gill. P 1921.
*Hydnum coralloides Scop. 1898 Penobscot.
Hydnum ochraceum (Pers.) Fr. P 1936.
*Hypoxylon cohaerens (Pers.) Fr. 1859 Cumberland.
*Hypoxylon enteromelum (Schw.) Berk. Cumberland, York.
*Hypoxylon turbinulatum (Schw.) Berk. 1897 Penobscot.
*Libertella faginea Desm. 1896 Penobscot.
Nectria sp. P 1934.
?*Polyporus borealis Fr. 1898 Penobscot.
Polyporus brumalis (Pers.) Fr. P 1936.
Polyporus cinnabarinus (Jacq.) Fr. P 1936.
*Polyporus elegans (Bull.) Fr. 1896 Penobscot.
Polyporus hirsutus (Wulf.) Fr. H 1935 Penobscot.
*Polyporus radiatus (Sow.) Fr. (Polystictus radiatus of R). 1900 Penobscot.
*Sphaeria radicum Schw. Cumberland.
*Stereum complicatum Fr. 1857 Cumberland.

FESTUCA ELATIOR L. MEADOW FESCUE
Claviceps purpurea (Fr.) Tul. C 1910 Penobscot.
Puccinia coronata Cda. A Maine.

FILIPENDULA ULMARIA (L.) Maxim. QUEEN OF THE MEADOW
(Spiraea ulmaria L.).
*Hendersonia lirella Cke. 1887 Penobscot.

FRAGARIA sp. STRAWBERRY
Botrytis sp. C 1931 Maine.
Fusarium sp. C 1926 Hancock.
Marssonia potentillae (Desm.) Fisch. var. fragariae Sacc. C 1913 Penobscot.
Mycosphaerella fragariae (Tul.) Lindau. C (general).
Pezizella lythri (Desm.) Shear & B. O. Dodge. B Maine.
Sphaerotheca castagnei Lév. C (general).

FRAGARIA VIRGINIANA Duchesne. STRAWBERRY
?*Ceuthospora sp. 1900 Penobscot.
*Mycosphaerella fragariae (Tul.) Lindau (Sphaerella fragariae (Tul.) Sacc. of R.; Ramularia tulasnei Sacc.). 1898 Penobscot.

FRAXINUS sp. ASH
*Ceratostoma spina (Schw.) Sacc. 1858 Cumberland.
*Dendrophoma pruinosa (Fr.) Sacc. 1859 Cumberland.
?*Dinemasporium strigosum (Fr.) Sacc. York.
*Hysterographium fraxini (Pers.) DeNot. Cumberland.
*Microthyrium microscopicum Desm. 1857 Cumberland.
*Mycosphaerella maculiformis (Pers.) Johans. & Buchholtz (Sphaerella maculiformis (Pers.) Auersw. of R). Cumberland.
Phyllosticta fraxinicola (F. Currey) Sacc. C 1927 Penobscot.
*Poria nitida (Pers.) Cke. 1897 Cumberland.

FRAXINUS AMERICANA L. WHITE ASH
*Cytospora fugax (Bull.) Fr. (Cytispora in R). Cumberland.
*Piggotia fraxini Berk. & Curt. 1899 Cumberland.
Polyporus sulphureus (Bull.) Fr. P 1936.
*Sphaerographium fraxini (Pk.) Sacc. 1899 Penobscot.
*Xylaria clavulata (Schw.) Berk. & Curt. 1899 Penobscot.

FRAXINUS NIGRA Marsh. BLACK ASH
(F. sambucifolia Lam.).
*Daldinia concentrica (Bolt.) Ces. & DeNot. 1858 Cumberland.

Fraxinus sambucifolia. See F. NIGRA.

GAULTHERIA PROCUMBENS L. CHECKERBERRY
*Asterina gaultheriae Curt. 1898 Penobscot.
*Mycosphaerella gaultheriae (Cke. & Ell.) House (Sphaerella gaultheriae Cke. & Ell. of R). 1898 Penobscot.
*Phyllosticta gaultheriae Ell. & Ev. 1897 Penobscot.

GAYLUSSACIA BACCATA (Wang.) C. Koch. BLACK HUCKLEBERRY
Exobasidium vaccinii (Fckl.) Wor. P 1931. C 1933 Penobscot.
Microsphaera alni var. vaccinii (Schw.) Salm. P 1931.
Pucciniastrum myrtilli (Schum.) Arth. A Maine. P 1931.

GERANIUM sp. CRANESBILL
*Uromyces geranii (DC.) Fr. Cumberland.

GLADIOLUS sp. GLADIOLUS
Didymellina iridis (Desm.) Höhn. C 1930 Lincoln.
Fusarium sp. P 1925 Supp. 50.
Rhizoctonia sp. C 1928 Penobscot.

GROSSULARIA HIRTELLA (Michx.) Spach.
(Ribes hirtellum Michx.).
Puccinia caricis grossulariata Arth. A Maine.

GROSSULARIA RECLINATA (L.) Mill. EUROPEAN GOOSEBERRY
(Ribes grossularia L.).
Septoria grossulariae (Lib.) Westend. B Maine.

HELIANTHUS ANNUUS L. SUNFLOWER
Fusarium sp. C 1910 Penobscot.
Sclerotinia sclerotiorum (Lib.) DBy. C 1928 Penobscot.

HELIANTHUS TUBEROSUS L. JERUSALEM ARTICHOKE
Puccinia helianthi Schw. A Maine.

HERACLEUM LANATUM Michx. COW PARSNIP
*Phoma asteriscus Berk. 1895 Penobscot.

HIERACIUM CANADENSE Michx.
Puccinia hieracii (Schum.) Mart. A Maine.

HIERACIUM SCABRUM Michx.
Puccinia hieracii (Schum.) Mart. A Maine.

Hordeum sativum. See H. VULGARE.

HORDEUM VULGARE L. BARLEY.
(H. sativum Pers.).
Helminthosporium gramineum Rabh. C 1913 Penobscot. L 1933 Maine.
Puccinia graminis Pers. L 1920 Maine. P 1933.
Ustilago hordei (Pers.) Lagerh. C 1914 Penobscot.
Ustilago nuda (Jens.) Kellerm. & Sw. C 1913 Penobscot. L 1933 Maine.

HUMULUS LUPULUS L. HOP
Sphaerotheca humuli (DC.) Wint. B Maine.

HYDRANGEA SP. HYDRANGEA
Phyllosticta hydrangeae Ell. & Ev. C 1909 Penobscot. L 1927 Androscoggin.

HYPERICUM BOREALE (Britt.) Bickn. ST. JOHN'S-WORT
Uromyces hyperici (Spreng.) Curt. A Maine.

HYPERICUM CANADENSE L.
Uromyces hyperici (Spreng.) Curt. A Maine.

HYPERICUM MAJUS (Gray) Britt.
Uromyces hyperici (Spreng.) Curt. A Maine.

HYPERICUM MUTILUM L.
Uromyces hyperici (Spreng.) Curt. A Maine.

HYPERICUM PERFORATUM L. COMMON ST. JOHN'S-WORT
Uromyces hyperici (Spreng.) Curt. A Maine.

Hypericum virginicum. See TRIADENUM VIRGINICUM.

IBERIS sp. CANDYTUFT.
Sclerotinia sclerotiorum (Lib.) DBy. (S. libertiana Fckl.). C 1910 Hancock.

ILEX sp. HOLLY
*Rhytisma ilicis-canadensis Schw. B Maine.

ILEX VERTICILLATA (L.) Gray. WINTERBERRY
*Rhytisma prini (Schw.) Fr. 1859 Wells.

IRIS sp. FLEUR-DE-LIS
Heterosporium gracile (Wallr.) Sacc. C 1910 Hancock. L 1925 York. P 1925 Suppl. 37.

IRIS GERMANICA L. FLEUR-DE-LIS
Heterosporium gracile (Wallr.) Sacc. C 1914 Hancock.

IRIS VERSICOLOR L. LARGER BLUE FLAG
Puccinia iridis (DC.) Wallr. A Maine.

JUGLANS CINEREA L. BUTTERNUT
*Melanconium oblongum Berk. 1896 Penobscot.

JUNCUS sp. RUSH
*Uromyces junci (Desm.) L. Tul. (Puccinia junci of R). Cumberland.

JUNCUS MACER S. F. Gray.
(J. tenuis Auth. not Willd.).
*Uromyces junci (Desm.) L. Tul. Penobscot.
Uromyces silphii (Burr.) Arth. A Maine.

Juncus tenuis. See J. MACER.

JUNIPERUS sp. JUNIPER
Gymnosporangium davisii Kern. B Maine.
*Lophodermium juniperinum (Fr.) DeNot. Cumberland.

JUNIPERUS COMMUNIS L. COMMON JUNIPER
Gymnosporangium clavariaeforme (Jacq.) DC. A Maine.
Gymnosporangium clavipes Cke. & Pk. A Maine.

JUNIPERUS COMMUNIS L. var. DEPRESSA Pursh. PROSTRATE JUNIPER
(J. sibirica Burgsd.).
Gymnosporangium aurantiacum Chev. H 1936 Penobscot.
Gymnosporangium clavariaeforme (Jacq.) DC. P 1936.
Gymnosporangium clavipes Cke. & Pk. P 1936. A Maine.
Gymnosporangium davisii Kern. A Maine.

Juniperus sibirica Burgsd. See J. COMMUNIS var. DEPRESSA.

JUNIPERUS VIRGINIANA L. var. CREBRA Fernald & Griscom. RED CEDAR
(J. virginiana L.).
*Gymnosporangium clavipes Cke. & Pk. 1900 Penobscot.
Gymnosporangium globosum Farl. P 1936. A Maine.
Gymnosporangium juniperi-virginianae Schw. P 1936. A Maine.
Gymnosporangium nidus-avis Thax. P 1936. A Maine.

KALMIA ANGUSTIFOLIA L. LAMBKILL
*Mycosphaerella colorata (Pk.) Earle (Sphaerella colorata Pk. of R).
1898 Penobscot.
Venturia kalmiae Pk. C Hancock.

Kalmia glauca. See K. POLIFOLIA.

KALMIA POLIFOLIA Wang. PALE LAUREL
(K. glauca Ait.).
*Dothidella kalmiae (Pk.) Sacc. 1899 Penobscot.

LACTUCA INTEGRIFOLIA Bigel. HORSE-WEED
*Septoria lactucicola Ell. & Martin. 1898 Cumberland.

LACTUCA SATIVA L. LETTUCE
Botrytis sp. C 1910 Kennebec.
Sclerotinia sclerotiorum (Lib.) DBy. C 1910 Penobscot.

Larix americana. See L. LARICINA.

LARIX LARICINA (Duroi) Koch. TAMARACK
(L. americana Michx.).
Melampsora bigelowii Thüm. A Maine.

LATHYRUS ODORATUS L. SWEET PEA
Alternaria sp. C 1925 Cumberland.
Fusarium sp. C (general).
Glomerella cingulata (Ston.) Spauld. & Schrenk. C 1928 Hancock.
Rhizoctonia sp. L 1926 Aroostook.

LEDUM GROENLANDICUM Oeder. LABRADOR TEA
(L. latifolium Ait.).
Chrysomyxa ledicola (Pk.) Lagerh. A Maine.

Ledum latifolium. See L. GROENLANDICUM.

LEONTODON AUTUMNALIS L. FALL DANDELION
(Apargia autumnalis (L.) Hoffm.).
Puccinia hieracii (Schum.) Martius. A Maine.

LIGUSTICUM SCOTHICUM L. SCOTCH LOVAGE
Aecidium ligustici Ell. & Ev. A Maine.

LILIUM CANADENSE L. WILD YELLOW LILY
Uromyces holwayi Lagerh. A Maine.

LILIUM CANDIDUM L. MADONNA LILY
Botrytis sp. L 1925 Waldo.

LIMONIUM CAROLINIANUM (Walt.) Britt. MARSH ROSEMARY
Uromyces limonii (DC.) Lév. A Maine.

LOBELIA INFLATA L. INDIAN TOBACCO
*Septoria lobeliae Pk. 1895 Cumberland.

LONICERA sp. HONEYSUCKLE
Leptothyrium periclymeni (Desm.) Sacc. C 1915 Hancock.
Microsphaera dubyi Lév. C 1914 Somerset.

LONICERA TATARICA L. TARTARIAN HONEYSUCKLE
*Microsphaera dubyi Lév. 1900 Penobscot.

LORINSERIA AREOLATA (L.) Presl. CHAIN FERN
(Woodwardia areolata (L.) Moore).
Uredinopsis mirabilis (Pk.) Magn. A Maine.

LUZULA CAMPESTRIS (L.) DC. var. MULTIFLORA (Ehrh.) Celak. WOOD RUSH
(L. intermedia (Thuill.) Nels.).
Puccinia obscura Schroet. A Maine.

Luzula intermedia. See L. CAMPESTRIS var. MULTIFLORA.

LYCOPERSICUM ESCULENTUM Mill. TOMATO
Alternaria solani (Ell. & Martin) Jones & Grout. C 1910 Penobscot, York. P 1918.
*Botryosporium pulchrum Cda. 1898 Orono.
Cladosporium fulvum Cke. C 1915 Sagadahoc, Penobscot.
Fusarium sp. C 1927 Kennebec.
*Gloeosporium phomoides Sacc. Penobscot.
Glomerella cingulata (Ston.) Spauld. & Schrenk. C 1927 Penobscot. P 1927.
Macrosporium sp. C 1929 Penobscot.
Phoma destructiva Plow. C 1927 Penobscot. P 1927 Suppl. 61.
Phytophthora infestans (Mont.) DBy. L 1927 (general).
Rhizoctonia sp. L 1927 Kennebec.
Sclerotinia sp. L 1933 Maine.
Septoria lycopersici (Speg.) Sacc. C (general). P 1918.
Verticillium albo-atrum Reinke & Berth. C 1931 Cumberland.

LYCOPUS AMERICANUS Muhl. WATER HOREHOUND
Puccinia angustata Pk. A Maine.

LYCOPUS VIRGINICUS L. BUGLE WEED
Puccinia angustata Pk. A Maine.

LYONIA LIGUSTRINA (L.) DC. MALEBERRY
(Andromeda ligustrina).
*Cucurbitaria longitudinalis Pk. York.
*Polyporus vaporarius (Pers.) Fr. (Poria vaporaria of R). 1859 York.
Rhytisma decolorans Fr. B Maine.

MEDICAGO SATIVA L. ALFALFA
Macrosporium sp. B Maine.
Pseudopeziza medicaginis (Lib.) Sacc. C 1911 York (common in most seasons). P 1917.

MENTHA ARVENSIS var. CANADENSIS (L.) Briquet. MINT
(M. canadensis L.).
*Phyllosticta decidua Ell. & Kellerm. 1899 Penobscot.
Puccinia menthae Pers. A Maine.
*Ramularia menthicola Sacc. 1891 Penobscot.

MENTHA CARDIACA Gerarde. MINT
(M. sativa L.).
*Phyllosticta decidua Ell. & Kellerm. 1900 Cumberland.
Puccinia menthae Pers. A Maine.

Mentha sativa. See M. CARDIACA.

MITELLA NUDA L.
Puccinia heucherae (Schw.) Diet. A Maine.

MOEHRINGIA LATERIFLORA (L.) Fenzl. SANDWORT
(Arenaria lateriflora L.).
Puccinia arenariae (Schum.) Wint. A Maine.

MONESES UNIFLORA (L.) Gray. ONE-FLOWERED PYROLA
Chrysomyxa pyrolae (DC.) Rostr. A Maine.

MUHLENBERGIA SYLVATICA Torr.
*Phyllachora graminis (Pers.) Fckl. 1899 Cumberland.

MYRICA ASPLENIFOLIA L. SWEET FERN
(Comptonia asplenifolia Ait.).
Cronartium comptoniae Arth. A Maine.

MYRICA GALE L. SWEET GALE
Cronartium comptoniae Arth. A Maine.
Gymnosporangium ellisii (Berk.) Farl. H 1936 Knox.
?*Ovularia monilioides Ell. & Mart. 1895 Cumberland.

Nemopanthus fascicularis. See N. MUCRONATA.

NEMOPANTHUS MUCRONATA (L.) Trel. MOUNTAIN HOLLY
(N. fascicularis Raf.).
*Rhytisma ilicis-canadensis Schw. 1893 Penobscot.

NUPHAR ADVENA Ait. YELLOW POND LILY
*Sphaerella paludosa Ell. & Ev. 1900 Penobscot.

NYMPHAEA ODORATA Ait. SWEET SCENTED WATER LILY
(Castalia odorata (Ait.) W. & W.).
*Cercospora nymphaeacea Cke. & Ell. 1900 Penobscot.

OENOTHERA BIENNIS L. EVENING PRIMROSE
Puccinia extensicola oenotherae (Mont.) Arth. A Maine.
Uromyces plumbarius Pk. A Maine.

OENOTHERA FRUTICOSA L. SUNDROPS
*Septoria oenotherae West. 1898 Penobscot.

ONOCLEA SENSIBILIS L. SENSITIVE FERN
Uredinopsis mirabilis (Pk.) Magn. A Maine.

OSMUNDA sp. FLOWERING FERN
*Leptostroma filicinum Fr. 1858 Cumberland.

OSMUNDA CINNAMOMEA L. CINNAMON FERN
Uredinopsis osmundae Magn. A Maine.
?*Uredo polypodii (Pers.) DC. 1859 York.

OSMUNDA CLAYTONIANA L. FLOWERING FERN
Uredinopsis osmundae Magn. A Maine.

OSMUNDA REGALIS L. var. SPECTABILIS (Willd.) Gray. FLOWERING FERN
Uredinopsis osmundae Magn. A Maine.

OSTRYA VIRGINIANA (Mill.) K. Koch. HOP HORNBEAM
(O. virginica Willd.).
?*Caldesiella ferruginosa (Fr.) Sacc. 1859 Cumberland.
*Gnomoniella fimbriata (Pers.) Sacc. 1859 Cumberland.

Ostrya virginica. See O. VIRGINIANA.

OXALIS STRICTA L. YELLOW OXALIS
*Microsphaera russellii G. W. Clinton. 1900 Penobscot.
*Phyllachora oxalina Ell. & Ev. 1900 Penobscot.

PAEONIA sp. PEONY
Alternaria sp. C 1925 Aroostook.
Botrytis sp. C 1917 Cumberland. P 1927.
Septoria paeoniae Westend. C 1910 Hancock.

PAPAVER NUDICAULE L. ICELAND POPPY
Rhizoctonia sp. C 1910 Hancock.

PARTHENOCISSUS QUINQUEFOLIA (L.) Planch. VIRGINIA CREEPER
(Ampelopsis quinquefolia).
*Plasmopara viticola (Berk. & Curt.) Berl. & DeToni. 1900 Penobscot.

PARTHENOCISSUS TRICUSPIDATA Planch. BOSTON IVY
(Ampelopsis tricuspidata Planch.).
Botrytis sp. C 1931 Penobscot.
Guignardia bidwellii (Ell.) Viala & Ravaz. C 1931 Hancock. P 1931.

PASTINACA SATIVA L. PARSNIP
Cercospora apii Fres. var. pastinacae Sacc. C 1928 Kennebec.

PEDICULARIS CANADENSIS L. COMMON LOUSEWORT
*Puccinia clintonii Pk. 1898 Penobscot.

PELARGONIUM sp. GERANIUM
?Bacillus caulivorus Prill. & Del. L 1924 Oxford.

PENTSTEMON LAEVIGATUS Ait. BEARD-TONGUE
*Septoria pentstemonis Ell. & Ev. 1899 Cumberland.

PHASEOLUS VULGARIS L. BEAN

Alternaria fasciculata (Cke. & Ell.) Jones & Grout. C 1930 Kennebec.
Botrytis cinerea Pers. C 1923 Hancock.
Colletotrichum lindemuthianum (Sacc. & Magn.) Briosi & Cav. C (general). P 1918.
Epicoccum sp. C 1909 Penobscot.
Fusarium sp. C 1925 Penobscot.
Fusarium martii Appel. & Woll. var. phaseoli Burkh. C 1928 Hancock. P 1925. L 1925 Penobscot.
Phytomonas flaccumfaciens (Hedges) Bergey et al. (Bacterium flaccumfaciens Hedges). C 1928 Kennebec.
Phytomonas phaseoli (EFS) Bergey et al. (Bacterium phaseoli EFS). C (general). P 1918.
Rhizoctonia sp. C 1917 Androscoggin.
Sclerotinia sp. C 1915 Franklin. L 1926 Penobscot.
Uromyces phaseoli typica Arth. C (general). P 1917. L 1925 Kennebec. A Maine.

PHILADELPHUS CORONARIUS L. MOCK ORANGE

*Cyphella pezizoides Zopf. 1896 Penobscot.
*Diplodia microspora Berk. & Curt. 1897 Penobscot.
*Gibberella pulicaris (Fr.) Sacc. Cumberland.
*Nectria cinnabarina (Tode) Fr. 1897 Penobscot.
*Phoma landeghemiae (Nits.) Sacc. 1897 Penobscot.

PHLEUM PRATENSE L. TIMOTHY

*Epichloë typhina (Pers.) Tul. 1890 Penobscot.
*Phyllachora graminis (Pers.) Fckl. 1895 Penobscot.
Puccinia graminis phlei-pratensis (Erikss. & Henn.) Stak. & Piem. A Maine. C 1914 Penobscot.
Scolecotrichum graminis Fckl. C 1913 Penobscot.

PHLOX sp. PHLOX

Erysiphe sp. C 1921 Sagadahoc. L 1926 Knox.
Septoria sp. C 1927 Cumberland.
Septoria phlogis Sacc. & Speg. C 1915 Hancock.
Verticillium glaucum Bon. C 1925 Aroostook.

PHLOX PANICULATA L. GARDEN PHLOX

*Erysiphe phlogis Schw. 1859 Cumberland.
*Septoria divaricata Ell. & Ev. 1897 Penobscot.

PICEA sp. SPRUCE

Ascochyta piniperda Lindau. P 1932.
Chrysomyxa ledicola (Pk.) Lagerh. C 1930 Washington.

PICEA ABIES Karst. NORWAY SPRUCE
(P. excelsa Link.).
*Cenangium abietis var. strobilinum Alb. & Schw. 1889 Penobscot.
*Phoma strobiligena Desm. 1898 Penobscot.

Picea canadensis. See P. GLAUCA.
Picea excelsa. See P. ABIES.

PICEA GLAUCA Voss. WHITE SPRUCE
(P. canadensis (Mill.) B.S.P.).
Chrysomyxa pyrolae (DC.) Rostr. (Melampsoropsis pyrolae of B.). A Maine. B Maine.
Lenzites saepiaria (Wulf.) Fr. P 1936.
Merulius tremellosus (Schrad.) Fr. P 1936.
Polyporus abietinus (Dicks.) Fr. P 1936.

PICEA MARIANA (Mill.) BSP. BLACK SPRUCE
(P. nigra (Ait.) Link.).
Chrysomyxa cassandrae (Pk. & G. W. Clinton) Tranz. A Maine.
Chrysomyxa ledicola (Pk.) Lagerh. (Melampsoropsis ledicola of B.). A Maine. B Maine.
Chrysomyxa pyrolae (DC.) Rostr. A Maine.
Fomes annosus (Fr.) Cke. B Maine.
Fomes pini (Thore) Lloyd (Trametes pini (Brot.) Fr. of B.). B Maine.
Fomes pinicola (Swartz.) Cooke. B Maine.
*Fomes subroseus (Weir) Overh. (Fomes carneus of B.). 1895 Somerset.
*Lophodermium pinastri (Schrad.) Chev. 1899 Penobscot.
Melampsorella cerastii (Pers.) Schroet. A Maine.
*Peniophora cinerea (Fr.) Cke. 1898 Cumberland.
?*Stilbum glomerulisporum Ell. & Ev. 1896 Penobscot.

Picea nigra. See P. MARIANA.

PICEA PUNGENS Engelm. BLUE SPRUCE
Chrysomyxa ledicola (Pk.) Lagerh. A Maine. C 1930 Piscataquis. P 1930.

PICEA RUBENS Sarg. RED SPRUCE
(P. rubra (Duroi) Dietr.).
Chrysomyxa ledicola (Pk.) Lagerh. (Melampsoropsis ledicola of B.). B Maine.
Chrysomyxa pyrolae (DC.) Rostr. A Maine.
Fomes annosus (Fr.) Cke. B Maine.
Fomes pini (Thore) Lloyd (Trametes pini (Brot.) Fr. of B). B Maine.
Fomes pinicola (Swartz) Cke. B Maine. P 1936.
Fomes subroseus (Weir) Overh. P 1936.
Melampsorella cerastii (Pers.) Schroet. A Maine.
Poria selecta Karst. P 1936.

Picea rubra. See P. RUBENS.

PINUS sp. PINE
*Agyrium rufum (Pers.) Fr. 1880 York.
*Amphisphaeria applanata (Fr.) Ces. & DeNot. York.
*Aposphaeria hemisphaerica (Alb. & Schw.) Sacc. 1859 York.
*Aposphaeria hysterella Sacc. York.
*Capnodium pini Berk. & Curt. Penobscot.
*Cenangium abietis Pers. 1887 Penobscot.
?*Cucurbitaria elongata (Fr.) Grev. Cumberland, York.
*Dendrodochium compressum Ell. & Ev. 1897 Penobscot.
*Ganoderma lucidum (Leyss.) Karst. (Fomes lucidus (Leyss.) Fr. of R.). 1895 Cumberland.
*Hydnum pithyophilum Berk. & Curt. York.
Hypoderma strobicola Tub. P 1922 Suppl. 29.
*Lecanidion fusco-atrum Rehm. York.
*Nectria cucurbitula (Tode) Fr. York.
*Pezizella vulgaris (Fr.) Sacc. 1880 York.
*Polyporus weinmanni Fr. 1896 Penobscot.
*Poria attenuata Pk. 1895 Piscataquis.
*Poria farinella Fr. Maine.
*Poria violacea Fr. 1895 Penobscot.
Rhizoctonia sp. C 1914 Penobscot. P 1921 Suppl. 23.
*Stereum imbricatum (Schw.) Lév. 1880 York.
*Stereum pini Fr. York.
*Trametes inodora Fr. 1890 Penobscot.
?*Tubercularia dubia Link. 1860 York.
*Valsa colliculus (Wormsk.) Berk. York.

PINUS BANKSIANA Lamb. NORTHERN SCRUB PINE
Cronartium comptoniae Arth. A Maine.
Cronartium quercuum (Berk.) Miyabe (C. cerebrum of P.). P 1918 Suppl. 5.

PINUS RESINOSA Ait. RED PINE
Coleosporium solidaginis (Schw.) Thüm. A Maine. C 1932 Kennebec. P 1932.
Cronartium comptoniae Arth. A Maine.

PINUS RIGIDA Mill. PITCH PINE
Coleosporium solidaginis (Schw.) Thüm. A Maine. P 1933.
Cronartium comptoniae Arth. A Maine.
*Dasyscypha ellisiana (Rehm) Sacc. 1899 Cumberland.
Fomes pini (Thore) Lloyd (Trametes pini (Brot.) Fr. of B). B Maine.

PINUS STROBUS L. WHITE PINE
Caliciopsis pinea Pk. P 1920.
*Calocera cornea Fr. 1900 Cumberland.
Coccomyces sp. P 1921 Suppl. 23.

PINUS STROBUS L. (Continued)
*Coccomyces pini (Fr.) Karst. 1899 Cumberland.
Cronartium ribicola J. C. Fischer. C 1916 Cumberland (general, however, over the State). A Maine. B Maine.
Cryptosporium pini Berk. & Curt. P 1922 Suppl. 29.
Fomes pini (Thore) Lloyd. P 1936.
*Fomes pinicola (Swartz) Cke. 1896 Penobscot.
*Lophodermium pinastri (Schrad.) Chev. 1898 Penobscot.
Polyporus schweinitzii Fr. P 1936. B Maine.
Septobasidium pinicola Snell. P 1936.
*Thelephora laciniata Pers. 1860 York.
*Tryblidiopsis pinastri (Pers.) Karst. 1858 Cumberland.

PINUS SYLVESTRIS L. SCOTCH PINE
Cronartium comptoniae Arth. A Maine.
*Cytospora pinastri Fr. 1900 Penobscot.
*Hydnum auriscalpium L. 1897 Penobscot.
*Phoma acuum Cke. & Ell. 1900 Penobscot.
*Phoma strobiligena Desm. 1898 Penobscot.
*Tryblidiopsis pinastri (Pers.) Karst. 1900 Penobscot.

PISUM SATIVUM L. PEA
Ascochyta pisi Lib. C (general).
Botrytis sp. C 1925 Waldo.
Cladosporium pisicola Snyder. P 1936.
Colletotrichum pisi Pat. C 1930 Oxford. P 1930.
*Erysiphe communis (Wallr.) Fr. 1886 Penobscot.
Erysiphe polygoni DC. C 1935 Somerset.
Fusarium sp. C (general). P 1927. L 1918 Maine.
Glomerella cingulata (Ston.) Spauld. & Schrenk. P 1928.
Mycosphaerella pinodes (Berk. & Blox.) Stone. C 1916 (general). P 1919 Suppl. 3.
Peronospora viciae (Berk.) D By. C 1925 Waldo.
Rhizoctonia sp. C 1929 Cumberland. L 1933 Somerset.
Septoria pisi Westend. C 1913 Penobscot.
Stemphylium polymorphum Bon. C 1925 Waldo.
Uromyces fabae (Pers.) D By. C 1934 Kennebec, York, Penobscot.

PLANTAGO MAJOR L. COMMON PLANTAIN
*Cercospora plantaginis Sacc. 1900 Penobscot.
*Ramularia plantaginis Ell. & Mart. 1899 Cumberland.

POA PRATENSIS L. KENTUCKY BLUEGRASS
*Erysiphe graminis DC. (Oidium monilioides Link). 1900 Cumberland.
Puccinia poae-sudeticae (Westend.) Jørstad. A Maine.

POLYGALA sp. MILKWORT
*Puccinia pyrolae Cke. Cape Elizabeth.

POLYGALA PAUCIFOLIA Willd. FRINGED POLYGALA
Puccinia pyrolae Cke. A Maine.

POLYGONATUM BIFLORUM (Walt.) Elliot. SOLOMON'S SEAL
*Vermicularia polygonati Schw. 1898 Androscoggin.

POLYGONUM AMPHIBIUM L.
(P. hartwrightii Gray).
Puccinia polygoni amphibii Pers. A Maine.

POLYGONUM AVICULARE L. KNOTWEED
Uromyces polygoni (Pers.) Fckl. A Maine.

POLYGONUM COCCINEUM Muhl.
Puccinia polygoni amphibii persicariae (Strauss) Arth. A Maine.

POLYGONUM CONVOLVULUS L. BLACK BINDWEED
*Ustilago anomala Kunze. 1899 Oxford.

POLYGONUM FOWLERI Robinson.
Uromyces polygoni (Pers.) Fckl. A Maine.

Polygonum hartwrightii. See P. AMPHIBIUM.

POLYGONUM MUHLENBERGII (Meissn.) Wats.
Puccinia polygoni amphibii persicariae (Strauss.) Arth. A Maine.

POLYGONUM PERSICARIA L. LADY'S THUMB
*Septoria polygonorum Desm. 1898 Androscoggin.

POLYPODIUM VIRGINIANUM L.
(P. vulgare L.).
Milesia polypodophila (Bell) Faull. A Maine.

Polypodium vulgare. See P. VIRGINIANUM.

POLYSTICHUM ACROSTICHOIDES (Michx.) Schott. CHRISTMAS FERN
Taphrina filicina Rostr. P 1929.

POPULUS sp. POPLAR
*Cytospora leucosperma (Pers.) Fr. (Cytispora of R.). Cumberland.
Hypoxylon pruinatum (Klotzsch) Cke. B Maine. P 1925 Suppl. 50.
Polyporus dryophilus Berk. B Maine.
*Polyporus pargamenus Fr. (Polystictus pergamenus of R). Cumberland.
*Stereum rufum Fr. (Hypocrea richardsonii Berk. & Mont. of R). 1857 Cumberland.
Taphrina aurea (Pers.) Fr. B Maine.
*Tympanis conspersa Fr. 1859 Cumberland.
Venturia tremulae Aderh. B Maine.

POPULUS ALBA L. WHITE POPLAR
Fusicladium radiosum (Lib.) Lindr. C 1919 Waldo. P 1919 Suppl. 2.

POPULUS BALSAMIFERA L. COTTONWOOD
(P. deltoides Marsh., P. monilifera Ait.).
Melampsora medusae Thüm. A Maine.
Polyporus adustus (Willd.) Fr. P 1936.
Polyporus velutinus Fr. P 1936.
Sclerotium bifrons Ell. & Ev. L 1920 Arostook. Det. by G. G. Hahn.

Populus deltoides. See P. BALSAMIFERA.

POPULUS GRANDIDENTATA Michx. LARGE-TOOTHED ASPEN
Melampsora medusae Thüm. C 1908 Penobscot.
Polyporus fumosus (Pers.) Fr. P 1936.
Poria punctata Fr. P 1936.
Radulum orbiculare Fr. P 1936.

Populus monilifera. See P. BALSAMIFERA.

POPULUS TACAMAHACA Mill. BALSAM POPLAR
Melampsora medusae Thüm. C 1908 Penobscot.

POPULUS TREMULOIDES Michx. AMERICAN ASPEN
*Cenangium populneum (Pers.) Rehm. 1898 Penobscot.
*Cytospora chrysosperma (Pers.) Fr. (Cytispora of R.). 1890 Penobscot.
*Cytospora nivea (Hoffm.) Sacc. 1900 Penobscot.
Fomes igniarius (L.) Gill. P 1921 Suppl. 23.
Lenzites betulina (L.) Fr. P 1936.
Melampsora abietis-canadensis (Farl.) C. A. Ludwig. A Maine.
Polyporus hirsutus (Wulf.) Fr. P 1936.
Polyporus picipes Fr. P 1936.
Sclerotium bifrons Ell. & Ev. L 1920 Aroostook. Det. by G. G. Hahn.
*Stereum rufum Fr. (Hypocrea richardsonii Berk. & Mont. of R.). 1898 Penobscot.
*Valsa nivea (Hoffm.) Fr. 1880 York.

POTENTILLA CANADENSIS L. CINQUEFOIL
Frommea obtusa (Strauss.) Arth. A Maine.
*Phragmidium potentillae (Pers.) Karst. 1898 Penobscot.

Potentilla littoralis. See P. PENSYLVANICA.

POTENTILLA MONSPELIENSIS L.
Phragmidium potentillae (Pers.) Karst. A Maine.

Potentilla pectinata. See P. PENSYLVANICA.

POTENTILLA PENSYLVANICA[2/] L.
(P. pectinata Raf., P. littoralis Rydb.).
Phragmidium potentillae (Pers.) Karst. A Maine.

Potentilla tridentata. See SIBBALDIOPSIS TRIDENTATA.

PRENANTHES SERPENTARIA Pursh. LION'S-FOOT
*Septoria nabali Berk. & Curt. 1899 Cumberland.

PRUNUS sp. CHERRY (See below for PLUM).
Botrytis sp. C 1915 Knox.
Cladosporium carpophilum Thüm. C 1916 Franklin, Penobscot, Washington. B Maine.
Dibotryon morbosum (Schw.) Theiss. & Syd. (Plowrightia morbosa (Schw.) Sacc.). C (general over range of host). P 1919.
Podosphaera oxyacanthae (DC.) D By. C 1910 Kennebec.
*Poria inermis Ell. & Ev. 1897 York.
Sclerotinia fructicola (Wint.) Rehm. C 1915 Cumberland.
*Solenia anomala (Pers.) Fr. 1892 Penobscot.

PRUNUS sp. PLUM (See above for CHERRY).
Cladosporium sp. C 1932 Hancock.
Cladosporium carpophilum Thüm. C 1920 Aroostook. L 1921 Aroostook.
Dibotryon morbosum (Schw.) Theiss. & Syd. (Plowrightia morbosa (Schw.) Sacc.). C 1908 (general over range of host).
Exoascus pruni (Berk.) Fckl. C (general over range of host).
Glomerella cingulata (Ston.) Spauld. & Schrenk. C 1931 Kennebec.
Podosphaera oxyacanthae (DC.) D By. C 1910 Penobscot.
Sclerotinia fructicola (Wint.) Rehm. C 1911 (general over range of host).

PRUNUS CERASUS L. SOUR CHERRY
*Sporocybe persicae (Schw.) Fr. Cumberland.

PRUNUS PENNSYLVANICA L. f. PIN CHERRY
*Dermatea cerasi (Pers.) Fr. 1856 Piscataquis.
Dibotryon morbosum (Schw.) Theiss. & Syd. (Plowrightia morbosa (Schw.) Sacc.). B Maine.

PRUNUS PERSICA (L.) Stokes. PEACH
Exoascus deformans (Berk.) Fckl. C 1909 (general over range of host). P 1917.

PRUNUS SALICINA Lindl. JAPANESE PLUM
Phytomonas pruni (EFS) Bergey _et al._ (Bacterium pruni EFS). C 1933 Cumberland.

[2/] On single "N" see discussion by Fernald in Rhodora 37: 286-292, 1935.

PRUNUS SEROTINA Ehrh. WILD BLACK CHERRY
*Cercospora circumscissa Sacc. 1899 Cumberland.
Polyporus dryophilus var. vulpinus (Fr.) Overh. P 1936.
Polyporus tulipiferae (Schw.) Overh. P 1936.
Poria prunicola (Murr.) Sacc. & Trotter. P 1936.

PRUNUS VIRGINIANA L. CHOKE CHERRY
Cercospora circumscissa Sacc. C 1913 Kennebec.
*Podosphaera oxyacanthae (DC.) D By. Penobscot.

PTERIDIUM AQUILINUM (L.) Kuhn. BRAKE, BRACKEN
(Pteris aquilina L.).
*Leptostroma pteridis Ehrenb. 1857 Cumberland.
*Phyllachora pteridis (Reb.) Fckl. Hancock.

Pteris aquilina. See PTERIDIUM AQUILINUM.

PYROLA sp. WINTERGREEN
Chrysomyxa pyrolae (DC.) Rostr. C 1930 Cumberland.

PYROLA ELLIPTICA Nutt. SHIN-LEAF
Chrysomyxa pyrolae (DC.) Rostr. A Maine.

PYROLA ROTUNDIFOLIA L.
*Chrysomyxa pyrolae (DC.) Rostr. 1859 York.

Pyrus arbutifolia. See ARONIA ARBUTIFOLIA var. ATROPURPUREA.

PYRUS COMMUNIS L. PEAR
Erwinia amylovora (Burr.) Winslow et al. (Bacillus amylovorus (Burr.) Trev.). C 1910 (general over range of host). P 1922.
Fabraea maculata Atk. C 1930 Penobscot.
Phytomonas tumefaciens (EFS & Town.) Bergey (Bacterium tumefaciens EFS & Town.). C 1912 penobscot.
Venturia pirina Aderh. C 1911 (general over range of host). P 1921.

PYRUS MALUS L. APPLE
Alternaria sp. L 1925 York.
Alternaria mali Roberts. C 1929 Kennebec, 1933 Oxford.
Botrytis cinerea Pers. C 1926 Penobscot.
Cephalothecium roseum (Fr.) Cda. C 1908 Cumberland. L 1927 York.
Coryneum foliicolum Fckl. C Cumberland.
Cylindrosporium sp. L 1912 York.
Cytospora sp. C 1910 Piscataquis. L 1914 Oxford.
Erwinia amylovora (Burr.) Winslow et al. (Bacillus amylovorus (Burr.) Trev.). C 1911 (Common in some seasons in southwest part of State). P 1917.

PYRUS MALUS L. (continued)

Fomes igniarius (L.) Gill. H 1936 Penobscot.
Fusarium sp. C 1910 York.
Gloeodes pomigena (Schw.) Colby (Phyllachora pomigena (Schw.) Sacc.). C 1908 Kennebec. L 1927 York.
*Gloeosporium versicolor Berk. & Curt. 1896 Penobscot.
Glomerella cingulata (Ston.) Spauld. & Schrenk. C 1910 (general).
*Glonium lineare (Fr.) DeNot. 1860 York.
Gymnosporangium sp. C 1910 York. L 1925 York.
Gymnosporangium clavipes Cke. & Pk. (G. germinale Kern). P 1931 Suppl. 84.
Gymnosporangium globosum Farl. C 1910 York. P 1931 Suppl. 84. A Maine.
Gymnosporangium juniperi-virginianae Schw. P 1917. C 1929 Somerset. L 1920 Lincoln. A Maine.
*Hydnum mucidum Pers. 1859 York.
Leptothyrium pomi (Mont. & Fr.) Sacc. C 1915 (general).
*Melanconis stilbostoma (Fr.) Tul. Cumberland, Wells.
Mycosphaerella pomi Pass. (Cylindrosporium pomi Brooks, Phoma pomi Pass.). C 1908 (general). B Maine.
Myxosporium corticola Edg. C 1910 Oxford.
Nectria cinnabarina (Tode) Fr. C 1925 Kennebec.
Nectria ditissima Tul. C 1913 Penobscot. P 1919 Suppl. 1.
Nectria galligena Bres. B Maine. P 1934.
Penicillium sp. C 1910 (general).
Penicillium expansum (Link) Thom. C 1908 (general).
Peniophora cinerea (Fr.) Cke. P 1936.
Phoma mali Schulz. & Sacc. C 1910 Kennebec, Penobscot. L 1925 Kennebec. B Maine.
Physalospora obtusa (Schw.) Cke. (P. cydoniae Am.Auth.; P. malorum Shear et al; Sphaeropsis malorum Pk.). C 1908 (general). L 1924 Penobscot. P 1919.
Phytomonas tumefaciens (EFS & Town.) Bergey et al. (Bacterium tumefaciens EFS & Town). C 1911 Penobscot. L 1927 Washington.
Podosphaera oxyacanthae (DC.) D By. C 1911 Franklin, Oxford, Kennebec.
*Polyporus admirabilis Pk. Cumberland.
Schizophyllum commune Fr. P 1936.
Sclerotinia fructicola (Wint.) Rehm. C 1910 Penobscot. L 1925 York.
Stereum purpureum (Pers.) Fr. C 1918 Cumberland. P 1919 Suppl. 1. H 1934 Penobscot, Kennebec. B Maine.
*Valsa ambiens (Pers.) Fr. 1880 York.
Valsa leucostoma (Pers.) Fr. C 1914 Oxford.
Venturia inaequalis (Cke.) Aderh. C 1908 (general). P 1917.

QUERCUS sp. OAK

*Cladosporium epiphyllum (Pers.) Fr. Cumberland.
*Diatrype obesa Berk. & Curt. (Valsaria quadrata (Schw.) Sacc. of R). 1878 Cumberland.
*Favolus alutaceus Berk. & Mont. Cumberland.
*Helotium herbarum (Pers.) Fr. 1859 Cumberland.
*Hypoxylon marginatum (Schw.) Berk. Cumberland.
Microsphaera densissima (Schw.) Cke. & Pk. C 1913 Hancock.
*Polyporus sulphureus (Bull.) Fr. 1897 Kennebec.
*Ustulina vulgaris Tul. 1880 York.

QUERCUS ALBA L. WHITE OAK

Favolus alveolaris (DC.) Quél. P 1936.
Stereum frustulosum Fr. P 1936.
Stereum rameale Schw. P 1936.

Quercus borealis. See Q. RUBRA.

QUERCUS ILICIFOLIA Wang. BEAR OAK

*Marssonia martini Sacc. & Ell. 1899 Cumberland.

QUERCUS RUBRA L. NORTHERN RED OAK
(Q. borealis Michx.).

*Coccomyces dentatus (Kunze & Schmidt) Sacc. 1880 York.
*Daedalea confragosa Pers. 1897 Penobscot.
Daedalea quercina (L.) Fr. P 1936.
*Diatrypella quercina (Pers.) Nits. 1859 Cumberland.
*Discosia artocreas (Tode) Fr. 1899 Cumberland.
Favolus canadensis Klotzsch. P 1936.
*Lasiosphaeria mutabilis (Pers.) Fckl. 1859 York.
*Microsphaera extensa Cke. & Pk. 1897 Penobscot.
Polyporus compactus Overh. P 1936 (First report from outside Pennsylvania and New Jersey).
*Sphaeria obscura Schw. Cumberland.

RANUNCULUS ACRIS L. TALL BUTTERCUP

*Erysiphe communis (Wallr.) Fr. 1900 Penobscot.
*Ramularia ranunculi Pk. 1900 Penobscot.

RHAMNUS sp. BUCKTHORN

*Puccinia coronata Cda. Cumberland.

RHAMNUS CATHARTICA L. COMMON BUCKTHORN

Puccinia coronata Cda. C 1928 Penobscot.

RHODODENDRON sp.

Phomopsis kalmiae Enlows. C 1933 Androscoggin.
Septoria rhododendri Cke. B Maine.

RHODODENDRON CANADENSE (L.) B.S.P. RHODORA
(Rhodora canadensis L.).
Exobasidium vaccinii (Fckl.) Wor. P 1931.
Pucciniastrum myrtilli (Schum.) Arth. A Maine.

Rhodora canadensis. See RHODODENDRON CANADENSE.

RHUS sp. SUMAC
*Cytospora rhuinae Fr. Maine. (R. says may be C. rhoina Fr.).
Physalospora obtusa (Schw.) Cke. (P. cydoniae Am. Auth.). C 1929 York.

RHUS TYPHINA L. STAGHORN SUMAC
*Calospora aculeans (Schw.) Sacc. 1857 Cumberland.
*Phoma pulchella (Berk. & Curt.) Sacc. Cumberland.
*Sporocybe rhois Berk. & Curt. (Lichen). 1900 Penobscot.

RIBES sp. CURRANT, GOOSEBERRY
Alternaria sp. C 1910 Kennebec.
Cronartium ribicola J. C. Fischer. C 1916 Kennebec.
Gloeosporium ribis (Lib.) Mont. & Desm. C 1910 Sagadahoc.
Mycosphaerella grossulariae (Fr.) Lindau. P 1919 Suppl. 9.
Puccinia caricis (Schum.) Schroet. C 1914 York, Penobscot.
Sphaerotheca mors-uvae (Schw.) Berk. & Curt. C 1914 Lincoln.

RIBES AMERICANUM Mill. WILD BLACK CURRANT
(R. floridum L'Her.).
Cronartium ribicola J. C. Fischer. A Maine.

Ribes floridum. See R. AMERICANUM.

RIBES GLANDULOSUM Grauer. SKUNK CURRANT
(R. prostatum L'Her.).
Cronartium ribicola J. C. Fischer. A Maine.
Puccinia caricis grossulariata Arth. A Maine.
Puccinia ribis DC. A Maine.

Ribes grossularia. See GROSSULARIA RECLINATA.
Ribes hirtellum. See GROSSULARIA HIRTELLA.

RIBES NIGRUM L. BLACK CURRANT
Cronartium ribicola J. C. Fischer. C 1917 York. L 1927 Hancock.

Ribes prostratum. See R. GLANDULOSUM
Ribes rubrum. See R. TRISTE.

RIBES TRISTE Pall.
(R. rubrum Gray).
*Plowrightia ribesia (Pers.) Sacc. 1896 Penobscot.
Puccinia ribis DC. A Maine.

RIBES VULGARE Lam. RED CURRANT
Cronartium ribicola J. C. Fischer. C 1917 Hancock, Kennebec.
Nectria cinnabarina (Tode) ex Fr. C 1914 Oxford.
Septoria ribis Desm. C 1916 Hancock.

ROBINIA PSEUDO-ACACIA L. LOCUST
*Aglaospora profusa (Fr.) DeNot. Cumberland.
*Nectria cinnabarina (Tode) Fr. Penobscot.
*Sphaeropsis robiniae Ell. & Barthol. Cumberland.
*Tubercularia granulata (Pers.) Fr. Cumberland.

ROSA sp.
Actinonema rosae (Lib.) Fr. C 1910 Hancock. L 1927 York.
*Cercospora rosicola Pass. 1900 Cumberland.
*Peronospora sparsa Berk. 1900 Penobscot.
Phragmidium sp. C 1918 Penobscot. P 1918 Suppl. 5.
Phragmidium disciflorum (Tode) J. F. James. C 1918 Oxford.
Phragmidium rosae-californicae Diet. C 1933 Lincoln.
Phragmidium speciosum (Fr.) Cke. C 1933 Hancock.
*Phragmidium subcorticinum (Schrank) Wint. Cumberland.
Phytomonas tumefaciens (EFS & Town) Bergey et al. (Bacterium tumefaciens EFS & Town). C 1930 Piscataquis.
Sphaerotheca sp. C 1930 Penobscot. L 1926 Knox.
Sphaerotheca humuli (DC.) Wint. C 1929 Cumberland.
Sphaerotheca pannosa (Wallr.) Lév. C 1911 Aroostook.

ROSA VIRGINIANA Mill.
Phragmidium americanum (Pk.) Diet. A Maine.

RUBUS sp.
Botrytis sp. C 1935 Penobscot.
Botrytis cinerea Pers. C 1928 Penobscot.
Elsinoë veneta (Burkh.) Jenkins (Gloeosporium venetum Speg.). C 1911 Androscoggin. L 1925 Penobscot.
Epicoccum sp. C 1910 York.
Fusarium sp. C 1931 Somerset.
Gymnoconia peckiana (Howe) Trotter. C 1909 Androscoggin (Common in most seasons).
*Helotium herbarum (Pers.) Fr. 1880 York.
Kunkelia nitens (Schw.) Arth. C 1936 Penobscot.
Mycosphaerella rubina (Pk.) Jacz. C 1924 Penobscot.
*Phragmidium rubi idaei (DC.) Karst. Westbrook.

RUBUS sp. (continued)
Phytomonas tumefaciens (EFS & Town.) Bergey et al. (Bacterium tumefaciens EFS & Town.). C 1930 Piscataquis.
Septoria sp. C 1929 Cumberland. L 1925 Cumberland.
Septoria rubi Westend. C 1913 Cumberland. L 1925 Cumberland.
Sphaerotheca humuli (DC.) Wint. P 1932.
*Tubercularia nigricans (Bull.) Link. 1889 Penobscot.

RUBUS ALLEGHENIENSIS Porter
(R. nigrobaccus Bailey).
Gymnoconia peckiana (Howe) Trotter. A Maine.
Kuehneola uredinis (Link) Arth. A Maine.

RUBUS CANADENSIS L. BLACKBERRY
Gnomonia rubi Rehm. C 1915 York.
Gymnoconia peckiana (Howe) Trotter. A Maine.
Kuehneola uredinis (Link) Arth. A Maine.
Kunkelia nitens (Schw.) Arth. A Maine. P 1924.
Phytomonas tumefaciens (EFS & Town.) Bergey et al. (Bacterium tumefaciens EFS & Town.). C 1914 Androscoggin.

RUBUS FLAGELLARIS Willd.
(R. plicatifolius Blanch. in part; R. villosus Auth.).
Kuehneola uredinis (Link) Arth. A Maine.
*Septoria rubi Westend. 1899 Cumberland.

Rubus frondosus. See R. RECURVANS.

RUBUS HISPIDUS L. DEWBERRY
Kuehneola uredinis (Link) Arth. A Maine.
*Rhytisma blakei Curt. 1857 York.

RUBUS IDAEUS L. COMMON RED RASPBERRY
(R. strigosus Michx.).
*Coryneum microstictum Berk. & Br. Cumberland.
Phragmidium rubi-idaei (DC.) Karst. A Maine.
Pucciniastrum americanum (Farl.) Arth. A Maine.

RUBUS NIGRICANS Rydb.
Kuehneola uredinis (Link) Arth. A Maine.

Rubus nigrobaccus. See R. ALLEGHENIENSIS.

RUBUS OCCIDENTALIS L. BLACK RASPBERRY
Gymnoconia peckiana (Howe) Trotter. A Maine.

RUBUS ODORATUS L. PURPLE FLOWERING RASPBERRY
Phragmidium rubi-odorati Diet. A Maine.

RUBUS PERGRATUS Blanch.
Kuehneola uredinis (Link) Arth. A Maine.

Rubus plicatifolius. See R. FLAGELLARIS.

RUBUS RECURVANS Blanch.
(R. frondosus Bigel.).
Kuehneola uredinis (Link) Arth. A Maine.

Rubus strigosus. See R. IDAEUS.
Rubus villosus. See R. FLAGELLARIS.

RUDBECKIA LACINIATA L. GOLDEN GLOW
Erysiphe cichoracearum DC. C 1919 Franklin.

RUMEX BRITANNICA L. GREAT WATER DOCK
Puccinia ornata Arth. & Holw. A Maine.

SALIX sp. WILLOW
*Coniothecium toruloides Cda. 1857 Cumberland.
*Discella carbonacea (Fr.) Berk. & Br. Cumberland.
Fusarium sp. C 1928 Washington.
Fusicladium saliciperdum (Allesch. & Tub.) Lindr. C 1929 (general). P 1928 Suppl. 65.
*Hypoxylon glomiforme Berk. & Curt. Cumberland.
*Hypoxylon morsei Berk. & Curt. 1857 Cumberland.
Marssonia populi (Lib.) Magn. C 1928 Hancock.
?*Melampsora farinosa (Pers.) Schroet. Penobscot.
*Phacidium salicinum Fckl. Penobscot.
Physalospora miyabeana Fukushi. P 1929 Suppl. 75.
*Solenia ochracea Hoffm. 1876 Cumberland.
*Trametes mollis (Sommerf.) Fr. 1859 Cumberland.
*Trametes suaveolens (L.) Fr. 1896 Lincoln.

SALIX ALBA L. WHITE WILLOW
Trametes suaveolens (L.) Fr. P 1936.

SALIX AMYGDALOIDES Anders. PEACH-LEAVED WILLOW
Melampsora bigelowii Thum. A Maine.

SALIX CORDATA Muhl. HEART-LEAF WILLOW
?*Melampsora farinosa (Pers.) Schroet. 1896 Androscoggin.
*Rhytisma salicinum (Pers.) Fr. 1899 Penobscot.
*Uncinula salicis (DC.) Wint. 1899 Penobscot.

SALIX DISCOLOR Muhl. GLAUCOUS WILLOW
*Corticium salicinum Fr. 1900 Penobscot.
*Uncinula salicis (DC.) Wint. 1900 Penobscot.

SALIX HERBACEA L. PYGMY WILLOW
*Rhytisma salicinum (Pers.) Fr. 1898 Piscataquis.

SALIX LUCIDA Muhl. SHINING WILLOW
?*Melampsora vitellinae (DC.) Thüm. 1900 Penobscot.
*Schizophyllum commune Fr. 1897 Penobscot.

SAMBUCUS sp. ELDER
*Dendrophoma sambuci (Berk. & Curt.) Sacc. Maine.
*Nectria sambuci Ell. & Ev. 1897 Penobscot.

SAMBUCUS NIGRA L. EUROPEAN ELDER
*Cercospora depazeoides (Desm.) Sacc. 1897 Cumberland.

SCIRPUS ATROVIRENS Muhl.
Puccinia angustata Pk. A Maine.

Scirpus campestris. See S. ROBUSTUS var. PALUDOSUS.

SCIRPUS ERIOPHORUM Michx.
Puccinia angustata Pk. A Maine.

SCIRPUS ROBUSTUS Pursh var. PALUDOSUS Nels.
(S. campestris Britton).
Uromyces scirpi (Cast.) Burr. A Maine.

SCUTELLARIA GALERICULATA L. HOODED WILLOW-HERB
*Septoria scutellariae Thüm. 1899 Cumberland.

SECALE CEREALE L. RYE
*Claviceps purpurea (Fr.) Tul. 1897 Cumberland.
Puccinia graminis Pers. L 1919.
*Puccinia rubigo-vera (DC.) Wint. Penobscot.

SEDUM sp. STONECROP
Septoria sedi (Lib.) Westend. P 1925 Suppl. 50.

SETARIA ITALICA (L.) Beauv. HUNGARIAN GRASS
Helminthosporium densum Riessl. C 1916 Cumberland.

SIBBALDIOPSIS TRIDENTATA (Sol.) Rydb.
(Potentilla tridentata Ait.).
Pucciniastrum potentillae Kom. A Maine.

SISYRINCHIUM ANGUSTIFOLIUM Mill.
Uromyces houstoniatus (Schw.) Sheld. A Maine.

SIUM CICUTAEFOLIUM Schrank. WATER-PARSNIP
*Septoria sii Rob. & Desm. 1899 Cumberland.

SMILAX HERBACEA L. CARRION FLOWER
*Phyllosticta smilacis Ell. & Mart. 1899 Penobscot.

SOLANUM MELONGENA L. EGGPLANT
Phoma sp. B Maine.

SOLANUM TUBEROSUM L. POTATO
Actinomyces scabies (Thax.) Güssow. C 1908 (general). P 1917.
Alternaria solani (Ell. & Mart.) Jones & Grout. C 1908 (general). P 1918.
Botrytis cinerea Pers. C 1914 (general). P 1927.
Corticium vagum Berk. & Curt. C 1908 (general). P 1917.
Erwinia phytophthora (Appel) Bergey (Bacillus phytophthorus Appel) (Bacillus atrosepticus Van Hall). C 1908 (general). P 1918.
Fusarium sp. C 1910 (general). P 1931.
Fusarium oxysporum Schlecht. C 1908 (general). P 1919.
Fusarium radicicola Woll. P 1918.
Phoma sp. C 1918 Aroostook. P 1919. L 1925 Penobscot.
Phoma tuberosa Melhus, Rosenbaum, & Schultz. C 1927 Aroostook. P 1927.
Phytophthora infestans (Mont.) D By. C 1908 (general). P 1917.
Sclerotinia sclerotiorum (Lib.) D By. C 1914 Washington.
Spondylocladium atro-virens Harz. C 1913 (general). B Maine.
Spongospora subterranea (Wallr.) Lagerh. C 1913 (general). B Maine.
Verticillium albo-atrum Reinke & Berth. C 1913 Somerset, Aroostook. P 1919 Suppl. 2.

SOLIDAGO sp. GOLDEN-ROD
*Coleosporium solidaginis (Schw.) Thüm. 1857 Cumberland.
?*Dinemasporium strigosum (Fr.) Sacc. Maine.
*Puccinia hieracii (Schum.) Mart. Maine.

SOLIDAGO CANADENSIS L.
*Coleosporium solidaginis (Schw.) Thüm. 1899 Penobscot.

SOLIDAGO GRAMINIFOLIA (L.) Salisb.
(S. lanceolata L. of R.; Euthamia graminifolia (L.) Nutt.).
Coleosporium delicatulum (Arth. & Kern) Hedgc. & Long. A Maine.
?*Leptosphaeria doliolum (Pers.) DeNot. 1899 Penobscot.
Puccinia extensicola euthamii Arth. A Maine.
*Rhytisma solidaginis Schw. Cumberland.

Solidago lanceolata. See S. GRAMINIFOLIA.

SOLIDAGO RUGOSA Mill.
Uromyces perigynius Halst. A Maine.

SONCHUS ASPER (L.) Hill. SPINY-LEAVED SOW-THISTLE
*Septoria sonchifolia Cke. 1899 Penobscot.

SORBUS AMERICANA DC. MOUNTAIN ASH
Gymnosporangium aurantiacum Chev. P 1922 Suppl. 29. A Maine. L 1920 Knox.
Gymnosporangium globosum Farl. C 1910 Hancock. A Maine.

Sorbus sambucifolia. See S. SCOPULINA.

SORBUS SCOPULINA Greene.
(S. sambucifolia Gray).
Gymnosporangium aurantiacum Chev. A Maine. H 1936 Hancock.

SPARTINA MICHAUXIANA Hitchc.
Puccinia peridermiospora (Ell. & Tracy) Arth. A Maine.

SPARTINA PATENS (Ait.) Muhl.
Uromyces acuminatus Arth. A Maine.

SPERGULA ARVENSIS L.
Puccinia arenariae (Schum.) Wint. A Maine.

SPINACIA OLERACEA L. SPINACH
Peronospora effusa (Grev.) Rabh. C 1929 Penobscot.

SPIRAEA LATIFOLIA (Ait.) Borkh. SPIRAEA
(S. salicifolia of R.).
*Podosphaera minor Howe. 1900 Penobscot.

Spiraea salicifolia. See S. LATIFOLIA.
Spiraea ulmaria. See FILIPENDULA ULMARIA.

STACHYS PALUSTRIS L. WOUNDWORT
*Cercospora stachydis Ell. & Ev. 1896 Twobush Is., Penobscot.

STEIRONEMA CILIATUM (L.) Raf. FRINGED LOOSESTRIFE
*Septoria conspicua Ell. & Mart. 1900 Penobscot.

STELLARIA MEDIA (L.) Cyrill. CHICKWEED
Melampsorella cerastii (Pers.) Schroet. A Maine.

SYMPHORICARPOS ALBUS Blake. SNOWBERRY
Gloeosporium rufo-maculans (Berk.) Thüm. C 1932 Penobscot.

SYRINGA sp. LILAC
Microsphaera alni (Wallr.) Wint. C 1908 (general over range of host).

SYRINGA VULGARIS L. COMMON LILAC
*Microsphaera friesii Lév. 1897 Penobscot.
Phyllosticta syringae Westend. L 1919 York.
Phytomonas syringae (Van Hall) Bergey et al. (Bacterium syringae) C 1928 Hancock. P 1928.

Taraxacum erythrospermum. See T. LAEVIGATUM.

TARAXACUM LAEVIGATUM (Willd.) DC.
(T. erythrospermum Andrz.).
Puccinia hieracii (Schum.) Mart. A Maine.

TARAXACUM OFFICINALE Weber. DANDELION
(T. vulgare (Lam.) Schr.; T. palustre (Lyons) Lam. & DC.).
Puccinia hieracii (Schum.) Mart. A Maine.
*Ramularia taraxaci Karst. 1899 Cumberland.

Taraxacum palustre. See T. OFFICINALE.
Taraxacum vulgare. See T. OFFICINALE.

THALICTRUM sp. MEADOW RUE
*Tranzschelia thalictri (Chev.) Diet. (Puccinia thalictri of R.). Cumberland.

THUJA OCCIDENTALIS L. WHITE CEDAR
Lophodermium pinastri (Schrad.) Chev. B Maine.
*Ombrophila enterochroma (Pk.) Sacc. 1898 Penobscot.
Pestalozzia sp. C 1931 Waldo.
Pestalozzia funerea Desm. B Maine.
Poria papyracea Schw. P 1936.
*Schizophyllum commune Fr. Penobscot 1897.

TILIA AMERICANA L. BASSWOOD
(T. glabra Vent.).
*Cyphella pezizoides Zopf. 1890 Penobscot.
*Cytospora carnea Ell. & Ev. (Cytispora of R.). Penobscot.
*Hercospora tiliacea (Ell.) Sacc. Penobscot.
*Hercospora tiliae (Pers.) Tul. (Rabenhorstia tiliae Fr. of R.). 1896 Penobscot.
*Solenia ochracea Hoffm. 1887 Penobscot.

Tilia glabra. See T. AMERICANA.

TITHYMALUS CYPARISSIAS (L.) Hill. CYPRESS SPURGE
(Euphorbia cyparissias L.).
Melampsora euphorbiae (Schub.) Cast. A Maine.

TRIADENUM VIRGINICUM (L.) Raf.
(Hypericum virginicum L.).
Uromyces hyperici (Spreng.) Curt. A Maine.

TRIENTALIS AMERICANA (Pers.) Pursh. STARFLOWER
*Septoria increscens Pk. 1897 Oxford.

TRIFOLIUM sp. CLOVER
Erysiphe polygoni DC. C 1922 (general).
Gloeosporium caulivorum Kirch. C 1912 (general). P 1928.
Polythrincium trifolii Kunze. C 1912 Penobscot.
Sclerotinia trifoliorum Erikss. C 1928 Aroostook.
Uromyces trifolii (Hedw.f.) Lév. C 1913 Penobscot.

TRIFOLIUM HYBRIDUM L. ALSIKE CLOVER
Uromyces trifolii hybridi (W. H. Davis) Arth. C 1913 Penobscot. A Maine.

TRIFOLIUM PRATENSE L. RED CLOVER
Colletotrichum trifolii S. M. Bain. C 1913 Penobscot. P 1919 Suppl. 4. L 1913 Aroostook.
Erysiphe polygoni DC. C 1922 York. P 1924 Suppl. 35.
*Phyllachora trifolii (Pers.) Fckl. 1898 Penobscot.
*Polythrincium trifolii Kunze. 1859 Cumberland.
Pseudopeziza trifolii (Biv.) Fckl. C 1913 (general).
*Sphaerella nebulosa (Pers.) Sacc. Cumberland.
Uromyces trifolii fallens (Desm.) Arth. C 1914 Penobscot. A Maine.

TRIFOLIUM REPENS L. WHITE CLOVER
*Polythrincium trifolii Kunze. 1898 Cumberland.
Uromyces trifolii trifolii-repentis (Liro) Arth. A Maine.

TRITICUM AESTIVUM L. WHEAT.
Cladosporium herbarum (Pers.) Link. C 1925 Androscoggin.
Erysiphe graminis DC. C 1918 Cumberland.
Fusarium sp. L 1925 Aroostook.
Gibberella saubinetii (Mont.) Sacc. C 1918 Aroostook. L 1918 Maine.
Puccinia graminis Pers. C 1918 Cumberland. L 1918 Aroostook. A Maine.
Puccinia rubigo-vera tritici (Erikss. & Henn.) Carl. (P. triticina of L.). L 1933 Maine.
Septoria nodorum Berk. L 1925 Androscoggin.
Tilletia levis Kühn. C 1918 Aroostook. L 1918 Maine.
Ustilago tritici (Pers.) Rostr. C 1910 Washington. L 1933 Maine.

TROPAEOLUM MAJUS L. NASTURTIUM
Bacterium aptatum Brown & Jamieson. L 1932. Det. by Nellie A. Brown.

TSUGA CANADENSIS (L.) Carr. HEMLOCK
Fomes roseus (Alb. & Schw.) Cke. P 1936.
*Irpex mollis Berk. & Curt. 1895 Cumberland.
*Merulius tremellosus (Schrad.) Fr. 1886 Penobscot.
*Polyporus caesius (Schrad.) Fr. 1894 Penobscot.
*Polyporus resinosus (Schrad.) Fr. (Polyporus benzoinus (Wahl.) Fr. of R.). 1894 Penobscot.
*Polyporus spumeus (Sow.) Fr. 1895 Penobscot.
Polyporus tsugae (Murr.) Overh. P 1936.
Poria tsugina (Murr.) Sacc. & Trotter. P 1936.
Pucciniastrum myrtilli (Schum.) Arth. P 1931. A Maine.
Trametes americana Overh. P 1936.
Trametes heteromorpha (Fr.) Lloyd. P 1936.
Trametes serialis Fr. P 1936.
*Tremella mesenterica Retz. 1857 Cumberland.
*Tremellodon gelatinosum (Scop.) Fr. 1858 Cumberland.

TULIPA sp. TULIP
Botrytis tulipae (Lib.) Hopkins. C 1927 Aroostook.
Sclerotinia parasitica Mass. C 1910 Hancock.

TYPHA LATIFOLIA L. COMMON CAT-TAIL
*Cladosporium typharum Desm. 1900 Penobscot.
*Epicoccum scabrum Cda. 1900 Penobscot.
*Epicoccum sphaerospermum Berk. 1857 Maine.
*Phoma orthosticha Ell. & Ev. 1858 Cumberland.

ULMUS sp. ELM
Gnomonia ulmea (Sacc.) Thüm. C 1908 (general over range of host). P 1920 Suppl. 17.
*Mollisia discolor (Mont.) Phill. 1858 Cumberland.

ULMUS AMERICANA L. AMERICAN ELM
*Blitrydium cucurbitaria (Cke.) Sacc. 1897 Hancock.
*Bulgaria inquinans (Pers.) Fr. 1898 Cumberland.
*Caldesiella ferruginosa (Fr.) Sacc. Cumberland.
Daedalea unicolor (Bull.) Fr. H 1936 Penobscot.
Fomes applanatus (Pers.) Wallr. P 1936.
Gnomonia ulmea (Sacc.) Thüm. H 1934.
*Karschia lignyota (Fr.) Sacc. 1897 Penobscot.
Polyporus adustus (Willd.) Fr. H 1936 Penobscot.
Polyporus conchifer (Schw.) Fr. P 1936.
Polyporus versicolor (L.) Fr. H 1936 Penobscot.

VACCINIUM sp.
Gibbera compacta (Pk.) Shear (Venturia compacta Pk.). B Maine.
*Rhytisma vaccinii (Sacc.) Fr. 1859 York.

VACCINIUM CAESPITOSUM Michx. BLUEBERRY
Pucciniastrum goeppertianum (Kühn) Kleb. (Calyptospora columnaris Kühn). P 1931.

VACCINIUM CANADENSE (L.) B.S.P.
Botrytis sp. P 1931.
Exobasidium vaccinii (Fckl.) Wor. P 1931.
Microsphaera alni var. vaccinii (Schw.) Salm. P 1931.
Pucciniastrum goeppertianum (Kühn) Kleb. (Calyptospora columnaris Kühn). A Maine. P 1931.
Pucciniastrum myrtilli (Schum.) Arth. P 1931.
Sclerotinia sp. P 1931.

VACCINIUM CORYMBOSUM L. HIGHBUSH BLUEBERRY
Botrytis sp. P 1931.
Exobasidium vaccinii (Fckl.) Wor. P 1931.
Microsphaera alni var. vaccinii (Schw.) Salm. P 1931.
Pucciniastrum goeppertianum (Kühn) Kleb. (Calyptospora columnaris Kühn). P 1931.
Pucciniastrum myrtilli (Schum.) Arth. P 1931. A Maine.
Sclerotinia sp. P 1931.

VACCINIUM MACROCARPON Ait. CRANBERRY
Acanthorhyncus vaccinii Shear. B Maine.
Fusicoccum putrefaciens Shear. B Maine.
Gibbera compacta (Pk.) Shear (Sphaerella maculiformis of R., Venturia compacta Pk.). 1855 Cumberland. B Maine.
Sclerotinia sp. P 1931.

VACCINIUM PENNSYLVANICUM Lam. BLUEBERRY
Botrytis sp. P 1931.
Exobasidium vaccinii (Fckl.) Wor. P 1931.
Microsphaera alni var. vaccinii (Schw.) Salm. P 1931.
Pucciniastrum goeppertianum (Kühn) Kleb. (Calyptospora columnaris Kühn). P 1931.
Pucciniastrum myrtilli (Schum.) Arth. P 1931. A Maine.
Sclerotinia sp. P 1931.

VACCINIUM PENNSYLVANICUM Lam. var. NIGRUM Wood. BLUEBERRY
Microsphaera alni var. vaccinii (Schw.) Salm. P 1931.

VACCINIUM ULIGINOSUM L. BLUEBERRY
Pucciniastrum goeppertianum (Kühn) Kleb. (Calyptospora columnaris Kühn). P 1931.
Pucciniastrum myrtilli (Schum.) Arth. P 1931.

VACCINIUM VITIS-IDAEA L. BLUEBERRY
Exobasidium vaccinii (Fckl.) Wor. P 1931.
Pucciniastrum goeppertianum (Kühn) Kleb. (Calyptospora columnaris (Kühn). P 1931.

VERBASCUM THAPSUS L. MULLEIN
*Sphaeria verbascicola Schw. 1900 Penobscot.

VIBURNUM ALNIFOLIUM Marsh. WITCH-HOBBLE
(V. lantanoides Micnx.).
*Phyllosticta tinea Sacc. 1899 Penobscot.

VIBURNUM CASSINOIDES L. WITHE-ROD
*Cercospora varia Pk. 1897 Penobscot.

Viburnum lantanoides. See V. ALNIFOLIUM.

VICIA VILLOSA Roth. HAIRY VETCH
Ascochyta pisi Lib. C 1911 Oxford.

VIOLA BLANDA Willd.
*Puccinia violae (Schum.) DC. 1896 Penobscot.

VIOLA CUCULLATA Ait.
*Puccinia ellisiana Thüm. (Aecidium mariae-wilsoni Pk. of R.). 1881 Cumberland.
Puccinia violae (Schum.) DC. A Maine.

VIOLA ERIOCARPA var. LEIOCARPA Fern. & Wieg.
(V. scabriuscula Schw.).
Puccinia violae (Schum.) DC. A Maine.

VIOLA FIMBRIATULA Sm.
Puccinia violae (Schum.) DC. A Maine.

VIOLA INCOGNITA Brain.
Puccinia violae (Schum.) DC. A Maine.

VIOLA LANCEOLATA L. LANCE-LEAVED VIOLET
Puccinia violae (Schum.) DC. A Maine.

VIOLA PRIMULIFOLIA L.
Puccinia violae (Schum.) DC. A Maine.

VIOLA RENIFOLIA Gray
Puccinia violae (Schum.) DC. A Maine.

VIOLA ROTUNDIFOLIA Michx. ROUND-LEAVED VIOLET
*Puccinia violae (Schum.) DC. 1890 Penobscot.

Viola scabriuscula. See V. ERIOCARPA var. LEIOCARPA.

VIOLA SEPTENTRIONALIS Greene.
Puccinia ellisiana Thüm. A Maine.
Puccinia violae (Schum.) DC. A Maine.

VITIS sp. GRAPE
Plasmopara viticola (Berk. & Curt.) Berl. & DeToni. C 1913 Kennebec.
Uncinula necator (Schw.) Burr. C 1931 York.

Vitis riparia. See V. VULPINA.

VITIS VULPINA L.
(V. riparia Michx.).
*Plasmopara viticola (Berk. & Curt.) Berl. & DeToni. 1900 Penobscot.
*Uncinula americana Howe. 1889 Penobscot.

Woodwardia areolata. See LORINSERIA AREOLATA.

ZANTEDESCHIA AETHIOPICA Spreng. COMMON CALLA
Erwinia aroideae (Town.) Holland (Bacillus aroideae Town). C 1908 Penobscot.

ZEA MAYS L. CORN
Alternaria fasciculata (Cke. & Ell.) Jones & Grout. C 1935 Kennebec.
Diplodia zeae (Schw.) Lév. C 1921 York. L 1933 Maine.
Fusarium sp. C 1910 Penobscot. P 1922 Suppl. 27. L 1933 Maine.
Helminthosporium inconspicuum Cke. & Ell. C 1917 York.
Phytomonas stewarti (EFS) Bergey et al. (Aplanobacter stewarti (EFS) McCul.) (Bacterium stewarti EFS). P 1933.
Puccinia sorghi Schw. C 1910 (general). P 1933. L 1933 Maine.
Rhizoctonia sp. C 1914 Oxford.
Ustilago zeae (Beckm.) Ung. (U. maydis Cda.). C 1909 (general). P 1925.

ALPHABETICAL LISTING OF PATHOGENS

DISEASES OF FRUITS AND VEGETABLES OBSERVED ON THE CHICAGO AND NEW YORK MARKETS IN 1937

Plant Disease Reporter
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CONTENTS

FRUIT AND VEGETABLE DISEASES ON THE CHICAGO MARKET IN 1937

By G. B. Ramsey, Senior Pathologist, Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, Chicago, Illinois.

A total of 70,614 carlots of fruit and vegetables were unloaded on the Chicago market in 1937[1]. In addition to these freight and express shipments, it was estimated that an equivalent of 11,272 carlots were received by truck. Most of these truck lots came from nearby States and the produce was so widely distributed throughout the Chicago district that it is impossible to get accurate information regarding the diseases shown. Consequently, in this report there is little information on the diseases of fruits and vegetables from Ohio, Michigan, Indiana, Illinois, Iowa, and Wisconsin. If it appears that most of the decaying fruits and vegetables come from California, Washington, Oregon, Florida, and Texas, it is because the produce from the distant States comes in carlot shipments to regular terminals and to South Water Market where regular inspection service is maintained. As a matter of fact, the fruits and vegetables shipped from distant well-organized producing centers are generally better graded and more free from blemishes and decay than local products.

APPLES:

The majority of the apples inspected showed some blue mold rot (Penicillium expansum). While many lots showed less than 5 percent, in a few cases there was as much as 20 percent loss on account of this decay.

Since the development and use of oiled wraps and shredded oiled paper, scald usually has been of little economic importance. However, occasional lots sometimes show small percentages of this trouble. This year about the only appreciable scald (4 to 6 percent) was found in some New York Greenings and McIntosh apples.

One lot of Washington Winesap apples showed 10 percent of soft scald

A lot of Yellow Newtown apples from Washington received here in April showed 25 to 50 percent of internal browning.

The most severe bitter pit observed during the year occurred in California Gravensteins received in July. The variation in amount of bitter pit according to size of fruit was well demonstrated in one lot in which the 125's size and smaller had only 1 percent, while the 113's and larger sometimes had as high as 30 percent of this blemish. The average for the larger sizes was about 16 percent.

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[1]Arrivals and Unloads of Fresh Fruits and Vegetables at Chicago. Annual Report Calendar year 1937. A. B. Farlinger, Bureau of Agricultural Economics, Chicago, Illinois.

Arsenical injury occurred to a slight extent in several lots of Idaho and Washington apples and in a few this injury damaged 40 percent of the stock. Some lots in storage showed shriveling and blue mold following this type of injury.

ASPARAGUS:

California asparagus on this market showed relatively little decay. The development of precooling methods in which either cold air or cold water is used reduces the temperature of this product quickly so that good refrigeration is maintained throughout the transit period. Consequently, bacterial decays and fungous rots (mostly fusaria) are generally well controlled.

During April several cars of California asparagus showed freezing injury of the tips of the spears, apparently due to precooling with air that was below the freezing point for asparagus (29.8° F).

Gray mold rot (Botrytis spp.) was found affecting about 10 percent of the stock in one lot received from California.

A car of South Carolina asparagus was received in May showing 20 to 40 percent of the spears badly wilted and shriveled.

AVOCADO:

No decay was observed in appreciable amounts in either the California or Florida stock received this year. However, a lot of 140 boxes of California avocados hauled by truck to Denver in January showed severe freezing injury, characterized by dark brown spots and slit-like openings throughout the flesh.

BANANAS:

Anthracnose (Colletotrichum musarum) caused slight discoloration and spotting of most lots of bananas inspected, and in a few instances an objectionable decay of the peel was noted.

Bruising of the bananas on the retail market was particularly damaging this year. In many bruised fruits anthracnose and rhizopus rot caused much loss.

The most serious loss observed in any one lot of bananas occurred in 300 bunches that showed brown discoloration of the flesh and peel due to chilling.

BEANS:

The greatest loss of green beans occurred in a car from South Carolina which arrived the last of May. On inspection it was found that there was no ice in the bunkers of the car and the temperature at the bottom of the doorway was 83°-86° F., and the beans at the top of the load showed a temperature of 112° to 115°. The beans in the bottom and the second layer hampers were fairly fresh and green and showed about 1 percent decay. Those in the third layer hampers had 50 to 75 percent decay, and the three top layer hampers showed 90 to 100 percent of the beans severely affected with bacterial soft rot (Bacterium spp.) and some watery soft rot (Sclerotinia sclerotiorum).

Watery soft rot was found in small amounts in stock from Florida, Louisiana, and Arkansas.

During February some lots of Florida beans showed soil rot (Rhizoctonia solani) affecting 5 to 10 percent of the stock.

Bacterial blight (Bacterium phaseoli) was observed only in small amounts in beans from Florida and Colorado.

A car of Colorado beans received in August showed a range of 3 to 25 percent with an average of 18 percent rhizopus rot, much of it nested.

A severe russetting developed in two cars of Florida wax beans that were delayed in transit on account of flood waters in February. The beans had a dirty greyish-brown appearance on arrival and after a few days on the market, they were so badly discolored that 211 hampers out of one car and 75 hampers out of another car had to be dumped.

Lima beans from Florida showed soil rot (Rhizoctonia solani) in some lots received in January and February. In advanced cases the fungus penetrated the pods and caused decay of the seeds.

California lima beans received in December showed discoloration and decay of pods due to Cladosporium, Alternaria, and Botrytis. Many pods also showed numerous small reddish-brown spots, the cause of which was not determined.

CABBAGE:

Most cars of cabbage inspected showed some bacterial soft rot (Bacterium spp.). The Florida, Alabama, and South Carolina stock received in April frequently had 3 to 15 percent of this type of decay in the wrapper leaves. The cabbage from Louisiana, Mississippi, and Tennessee received during May showed most serious bacterial soft rot affecting the stem. This decay is also common in cabbage that has been injured by freezing. One lot of New York cabbage had 60 percent of bacterial soft rot following freezing injury.

A small amount of black rot (*Bacterium campestre*) was noted in cabbage from South Carolina and Texas.

CANTALOUP:

Most California and Arizona melons arrived on this market without showing much decay of consequence. However, a lot of soft melons received from Mexico in April showed green mold rot (*Cladosporium* spp.) and fusarium (*Fusarium* spp.) affecting 8 to 80 percent with an average of 65 percent.

CARROTS:

About 90 percent of the carrots shipped to the Chicago market come from California. Most of this stock arrives in exceptionally good condition, but occasionally a slight amount of watery soft rot (*Sclerotinia sclerotiorum*) occurred in a few lots. Macrosporium blight (*M. carotae*) discolored about 30 percent of the tops in some lots.

Gray mold rot (*Botrytis* spp.) occurred in 2 percent of a lot of carrots from Colorado received in September.

CAULIFLOWER:

Bacterial soft rot (*Bacterium* spp.) caused the most damage to the curd and jackets of cauliflower during the year. One lot received from California in February showed 50 percent so affected. Colorado stock showed some yellowing of the jacket leaves and a spreading and ricey condition of the curd.

A storage lot of New York cauliflower showed 2 percent gray mold rot (*Botrytis* spp.).

CELERY:

Bacterial soft rot (*Bacterium* spp.) following freezing injury affected several lots of Florida and California celery during January. This decay was also very serious in stock received in May. A car of celery from Florida arrived showing a temperature of 68° F. at the top of the load and 55° at the bottom, with 90 percent of the bunches affected. A lot of California celery showed a temperature of 45° at the bottom and 68° at the top of the load. The celery in the bottom layer crates showed 1 to 5 percent decay, the middle layers 10 to 75 percent, and the top layer 75 to 100 percent of bacterial soft rot. The hatch covers were down, the plugs in, and the bunkers half full of ice in this car at time of inspection.

Watery soft rot (*Sclerotinia sclerotiorum*) was serious in California celery in May. This decay ranged from 5 percent in some cars to 65 percent in others. It also occurred in Florida celery from February to June. One of the last loads inspected showed a range of 10 to 50 percent with an average of 25 percent watery soft rot and also about 15 percent black heart.

Late blight (*Septoria* spp.) was found affecting from 10 to 30 percent of the leaves and stalks in several California shipments during March and April.

ENDIVE:

During November several shipments of California endive showed reddish-brown discoloration of the blanched heart leaves. The cause of this trouble is not known. Some gray mold rot (*Botrytis* spp.) and bacterial soft rot was present in the outer green leaves of the bunches, but these diseases were not prominent in the heart leaves.

CUCUMBER:

Bacterial spot (*Bacterium lachrymans*) was observed in cucumbers from Cuba, Florida, New York, and Maryland. The most severe anthracnose (*Colletotrichum lagenarium*) noted was in a lot of cucumbers from Maryland which showed a range of from 4 to 45 percent with an average of 30 percent.

DANDELION GREENS:

Bacterial soft rot mostly in the early stages of development was found affecting 65 percent of the plants in one lot received from Texas. No other decays were observed.

EGGPLANT:

Many lots of Florida eggplant showed some phomopsis fruit rot (*Phomopsis vexans*). In the cars inspected the decay often ranged between 1 and 10 percent, the average being near 5 percent.

GRAPES:

The table grapes received from California generally showed small to moderate amounts of decay. Two or 3 percent of blue mold (*Penicillium* spp.) and rhizopus rot was noted in several lots. The juice grapes, however, often showed a much higher percentage of decay, for example, a car of black juice grapes showed a range of from 15 to 85 percent and an average of 40 percent gray mold rot (*Botrytis* spp.) and rhizopus rot.

GRAPEFRUIT:

Numerous cars of Florida and Texas grapefruit inspected showed blue mold rot (*Penicillium italicum*) ranging from 1 to 20 percent; the average in most lots was usually near 5 percent.

Stem end rot (*Phomopsis* and *Diplodia*) was observed in Florida grapefruit, occasionally affecting as much as 5 percent.

LEMONS:

Most lots of lemons inspected showed a little green mold (*Penicillium digitatum*). One lot showed 40 percent infected, but the history of this lot was unknown.

LETTUCE:

As in previous years, bacterial soft rot caused most serious damage to lettuce received on the market. California stock received during April, May, and June often showed 15 to 60 percent of this decay, the higher percentages in most instances being associated with tipburn. One car that stood on track over two weeks on account of poor market conditions had 80 to 100 percent of the heads affected with bacterial soft rot.

Tipburn continues to be one of the most serious troubles affecting head lettuce. In some cars inspected, from 45 to 90 percent of the heads were affected with tipburn.

MUSTARD GREENS:

One lot of mustard received from Texas in February was badly blemished with white rust (*Albugo candida*).

NECTARINES:

In September a lot of California nectarines that had been in storage for six weeks showed severe internal breakdown and a small amount of brown rot (*Sclerotinia fructicola*) and blue mold (*Penicillium* spp.).

ONIONS:

Most onions showing serious decay were affected either with gray mold rot (*Botrytis* spp.) or bacterial soft rot. The greatest loss noted occurred in a lot of Colorado onions inspected in a store. These onions showed 80 percent of gray mold rot and 65 percent had developed sprouts.

A lot of Texas onions had an average of 50 percent gray mold rot. Stock from Washington, Utah, and Iowa often showed from 1 to 16 percent with an average of about 8 percent of this decay.

Bacterial soft rot occurred in Texas onions during April and May to the extent of 3 to 15 percent. Some black mold rot (Aspergillus niger) was also observed in Texas stock at this time.

Practically all onions in a storage lot from Utah showed discolorations due to ammonia fumes.

Smudge (Colletotrichum circinans) was found causing some serious blemishes in Illinois white onions.

Rhizopus soft rot often occurs in small amounts, but serious loss is seldom caused by this rot. A few cars of California onions received in July showed this decay ranging from 2 to 50 percent. There was no ice in the bunkers in these cars at the time of the inspection.

ORANGES:

Florida oranges received from January to April frequently showed blue mold rot (Penicillium italicum) ranging from 2 percent in some boxes to as high as 30 percent in others, the average usually being near 10 to 12 percent. The stock received in November and December sometimes had serious skin breakdown occurring as sunken brown pits and areas, 1/8 to 1/2 inches in diameter about the stem end of oranges that had "color added". Other car lots showed this processing injury affecting from 10 to as high as 50 percent of the fruit. Stem end rot (Phomopsis sp.) and blue mold rot (Penicillium spp.) sometimes was associated with this injury.

California oranges marketed in February showed some brown rot (Phytophthora citrophthora). A few inspections at that time revealed about 2 percent of this decay.

PEACHES:

The peaches from Georgia, Arkansas, Tennessee, Illinois, and Michigan all showed more or less brown rot (Sclerotinia fructicola). In a few cars this decay ranged as high as 50 percent in some baskets, and an average of 20 percent was not unusual.

Rhizopus rot occurred in the top layer baskets in many cars, especially in the ripe lots that showed excessive bruising.

Some shipments of peaches that arrived in otherwise good condition showed skin discolorations and streaking apparently due to mechanical injury during the defuzzing process.

PEARS:

Gray mold rot (Botrytis sp.) caused some damage to pears on this market. California and Oregon stock sometimes had 2 or 3 percent of this decay. Several lots of Oregon Bosc pears received in November showed some gray mold, and 15 to 25 percent were noticeably shriveled about the stem end.

PEAS:

A large number of carlots of California peas received in April showed little or no decay, but much of this stock showed 20 to 30 percent of defects consisting of poorly filled pods and blemishes due to pod spot (Ascochyta pisi) and scab (Cladosporium pisicola).

Gray mold rot (Botrytis spp.) occurred in one lot of Idaho peas to the extent of 5 percent. A few lots of California peas also showed from 1 to 3 percent of this decay.

A physiological spotting of the seed coat was found in a few peas from Mississippi in May.

Cladosporium scab and mosaic were the cause of the most important marketing defects noted in California peas.

PECANS:

On inspection of a lot of pecans that had been in cold storage for a year, it was found that the shells were dull and somewhat darker than normal in color and 45 percent of the meats within were discolored greyish-brown to black. This injury was caused by ammonia fumes escaping from the refrigerating system.

PEPPERS:

Green peppers from Florida received in April frequently showed a high percentage of decay caused by a species of Phytophthora. In one car inspected this decay ranged from 30 to 90 percent in various hampers, the average for the lot being 70 percent. Serious decay was also caused by bacterial soft rot and Rhizopus. One lot examined in June showed a range of from 20 to 70 percent of these rots, the average being 38 percent.

A lot of California peppers in storage showed 45 percent of gray mold rot (Botrytis spp.).

PINEAPPLES:

The pineapples received from Cuba from April until June often showed a very high percentage of black rot (Thielaviopsis paradoxa). In some instances noted, decay ranged as high as 70 percent, and the average in many cars was near 40 to 50 percent. Much of this decay was in advanced stages so the affected fruits were a total loss. Some Cuban stock also showed a brown rot in which a Fusarium was constantly associated.

Several lots of Mexican pineapples received on this market during June had a very high percentage of the fruits showing a brown watery internal breakdown of the heart region of the fruit. In some lots 90 to 100 percent of the stock was affected, but none of this trouble showed externally. No organisms of any kind were found associated with this trouble.

PRUNES:

The Washington, Oregon, and Idaho Italian prunes received during September sometimes showed a small percentage of blue mold (Penicillium spp.), but most serious decay was caused by Rhizopus, especially in the stock that was generally ripe and becoming soft. Sometimes rhizopus rot affected more than half of the prunes in some boxes. The average in the worst lots was about 20 percent.

POTATOES:

Bacterial soft rot occurred in many cars of Florida potatoes shipped during January to April. Sometimes this decay affected 50 percent of the tubers in certain crates. The average for most lots usually was not more than 10 to 15 percent. The general appearance of the stock indicated better harvesting, washing, and drying conditions than prevailed last year.

Idaho potatoes sometimes had 12 to 16 percent fusarium tuber rot (Fusarium spp.), mostly of the dry type, but in general this storage decay affected little more than 1 or 2 percent in most of the lots inspected.

A few lots of Idaho potatoes inspected in August and September showed from 3 to 5 percent leak (Pythium spp.). A lot of Washington potatoes inspected at this time also showed approximately 8 percent leak.

Alabama and Louisiana potatoes received during May and June frequently showed small amounts of sclerotium rot (Sclerotium rolfsii) and in a crate or two this decay ranged as high as 20 percent.

California, Oklahoma, and North Carolina potatoes marketed during June and July showed bacterial soft rot in many lots. Some of this decay followed mechanical injuries and some followed scald. A car of North Carolina potatoes arrived under ventilation during the hot weather in July, showing 15 to 80 percent, with an average of 45 percent bacterial soft rot.

White Rose potatoes from the Shafter district in California marketed during July, showed considerable brown discoloration affecting 1/4 to 1/2 of the tuber, usually at the bud end. This stock is very susceptible to bruising and peeling and must be picked up immediately after digging in order to avoid scald during hot weather. In scalded tubers the brown discolored areas at the bud end were slightly sunken and sticky owing to invasion by bacteria.

The most serious scab (Actinomyces scabies) noted was in a car of Minnesota potatoes inspected in September, which showed a range from 20 to 65 percent with an average of 35 percent of the tuber appreciably blemished.

A small amount of nematode injury was found in Florida potatoes during January.

A watery breakdown and black heart condition was found in some potatoes from Florida and Hawaii that had been fumigated with methyl bromide for control of tuber moth.

RADISHES:

Generally speaking, overmaturity and pithiness of radishes reduces the marketability of this stock more than decay. Bacterial soft rot in the tops was noted in several lots, but not in high percentages.

RHUBARB:

A lot of Washington rhubarb consisting of 125 boxes inspected in a store showed from 20 to 90 percent with an average of 65 percent gray mold rot (Botrytis spp.) at the ends of the stalks. The rhubarb in 21 boxes was completely decayed. A few lots of California rhubarb also showed some of this decay ranging from 2 to 15 percent.

RUTABAGAS:

The only decay of any consequence noted in rutabagas was in some Canadian stock received in March, which showed an average of 7 percent gray mold rot (Botrytis spp.).

One lot of Canadian rutabagas also showed 2 percent of slight brown-heart.

SHALLOTS:

Louisiana shallots received during February and March often showed 1 or 2 percent of bacterial soft rot. In bruised and crushed lots the decay sometimes ranged to as high as 30 percent. Generally this stock is so well refrigerated with layers of crushed ice in the barrels that decay does not develop. Temperatures of 33 and 34° F. were noted in some lots.

SPINACH:

Bacterial soft rot (*Bacterium* spp.) caused some loss in most lots of spinach but generally this decay did not affect more than 5 percent of the stock. In the instances of excessive loss, such as in a car of Texas spinach received in January, which showed a range of 8 to 65 percent with an average of 40 percent bacterial soft rot, some very unfavorable loading or transit conditions are indicated. The spinach in the top two layers of baskets was badly wilted and about two-thirds decayed, while the stock in the bottom four layers of baskets showed very little wilting and about 40 percent bacterial soft rot. Although there was crushed ice over the top of the load at the time of inspection on this market and temperatures of 36° F. at the top and 39° at the bottom were noted, certainly sometime previously this stock had been much warmer.

One lot of Texas spinach had about 1 percent of *Heterosporium* leaf spot.

STRAWBERRIES:

Rhizopus rot (*Rhizopus* spp.) was the most common and destructive decay encountered in strawberries from all regions. Many lots from Louisiana, Arkansas, and Tennessee averaged about 10 percent of this decay.

One car of Arkansas berries received in May had an average of 6 percent gray mold rot (*Botrytis* spp.) and some leather rot (*Phytophthora* spp.).

SQUASH:

The only decay of serious consequence in squash was observed in a lot from Minnesota in December with 20 percent gray mold rot (*Botrytis* spp.).

SWEETPOTATOES:

Sweetpotatoes were received from Delaware, New Jersey, Virginia, Tennessee, Louisiana, and Texas, which often showed a range of from 2 to 28 percent of rhizopus rot (*Rhizopus* spp.) with an average for most lots near 10 percent.

TOMATOES:

Throughout the months of January to April this market receives a large number of cars of tomatoes from Mexico. Considering the long trip made by this perishable product, the stock arrives in a very satisfactory condition. However, carlots that arrive showing most of the fruit ripe frequently show from 10 to 30 percent of rhizopus rot and bacterial soft rot. The stock that arrives mostly green and is held on track or in ripening rooms for coloring, often develops alternaria rot (Alternaria spp.) and green mold rot (Cladosporium spp.). These two decays frequently damage from 10 to 20 percent.

Tomatoes from Cuba are received in January and February. This stock also shows most damage from rhizopus and bacterial soft rot because the fruits are frequently ripe and soft.

Most Florida tomatoes arrive from January to June. Phoma rot (Phoma destructiva) caused serious loss in this stock from February to March. Many lots showed a range of from 5 to 35 percent with an average of 15 percent of this decay. One car lot that was held on track for ripening showed 12 to 50 percent with an average of 30 percent of phoma rot in growth cracks about the stem scar and in shoulder bruises.

During June and July most shipments of tomatoes originate in Texas and Mississippi. Many lots of Texas tomatoes had buckeye rot (Phytophthora terrestris) [P. parasitica] and soil rot (Rhizoctonia) averaging about 10 percent. Some lots also showed about 15 percent blossom end rot (physiological) which was often followed by bacterial soft rot.

Bacterial soft rot and Rhizopus caused greatest damage to the tomatoes received from Mississippi. Blossom end rot was also noted affecting 4 or 5 percent of the tomatoes in a few lots.

One lot of Mississippi tomatoes showed small amounts of bacterial speck, (Bacterium punctulans), ghost spot, and cloudy spot. These last two blemishes are probably due to insect punctures.

California tomatoes arrive in greatest quantities during October and November. Alternaria rot and green mold rot (Cladosporium spp.) were most common and caused most serious damage this season. Tomatoes shipped in November following wet or foggy weather sometimes had from 15 to 25 percent decay at the stem end by the time that they arrived here. Green tomatoes held on track or in the ripening rooms sometimes showed as much as 65 percent of these decays by the time they were ripe.

Pleospora rot (Pleospora lycopersici) caused decay in several lots of California tomatoes during November and December. However, unless perithecia have begun to form in the larger lesions, it is very difficult to distinguish the Macrosporium stage of this fungus from other Alternaria and Macrosporium species without microscopic examination. Consequently, it is probable that many reports of alternaria rot in California tomatoes at this time of the year are in reality pleospora rot. Furthermore, when lesions about the stem scar begin to show the development of perithecia, they look very much like phoma (*Phoma destructiva*), and it is not uncommon to find some reports of phoma rot in this stock, but in the writer's experience, no true phoma rot has been observed in these November and December shipments.

Virus mottling of the tomatoes from California was not extremely serious on this market. However, many lots showed uneven ripening and some mottling of the fruit. Apparently, most of the blemishes were due to the spotted wilt and mosaic viruses.

WATERMELON:

Anthracnose (*Colletotrichum lagenarium*) seemed to cause an unusual amount of spotting of watermelons from Florida and Georgia. A lot of Florida melons received in May showed an average of 30 percent of the fruits covered with small anthracnose spots. A car of Georgia melons received in July showed 20 percent with small spots and 10 percent deeply pitted anthracnose spots. A small amount of stem end rot (*Diplodia tubericola*) was noted in some lots from Texas and Georgia.

The bruising and cracking of melons during transit is still one of the most important transit problems in marketing watermelons. For example, a carload of Cuban Queen melons from Georgia which showed some shifting of the load on arrival at this market had 144 melons cracked and broken, 23 badly bruised, and 56 scarred.

DISEASES OF FRUITS AND VEGETABLES ON THE NEW YORK MARKET DURING 1937

By C. O. Bratley and James S. Wiant, Associate Pathologists, Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, New York City, New York.

The Market Pathology Laboratory in New York City was established for purposes of research on the diseases of fruits and vegetables in transit, in storage, and on the market. During the course of such investigations contact is continually had with members of the produce trade, representatives of rail and water transportation companies, private produce inspection agencies, and more particularly with the inspectors of the Bureau of Entomology and Plant Quarantine and those of the Fruit and Vegetable Division of the Bureau of Agricultural Economics. Through such contacts attention is frequently called to the occurrence of new or uncommon troubles, or to the unusual absence or abundance of the more common diseases, and in many cases these are followed up with personal observations on commercial shipments. Likewise when a research problem centers on a given commodity observations are regularly made on representative commercial lots. No attempt is made to follow the arrival condition of representative lots of all fresh produce coming into the market. Observations are, however, recorded of the more interesting or unusual conditions met with in the manner described above. The results of such observations during the calendar year 1937 are summarized below.

APPLES:

Relatively few cases were found of injury to apples from improper washing for spray removal. Three severe cases were, however, observed in the early fall. Twenty-eight percent of the fruit in a carlot of Washington Delicious had from traces to entire surface showing a dark brown discoloration as though the skin had been cooked. A few days earlier a car of Jonathans from the same packing house showed 6 percent injury. Inquiry at shipping point brought out the fact that the thermometer in the washing tank was incorrect and the fruit had been subjected to temperatures above 130° F. A truck lot of Lady apples from Virginia had about 25 percent of the fruit showing from 5 to 100 very small spots around lenticels. Upon tracing to point of origin it was learned that rinse water was carried some distance by hand, thus explaining why acid was not thoroughly removed.

California Gravenstein apples were more generally affected with bitter pit (physiological) than noted in previous years. In eight cars examined an average of 12 percent of the fruit was affected. One car showed 22 percent and the least affected lot showed 3 percent. Shippers reported that this fruit was not visibly affected when packed.

Gray mold rot (Botrytis cinerea) affected 2, 7, 3, and 10 percent respectively in four of the above cars. This decay had not spread by contact, being found scattered through the box.

CHERRIES:

Except for 2 and 5 percent respectively of brown rot (Sclerotinia fructicola) in two early shipments, cherries from California were unusually free from decay and cracking.

Again a mild form of pitting similar to that seen very commonly on California fruit the past three years, was observed in a few early shipments from that State. The pits were about 1/8 inch in diameter, but slightly sunken, and contained a slightly raised ring in the center around what seemed to be an insect puncture. The pit was rarely discolored, and isolations either remained sterile or gave a variety of organisms.

An unusual pitting taking the form of barely visible to pin-head size, bleached or tan slightly depressed spots, was found in 4 cars of mixed varieties of cherries from Stockton, California. In one car almost 100 percent of the fruit was affected while pitting occurred on from 10 to 50 percent of the others. Affected fruits were scattered throughout the packs but were more prevalent along the edges of the lugs. Pitting was more pronounced on poorly colored fruit than on those fully mature. From the shippers it was learned that the cars had been treated with sulfur dioxide as used for fumigating cars of grapes for control of gray mold rot. Since no decay occurred in any of the California cars on days the treated cars were observed, no indication of the effectiveness of the treatment for decay control could be obtained.

Barely had cherry shipments started from the Pacific Northwest before heavy rains caused almost all of the riper fruit to crack. At first the few shipments received in New York City contained fruit almost 100 percent cracked. Two weeks later receipts showed about 30 percent cracking. A few of the final shipments for the season showed none of the cracking but an occasional fruit was malformed, bearing scars or irregular sunken areas on its surface. Shipments made during this season showed more cracking than had been seen on the market previously.

In only a few cases was green mold rot (Cladosporium spp. and Alternaria spp.) common on the cracked cherries. This is surprising since in previous years cracks of this nature were frequently lined with these decay fungi. Freedom from decay probably resulted in part at least from expeditious handling and thorough refrigeration given the fruit Cooling was carried to extremes in three of the cars that had been refrigerated with salt-ice mixtures, for several lugs next to the bunkers were frozen.

GRAPEFRUIT:

During the summer several carlots of California grapefruit were found to contain as high as 10 percent blue mold rot (Penicillium spp.). These lots were said to have been held in cold storage at shipping point.

GRAPES:

Certain lots of California Emperor grapes of the 1936 growing season packed in sawdust-filled lugs and kegs and held in cold storage until January and February of 1937 showed a rather high percentage of berries affected with a jet-black decay. Specimens were examined from 5 different carlots in which about 40 percent of the bunches contained from 1 to 5 affected berries. The decayed areas were firm and flattened or slightly sunken. Many affected areas were black and shiny; a few bore dark green to black sparse mycelium to which grains of sawdust clung. Decayed tissue was shallow, firm, black in the center to milky gelatinous on the edges. By peeling the skin from the grape the decayed tissue was removed with it, being readily separated from the healthy tissue.

Species of Alternaria, Cladosporium, and Hormodendrum, in that order of abundance, were repeatedly isolated from the lesions. Undoubtedly these entered injured areas on the fruit. Gray mold rot and penicillium rots that are usually found, did not occur in these shipments. This black decay has been of no importance in previous years. Probably some unusual condition during growth or packing of the grapes predisposed them to the decay, since there was nothing unusual about the method of storing or the storage conditions used. In some cases at least the affected grapes had been treated with sulfur dioxide by application of sodium bisulfite in the sawdust.

During June similar lesions were observed on a few grapes of the Almeria variety from Argentina. Fungi of the genera enumerated above were again found in the lesions.

Almeria spot (physiological) on this variety of grape from California was common in the fall. Most shipments contained about 2 percent and a few had as much as 10 percent of the berries affected. The spots were usually deep in the berry at the stem end and caused a flattening but no surface discoloration of the fruit.

Many shipments of the colored varieties of table grapes showed injury from the sulfur dioxide used as a fumigant for decay control. In most cases the injury consisted of small, bleached, slightly shriveled areas centering at the cap-stem attachments. Despite the fact that the affected fruits were astringent and lacking in flavor, the buyers seemed to overlook most of the injury.

During May two 5,000 box shipments of grapes mostly of the Barlinka variety arrived in New York City after 24 days refrigerated transit from South Africa. Each bunch was wrapped individually and packed in excelsior. Although no sulfur dioxide or other antiseptic treatment had been given them, most arrived in good condition. A few boxes showed from 1 to 2 percent gray mold rot.

HONEY DEW MELONS:

Charcoal rot (Rhizoctonia bataticola) was found on two occasions in carlots of California melons and in one carlot of Arizona melons. Although commonly observed on South American Honey Dews the decay has seldom been reported from the market on domestic melons.

Anthracnose (Colletotrichum lagenarium) was noted on South Carolina Honey Dews. The disease is not found on this market on melons from the Western States.

Several late-season carlots of California Honey Dews that had been held in transit or on track for a total of 17 days between time of shipping and that of unloading showed symptoms indistinguishable from those of low-temperature (cold storage) breakdown. Decays caused by Cladosporium cucumerinum, Fusarium spp., and Alternaria spp. were abundant in the broken down areas of the rind. Two melons were found affected with watery soft rot (Sclerotinia sclerotiorum). This is the first time that we have noted this decay on Honey Dews. Gray mold rot (Botrytis cinerea) was likewise found in several melons in one of the carlots. Only twice previously have we found this decay on Honey Dew melons on the New York market, both times on melons that had been held for some weeks at cold storage temperatures.

LEMONS:

In May, sweet-orange scab (Elsinoë australis) was found affecting most of the fruit in two small shipments from San Lorenzo, Paraguay. The scabbed spots were only slightly raised and were covered with reddish-brown corky tissue. The disease was identified by Dr. Anna E. Jenkins.

Common citrus scab (Sphaceloma fawcetti) was found affecting almost every fruit in a 125-box shipment of lemons from Florida. In this case the fruits bore disfiguring protuberances with but small corky areas on the tops.

LIMES:

Stylar end rot (physiological) of Persian limes from Florida was more prevalent this summer than in any recent season. Twenty-five percent of the fruit was affected in some lots and in 25 or so shipments seen during the summer, an average of 5 percent was found, with greater amounts on riper fruits. Oospora rot (Oöspora citri-aurantii) occasionally followed this trouble as did aspergillus rot (Aspergillus niger) in fruits held at a high temperature.

Seen for the first time in West Indian limes was a trouble having the same appearance and involving the same tissues as stylar end rot in Persian limes. It affected an occasional fruit in a large lot from the Dominican Republic that had been held in a New York storage house.

Oleocellosis (rupturing of oil cells of rind at picking time) was very common on shipments of green fruits both of Persian and West Indian varieties, and was the most important blemish found on these fruits.

Stem end rot (Diplodia natalensis and Phomopsis citri) was found occasionally but was not as prevalent as usual.

OLIVES:

Two lots of large size fresh olives from California in the turning stage of maturity showed about 30 percent decay starting at the blossom end. The decayed tissues were black, firm, and wrinkled. Isolations yielded species of Alternaria and Fusarium, chiefly the latter.

About half of the fruit in a large lot of green olives from California were dark brown around the pit although no external evidence of the trouble was visible. A similar internal breakdown has been seen on olives stored at low temperatures.

ORANGES:

Oranges were generally free from decay but pitting and skin breakdown around the stem end of the fruit were common and were the most important factors of condition in fruit from Florida. Collapsed areas in the skin involving from a few oil vesicles to areas covering most of the surface of the fruit were observed in a few shipments of natural color fruits and in many shipments of dyed fruit. The worst cases of these occurred early in the season when fruits at packing were subjected not only to dye solutions but also to the ethylene de-greening treatment. The following percentages of badly injured fruits were noted in various lots of Hamlin and Parson Brown oranges during the month of October: 30, 55, 80, 65, 72, 70, and 15. Lesser amounts occurred in many other lots of oranges of all early varieties.

Stem end rot (Diplodia natalensis or Phomopsis citri) was found in quantity in only two or three shipments early in the season. One car of Pineapple oranges arriving in late September contained 32 percent of this decay. An additional 32 percent of the fruit bore reddish-brown collapsed areas in the skin characteristic of "gas-burn" due to long continued de-greening treatment.

Brown stain (physiological) was found affecting 30 percent of the fruit in a boat shipment under refrigeration from California in August.

Small, definitely limited glassy areas overlying mushy, off-flavored juice vesicles were found in several lots of oranges shipped from northern Florida immediately after a freeze which occurred during the second week of December. No other recognized effect of the freeze on the fruit was noted on the market until the last of December when an occasional fruit was found showing buckling of the segment walls and drying of the segments at the stem end.

Blue mold rot (*Penicillium* spp.) was of no importance in Florida oranges but occurred regularly in those from California. In only a few lots of the latter fruit did this decay affect more than 5 percent of the fruit. An estimated average of the decay in this fruit for the year is about 1 percent.

PEACHES:

Seventy boxes of peaches shipped in a car of California grapes were badly pitted and bleached by sulfur dioxide which had been blown into the car, after loading, for the control of gray mold (*Botrytis cinerea*) on the grapes.

In another car of mixed California fruits containing nectarines, plums, and peaches, 25 percent of the latter were decayed with rhizopus rot (*Rhizopus nigricans*), while the other fruits were sound.

PEAS:

Cladosporium scab [*C. pisicola*] and thrips injury constituted two serious blemishes of California peas.

PINEAPPLES:

A cracking and gumming occurred commonly on the Red Spanish variety pineapples from Puerto Rico early in the season. The cracks were located between the fruitlets, usually near the base of the fruit. Sometimes rather large cavities were formed and in all cases these were lined with a thin layer of decayed tissue. The border of the decayed tissue was brown and watersoaked but the inner portion was tan in color and fairly dry. In most cases a *Fusarium* was found covering the decayed tissue with fine white to pink mycelium. A species of *Penicillium* producing abundant sporulation was found in a few of the cavities.

During April and May many shipments of this variety contained as high as 15 percent of the fruit affected with from 1 to 4 lesions per fruit. Shipments received in late June and July were not affected. The trouble was not observed on fruits of the Cabezonas and Smoothe Cayenne varieties.

Black rot (*Thielaviopsis paradoxa*) in various amounts was found in practically all shipments of pineapples from Puerto Rico and Cuba. Certain shipments said to have been made during or immediately following protracted rainy periods contained as much as 25 percent decay. The average rot in Puerto Rican fruit during the season was estimated to have been between 3 and 4 percent. Well over half of the shipments were repacked in part at New York before they were sold. Even so, the receivers considered the season to be better than usual in regard to prevalence of this decay. About 3/4 of the decay was found to have started at the base of the fruit, with most of the remainder starting on the side of the fruit.

POMEGRANATES:

In most lots of California pomegranates received during late summer, from few to many of the larger size fruits were cracked open owing to the internal pressure. The cracked surfaces were surprisingly free from decay although in a few cases dark mycelium similar to that of *Alternaria* was found.

PRICKLY PEARS:

During the fall months many carlots of prickly pears from California were found free from decay. In a few cars 2 or 3 percent of the fruits were affected with rhizopus rot (*Rhizopus* spp.) which caused the fruit to collapse but held it together in the wrap by the luxuriant growth of mycelium. Blue mold rot (*Penicillium* spp.) in the form of slowly developing, circular, dark-brown watersoaked spots with tufts of blue fungus in the centers, was found on an occasional fruit in a few cars.

SPINACH:

A white rust of spinach (caused by what appears to be *Albugo occidentalis*) was found as a serious blemish of the leaves of Texas spinach (P.D.R. 21: 114-115). In one carlot three-fourths of the plants examined were affected.

Bacterial soft rot and downy mildew (*Peronospora effusa*) continued to remain the most important market disease of this commodity.

TOMATOES:

A decay caused by a species of *Diplodia* was noted on a Cuban tomato.

Phoma rot (*Phoma destructiva*) continued to be one of the most important decays of Cuban tomatoes.

Pleospora rot (*Pleospora lycopersici*) was responsible for heavy losses in late-season California stock. Spotted wilt caused serious blemishing of tomatoes in many lots.

WINTER QUEEN WATERMELONS:

Only three carlots of Winter Queen watermelons were unloaded on the New York market during 1937. The receipts thus fell to the lowest point since records of carlot unloads were first recorded in 1928. The melons were free of decay, in contrast with those received during the past several years during which time phytophthora rot was of considerable importance.

THE WHEAT STEM RUST EPIDEMIC OF 1937 IN KANSAS[1/]

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After a lapse of only one year the winter wheat of the central United States again was damaged by a severe epidemic of stem rust (<u>Puccinia graminis tritici</u>). Two serious epidemics of that disease in a period of only three years is an unusual occurrence in the relatively dry area in which hard red winter wheat is grown. In 1937 very heavy losses resulted in Kansas from stem-rust infection in the eastern half of the State, and in some localities rust damage was greater than that recorded for the severe epidemic of 1935. Heavy local infections developed in north-central Texas late in May and moved gradually northward with the main path of infection directed northeast across eastern Oklahoma, southeastern Kansas, central Missouri, and central Illinois. Owing to the prevailing southerly winds, there was considerable spread of rust north of this main pathway and heavy infections developed on winter wheat in southeastern Nebraska and southwestern Iowa as well as on spring wheats farther north. Because of severe drought in western Kansas most of the surviving wheat acreage was in the eastern half of the State where rust was the most serious. Of the 158 million bushels of wheat produced in the State in 1937, more than 115 million bushels were grown in the eastern half in spite of rust.

Meteorologic Conditions Compared with Those Recorded for 1935

Weather conditions in Kansas during May and June were somewhat similar to those for the same months in 1935 but different from them in certain respects. Inasmuch as the drought during the winter and early spring had seriously damaged the wheat crop in the western third of the State before the stem-rust epidemic developed, the remarks on meteorologic factors will be confined mostly to the central and eastern thirds of the State. Severe

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[1/] Contribution No. 378 from the Department of Botany, Kansas Agricultural Experiment Station, in cooperation with the Division of Cereal Crops and Diseases, Bureau of Plant Industry, U. S. Department of Agriculture.

drought continued in much of the western third throughout the spring months and except for localities favored by local rains the wheat crop was seriously damaged in that section by lack of moisture. Although some stem-rust infection appeared in western counties, it usually was light and its effect was overshadowed by drought injury.

Surveys and information from other sources revealed that stem rust made its appearance in the southern counties, from Harper County eastward during the last few days of May. Infection spread gradually northward and reached its peak by June 20 in the eastern two-thirds of the State. Assuming that temperatures and rainfall occurring more than two weeks before the appearance of stem-rust infection could have had little effect on the development of the epidemic, it appears that meteorologic conditions which most critically affected rust development must have occurred during the period May 15 to June 15, inclusive. By June 20 the maximum daily temperatures had risen above 100° F., rust infection was arrested in its development, and the wheat crop matured very rapidly.

The rainfall during May and June in 1937 followed the same general trend as that for the same months in 1935 but was much lighter. Figures 1 and 2[2/] show that there were frequent rains at Manhattan during the last two weeks of May and the first two weeks of June in both years. When the total amount of rainfall for May and June in both years is compared, however, it is apparent that there was a great excess of moisture in the eastern two-thirds of Kansas in May, 1935 and a moderate excess in both sections in June (Table 1). In 1937 the rainfall was below normal in all cases except for a very slight excess in the central section in May. Thus, it would seem that a heavy stem-rust infection developed under excess-moisture conditions in 1935 and under moisture-deficient conditions in 1937. The writers are of the opinion that the total rainfall is of less importance in the development of stem rust than the frequency and distribution of rains and other forms of moisture, other conditions being equal.

Table 1. Average rainfall, mean temperatures, and departure from normal in the eastern and central thirds of Kansas in 1935 and 1937.

Month	Section of State	Rainfall in inches: Average 1935	Average 1937	Departure 1935	Departure 1937	Mean temperature in degrees F.: Average 1935	Average 1937	Departure 1935	Departure 1937
May	Eastern	10.22	4.06	+5.37	-0.77	60.4	66.8	-4.1	+2.1
	Central	8.46	3.96	+4.64	+0.12	60.0	67.3	-4.1	+3.0
June	Eastern	7.30	3.59	+2.40	-1.22	70.6	75.2	-3.6	+0.9
	Central	5.05	3.18	+0.91	-0.88	71.1	75.1	-3.2	+0.7

2/Figures at end of Supplement.

Thus, while the rainfall in May and June, 1937, was generally below that in 1935, Figure 1 shows that precipitation in some form occurred on all but 7 days of the critical infection-rust period of May 15 to June 15. During that period rain fell on 17 of the 32 days, and moisture in the form of fog, mist, or dew occurred on 8 other days. On several occasions there were both dew and showers in single 24-hour periods. Except for June 12, on which a very strong wind blew from the south, there was some form of precipitation on each of the first 15 days, although the total for the period was only 3.37 inches. Owing to the frequency of occurrence, moisture conditions seemed to be nearly ideal for stem-rust infection at Manhattan. Similar conditions throughout the eastern two-thirds of the State were reported in Climatological Data of the U. S. Weather Bureau. However, in the southeastern part, where the heaviest stem-rust infection occurred, there was considerably more rain than in other parts of Kansas, and, during the period June 8 to 15, inclusive, many fields were water-logged. Moreover, because of favorable growing conditions in that section, growth of wheat was very rank and there was much lodging.

A comparison of the temperature charts for 1935 and 1937 (Figs. 1 and 2) reveals certain general similarities. The mean temperatures were higher in both the eastern and central sections in 1937 than in 1935. Thus it seems that a heavy epidemic developed in the presence of subnormal temperatures in 1935 and supernormal temperatures in 1937. However, the excesses recorded for 1937 were so slight that the influence on stem-rust infection probably differed little from the normal season. It is conceivable that the slightly higher average temperatures favored rather than reduced infection. The mean May temperature for the State was 59.0° F. in 1935 and 66.7° F. in 1937. The mean temperature for June was 71.0° F. in 1935 and 74.3° F. in 1937.

Although mean temperatures as well as maxima and minima doubtless are important contributing factors in the development of any stem-rust epidemic, the writers are of the opinion that minimum temperatures are the most important of the three measurements. Not until minimum temperatures become high enough to favor abundant germination of urediospores have heavy stem-rust infections been noted in Kansas. Minimum temperatures usually are those recorded at night and it should be noted that most of the spring rains and all of the dews occur at night or in the very early morning. It would seem, therefore, that conditions particularly favorable for stem-rust infection would be the occurrence of some form of free moisture in the presence of relatively high minimum temperatures. Figure 2 shows at least 3 periods when moisture and temperature conditions were very favorable for rust infection during May and June, 1935. Figure 1 shows three similar periods between May 15 and June 20, 1937. It is interesting to note the close coincidence of the dates of the two last favorable periods in 1937 with similar periods in 1935. A rather long period began on May 24 and extended to June 4, 1937. A similar period occurred from May 26 to June 3, 1935. The second favorable period extended from June 11 to June 16 in 1937, and a similar period was recorded from June 11 to June 17, 1935. It should not be inferred that infection occurred only on dates included in the periods recorded as favorable. Some infection undoubtedly did occur on other dates, but it is believed that conditions on the dates indicated were particularly favorable for stem-rust infection and that the occurrence of such favorable periods plays a major part in the development of epidemics. Some observers believe that the maximum temperatures on May 20, 28, and 29, and on June 12 and 13, 1937, were too high to favor the development of stem rust. However, they are day-time temperatures and had little, if anything, to do with infection. The temperature of 93° F. on May 20 and 28 may have retarded rust development a day, but it is doubtful if other maximum temperatures were high enough to have any retarding effect.

Crop Conditions in Relation to the Epidemic

A survey of crop conditions in the spring of 1935 indicated that the stem-rust epidemic of that year was favored in its development by late heading and a very long fruiting period induced by subnormal temperatures in combination with heavy rainfall. Delayed heading in 1935 was due to prolonged winter and early spring drought. In 1937 the development of the crop in the eastern two-thirds of Kansas was only slightly delayed by early spring drought; heading, therefore, was earlier than in 1935. Light but frequent rains during the last two weeks of May and first two weeks of June favored top growth and in parts of the State (Section IV, Figure 3), the wheat was very rank and succulent. Much lodging occurred in some varieties in that section. Rank growth naturally favored the development of stem rust and was an important factor in the heavy infections of that area. In section III also, top growth was abundant in most fields but not so heavy as in section IV. In all sections the temperatures were sufficiently high to permit the normal development of the crop to a point where it was able to mature very rapidly when the temperatures rose to 100° F. or higher on June 20. Temperatures remained very high for a week following that date and most wheat ripened in that period.

Another interesting feature of the 1937 wheat crop in Kansas was the large acreage in part of the western half of the State, where the plants were severely injured by drought prior to normal heading time, but recovered to some extent after the rains began in May. Plants in this area put out many fresh green tillers after the first of June. The area in which this situation developed is shown in Figure 4. In several of the affected counties, notably Saline, Ellsworth, Barton, Russell, and Ellis, considerable stem-rust infection had developed on the late, green tillers by June 15. High temperatures beginning about June 18 so injured the secondary growth that most of it soon died; many damaged fields were plowed up by June 25. Had the season remained cool enough to permit the new tillers to continue their development, they probably would have been destroyed by stem rust. The high temperatures not only killed the plants but also arrested development of stem rust and prevented the building up of inoculum for northward distribution.

Source of Stem Rust Inoculum and Progress of the Epidemic

The writers have no evidence indicating that stem rust in the uredial stage overwintered in Kansas in any significant quantity in 1937. It cannot be said that no overwintering occurred, but the lateness of the appearance of stem rust in the spring indicates that overwintering was not abundant. The first reports of the presence of stem rust in the State were received from Sumner and Cowley Counties, along the southern border, on May 26. On May 16 an examination of several fields of wheat in Sumner County had revealed no infection, but traces of primary infection were found about 50 miles south of the Kansas line near Perry, Oklahoma. Light to moderate infections were observed the following day in southern Oklahoma and a rather heavy local infection was encountered at Denton in northern Texas. No stem rust was observed on winter wheat in the vicinity of Manhattan until June 4, but infections found on that date undoubtedly had been present for 3 or 4 days. By this time, reports of heavy infection were being received from counties along the southern border of the State from Harper County eastward, with indications of a very heavy concentration in the southeastern part. By June 8 light to moderate infection could be found in nearly every field of wheat as far north as the central part of the State, and the rust was approaching epidemic proportions in the southern counties. One particularly striking feature of the development of stem rust in Kansas in the early part of the season was the unusually heavy infection on the leaves. On a survey made on June 9 and 10, fields were frequently encountered in which leaves exhibited as high as 25 percent infection, while stems showed only a trace to 5 percent.

As soon as it became obvious that heavy stem-rust infection was likely to occur in eastern Kansas, the writers made frequent survey trips in the affected area to gain first-hand information on the progress and extent of the epidemic. The situation was so serious and was changing so rapidly that aid in making a thorough survey was asked of several Federal and State officials then known to be traveling in the State. Invaluable aid was furnished by Wallace Butler, of the Bureau of Entomology and Plant Quarantine, and by K. S. Quisenberry, C. H. Ficke, and A. G. Johnson, of the Bureau of Plant Industry, United States Department of Agriculture. Equally valuable assistance was given by John H. Parker, of the Kansas Agricultural Experiment Station. Figure 5 shows the routes of survey trips originating or terminating at Manhattan during the period of May 16 to June 25, inclusive. Nearly every county in the eastern half of the State was entered at least once and many counties were visited several times. By June 25 reports on 238 field observations had been received from all of these sources and an excellent picture of the extent and severity of the epidemic was beginning to take form.

Besides the survey just discussed, information and opinions also were sought from capable observers in various localities to assist in the measurement and evaluation of the infection. Reports were received from farmers, millers, elevator operators, county agents, branch experiment station personnel, crop inspectors, estimators, reporters, and many others whose experience with wheat in Kansas lent weight to their opinions.

All surveys and other sources of information agreed by June 15 that a major epidemic of stem rust was certain to occur in the eastern third of the State. By that date nearly every field of winter wheat in the eastern two-thirds of the State contained more or less stem-rust infection. The situation rapidly became more critical and the epidemic reached its peak in eastern Kansas by June 20 after which further infection was prevented by extremely high temperatures which began on June 18. Wheat matured very rapidly after the latter date in all except occasional late fields. The heavy crop in the central part of the State, therefore, escaped much of the severe loss experienced farther east.

Full information on the physiologic races of stem rust involved in the 1937 epidemic in Kansas is not yet available, but the writers are grateful to Dr. E. C. Stakman, of the University of Minnesota, for the advance information that physiologic races 11 and 56 were two of the most important ones. Race 56 was the most abundant one in 1935 and its recurrence in abundance in 1937 indicates that it is now an important one in the western plains area.

Distribution, Prevalence, and Severity of Stem Rust

These topics already have been partially discussed above but certain phases need further emphasis. By harvest time stem rust of wheat was present throughout Kansas. Even the drought-injured crop in the extreme western part of the State had traces of stem-rust infection. The amount of infection increased regularly from west to east, with the heaviest infections occurring in the eastern 4 ranges of counties. The data on losses shown in Figure 3 are a fair indication of the severity of infection but do not reveal the whole picture. For example, the average loss for section III was only 3.51 percent, but a great many fields in that section had 60 to 80 percent infection. The highest average yields in the State were obtained in section II, although most fields had considerable stem rust. In both of these sections wheat was well advanced before heavy rust infection developed and harvest was not delayed by wet weather as it was in the eastern counties. The crop, therefore, was in the right condition to mature rapidly and produce high yields when the hot weather began on June 18. In section IV infection was extremely heavy, susceptible varieties exhibiting 100 percent infection in nearly every field. It is doubtful if there was a single field of winter wheat in the eastern two-thirds of Kansas that did not have considerable stem-rust infection by harvest time and at least traces could be found in almost every field in the western third of the State.

Magnitude and Types of Losses

Four main types of loss caused by stem rust were noted in 1937 and are discussed below under appropriate headings.

1. Reduction in yield. The percentage loss in each county in eastern Kansas (Fig. 3) is an estimated average made after comparing the estimates of several competent observers with the writers' knowledge of the situation and with market reports and information furnished by the Kansas State Board of Agriculture. The records of the surveys discussed above were compared with estimates on losses made by county agricultural agents, Federal officials, and others familiar with the situation. The percentages shown in Figure 3, therefore, represent the composite opinion of several separate observers and should be as accurate as any estimate could be expected to be.

The lines dividing the State into 4 sections are partly natural on the basis of the percentage loss and partly arbitrary to provide a fairly straight north and south arrangement. For example, there are several counties in section IV having much lower percentage losses than surrounding counties in that section. The amount of rust infection in such counties as Wabaunsee, Shawnee, Douglas, Osage, Coffey, and Chautauqua suggests that the estimates of loss should have been higher, but the figures shown were the most reliable ones obtainable.

The percentage loss figures given in Figure 3 show more clearly than the bushel loss that the greatest rust damage was roughly in the four eastern ranges of counties, with the heaviest concentrations in southeastern and northeastern counties. Section III was one in which stem-rust infection was generally heavy but where only moderate damage occurred. In section II, rust infection was generally moderate and the average loss was estimated at only 0.95 percent. The average loss from stem rust in section I was not over a trace, although there were localities where infection was heavy. Obviously some loss in yield resulted, even though it was small. Therefore, it was decided to evaluate all recorded traces as 0.2 percent in calculating the loss in terms of bushels.

The lower figures shown in each county of the eastern half of Kansas represent the calculated loss in bushels. This figure was obtained by using the estimated percentage loss with the estimated yields per county as furnished by the Kansas State Board of Agriculture in its report of August 10. The August estimate is considered to be the most accurate one available until the final report is made after the entire crop is marketed or accounted for. The august report indicated a winter wheat yield for the State of 158,040,000 bushels. The bushels loss shown in Figure 3 also emphasize the heavy concentration of stem rust in southeastern and northeastern counties. The highest total loss in bushels was obtained in Brown County which also had the highest estimated percentage loss. Atchison County had the second highest loss in bushels, while Jackson County was in third place. These facts would seem to be at variance with the statement that the heaviest losses occurred in southeastern counties, but it is the consensus of opinion among capable observers that the most widespread serious losses occurred in southeastern Kansas. The large loss in bushels in some of the counties in section IV was based on a high estimated percentage loss and an unusually large acreage of wheat in those counties.

Table 2. Losses caused by stem rust and yield of winter wheat in four sections of Kansas in 1937.

Section of State	Ave. percent loss	Loss in bushels	Actual yield in bushels	Potential yield in bushels
I	Trace	90,695	45,257,000	45,347,695
II	0.95	461,620	48,155,000	48,616,620
III	3.51	1,458,010	40,039,000	41,497,010
IV	27.14	9,161,140	24,589,000	33,750,140
Average or total	6.60	11,171,465	158,040,000	169,211,465

The information given in Figure 3 is summarized in Table 2. It will be noted that the average loss from stem rust for the entire State was 6.60 percent and that the total loss was more than 11,000,000 bushels. At 90 cents a bushel, this represents a monetary loss of slightly more than 10 million dollars.

2. Losses from reduction in grade. This factor, while very real in nature, is extremely difficult to evaluate. It undoubtedly was included by most observers in their estimates on percentage loss and, therefore, is at least partially accounted for in the losses discussed above. It is certain, however, that much of the wheat harvested in section IV was badly shriveled, for many reports have been received showing test weights as low as 42 to 45 pounds per bushel. Much wheat was given a market grade of "sample" with the statement that it was fit only for feed.

After considering all of the figures and opinions available, it seems reasonable and safe to estimate the loss due to reduction in grade at about one-sixth of the monetary loss, or roughly about $1,500,000.

3. Abandonment. This type of loss also is extremely difficult to measure, although one of the writers saw some excellent examples of it in 1937. In the southeastern and northeastern parts of section IV, many fields of wheat were not harvested. In some cases farmers took combines into the field and cut a round or two but failed to obtain enough grain to pay them to continue. Many such fields were burned.

4. Losses from the necessity of procuring new seed. Most of the farmers in Kansas save a portion of their wheat crop for seed the following year or procure seed from their neighbors. In 1937 some farmers in the extreme eastern part of the State harvested no wheat because of stem-rust infection; many others harvested grain of such poor quality that it was not considered suitable for seed. Therefore, it was necessary for many farmers to buy new seed--sometimes at rather distant points and at prices somewhat above market price. Such losses cannot be accurately measured, although it is known that they were considerable in Kansas in 1937.

Reaction of Principal Commercial Wheat Varieties to Stem Rust in 1937

Some very wide differences in the response of commercial varieties to stem-rust infection were noted in 1937. In general, the soft red winter varieties were more heavily infected than the hard red winter sorts. The high susceptibility of the soft varieties partially accounts for the severe losses in the extreme eastern part of the State, for in that section much of the wheat grown is soft red winter. An opportunity was afforded to make stem-rust readings on varieties of wheat grown by the Department of Agronomy of the Kansas Agricultural Experiment Station in 52 cooperative tests with farmers in different parts of the State. A summary of the data obtained is presented in Table 3. It will be noted that Early Blackhull had the lowest average percentage infection and that Quivira was second lowest. Except for a single test of Early Blackhull in northeastern Kansas both of these varieties were tested only in the central and western sections of the State, where infection was not so heavy as farther east. Furthermore, both varieties are very early and tend to escape heavy infection. Rust records of these varieties compared with Kanred and Oro in date of sowing experiments at Manhattan revealed, even in late sowings, that Early Blackhull had an average of 25 percent infection, Quivira 50 percent, and Kanred and Oro 60 percent each. Thus, it seems that in addition to its rust-escaping qualities because of earliness, Early Blackhull also has some resistance to stem rust.

Table 3. Percentage of stem rust on winter wheat varieties grown in cooperative wheat variety tests in Kansas, 1937

Variety	Weighted average percent stem-rust infection in sections of Kansas: Northeast	Southeast	Southcentral	West and Northcentral	Weighted average for State
Kanred	50(1)*	52(2)	31(15)	8(14)	22(32)
Turkey	74(9)	73(13)	36(15)	16(14)	47(51)
Tenmarq	78(9)	66(13)	31(15)	13(14)	44(51)
Cheyenne			37(11)	7(12)	21(23)
Blackhull	61(9)	56(14)	28(15)	8(14)	37(52)
Quivira			13(10)	1(3)	10(13)
Kanred x Hard Federation Ks 2673			32(10)	11(3)	27(13)
Early Blackhull	23(1)		4(11)	1(12)	3(24)
Kawvale	61(9)	49(13)	44(4)	48(2)	52(28)
Fulcaster	92(9)	87(14)	79(4)	78(2)	87(29)
Clarkan	86(9)	85(14)	74(4)	80(2)	80(29)
Harvest Queen	87(9)	83(14)	76(4)	73(2)	83(29)
Michigan Wonder	92(9)	83(11)			88(20)
Iobred	62(8)				62(8)
Chiefkan	85(1)		28(8)	27(6)	33(15)
Weighted average severity for section	75	72	32	15	

* Number in parentheses indicates the number of tests.

Table 3 shows clearly that stem-rust infection was heaviest in the northeastern and southeastern parts of the State, while it was only about one-half as severe in the south-central part and one-fifth as heavy in the north-central and western sections. It is notable, however, that the soft red winter varieties such as Fulcaster, Clarkan, Harvest Queen, and Michigan Wonder were heavily rusted in all sections.

In northeastern Kansas, Early Blackhull had the lowest percentage infection, but the variety appeared in only one test. It was followed in order by Kanred, Blackhull, Kawvale, and Iobred. Kanred and Blackhull are not recommended for that section of the State for agronomic reasons. Kawvale and Iobred were outstanding in that section for their ability to produce a crop in the presence of a heavy epidemic of stem rust. Both varieties are only moderately resistant and frequently may have rather heavy infections. Both are a little earlier than the soft wheats grown in that section and often partially escape infection. Both also have a type of resistance characterized by late initial infection and small uredia as well as relatively low percentages of infection. Iobred is grown only in a few counties in the extreme northeastern corner of the State.

Kawvale, on the other hand, is widely grown in the eastern third of Kansas. It made a remarkable record in the rust year 1935 and again in 1937. In both years it consistently made good yields in eastern Kansas in localities where nearby fields of soft wheats were destroyed by stem rust. Although Kawvale is a semihard wheat and is inclined to shatter when fully ripe, it has several characteristics that permit it to make a crop in rust years. Besides the qualities mentioned above, Kawvale has a strong straw and, therefore, does not lodge easily. It also ripens rapidly, once it has turned. The combination of all of the foregoing favorable characters enables Kawvale to emerge with excellent yield records, even though it may show heavy stem-rust infection late in the season.

Among the wide-grown hard red winter wheats, Early Blackhull, Kanred, and Blackhull had the lowest average infections. Table 3 shows Cheyenne with a lower average infection than either Kanred or Blackhull, but it was grown only in the south-central, north-central, and western sections, where stem rust was lighter than it was in the eastern part of the State. Cheyenne is known to be a very susceptible variety. Early Blackhull is commercially grown principally in south-central Kansas, while Kanred is especially important in northwestern Kansas. Blackhull is now the most wide-grown variety in Kansas, and its moderate resistance to stem rust is of considerable importance. It possess some of the characteristics that already have been discussed for Kawvale. Besides a moderate degree of resistance, Blackhull also yields well, even under conditions of occasional heavy infections. Under general field conditions it seldom shows as high percentages of infection as Turkey or Cheyenne, and the uredia usually are much smaller than those on fully susceptible varieties.

The average infection for Tenmarq (Table 3) indicates that it has about the same susceptibility to stem rust as Turkey. In the northeastern section, Tenmarq had a higher average percentage than Turkey, while in the south-central section, for which Tenmarq is recommended, it was slightly less severely rusted than Turkey and very similar to Kanred in its behavior.

Although Iobred, Kawvale, Early Blackhull, Blackhull, and Kanred are recognized as possessing some resistance to stem rust, none of them has the degree of resistance desired and a program of breeding for stem-rust resistance is under way at Manhattan. None of the winter wheat varieties tested proved to have strong enough resistance to stem rust, so it was necessary to use such spring wheats as Hope, Marquillo, Thatcher, and Renown as sources of resistance in crosses. Numerous winter-wheat segregates having high resistance to stem rust have been isolated and purified. Some of the hybrid lines are sufficiently advanced to be grown in nursery yield-test experiments in 1938, and it is hoped that within a few years both hard and soft red winter wheats, highly resistant to stem rust, will be available for distribution.

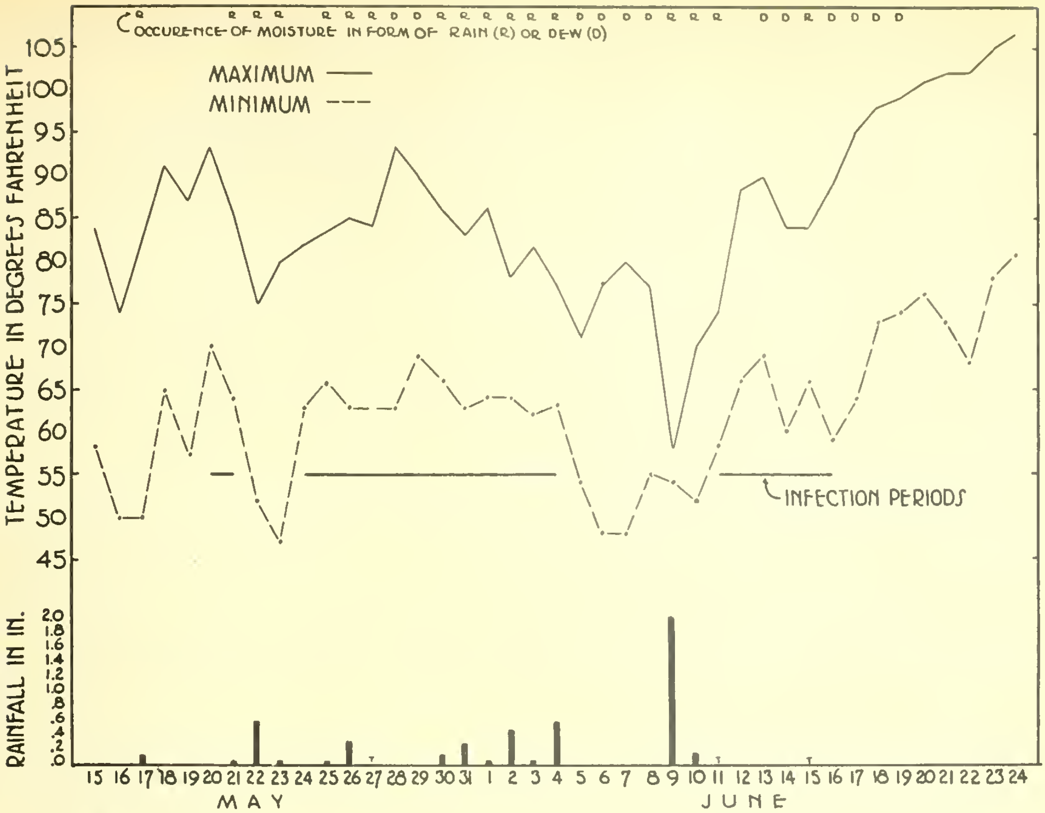


Figure 1: Maximum and minimum air temperature, rainfall, and periods favorable to the development of stem rust at Manhattan, Kansas, from May 15 to June 24, 1937

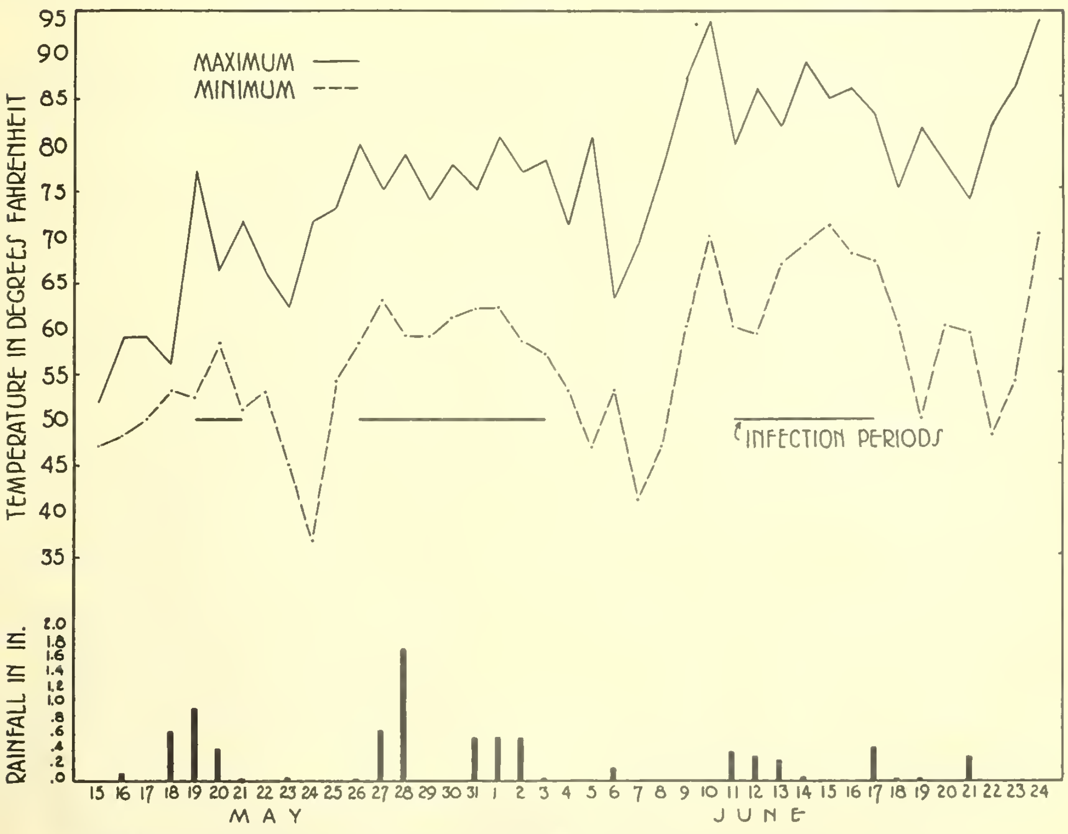
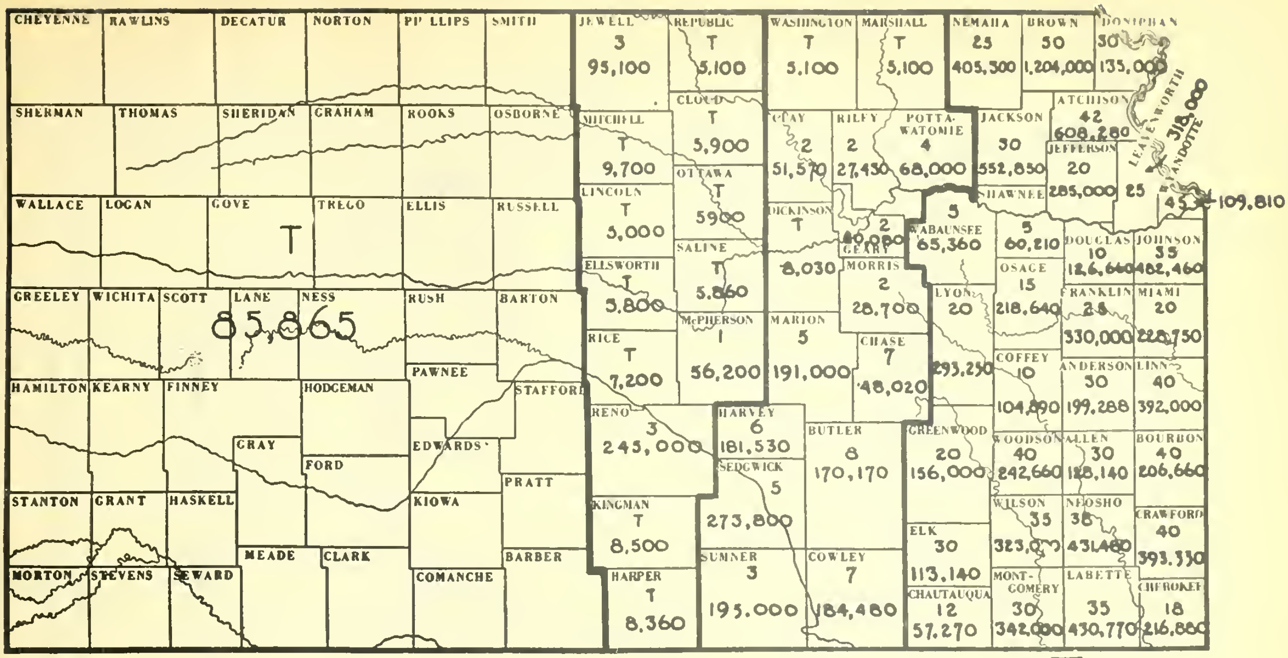


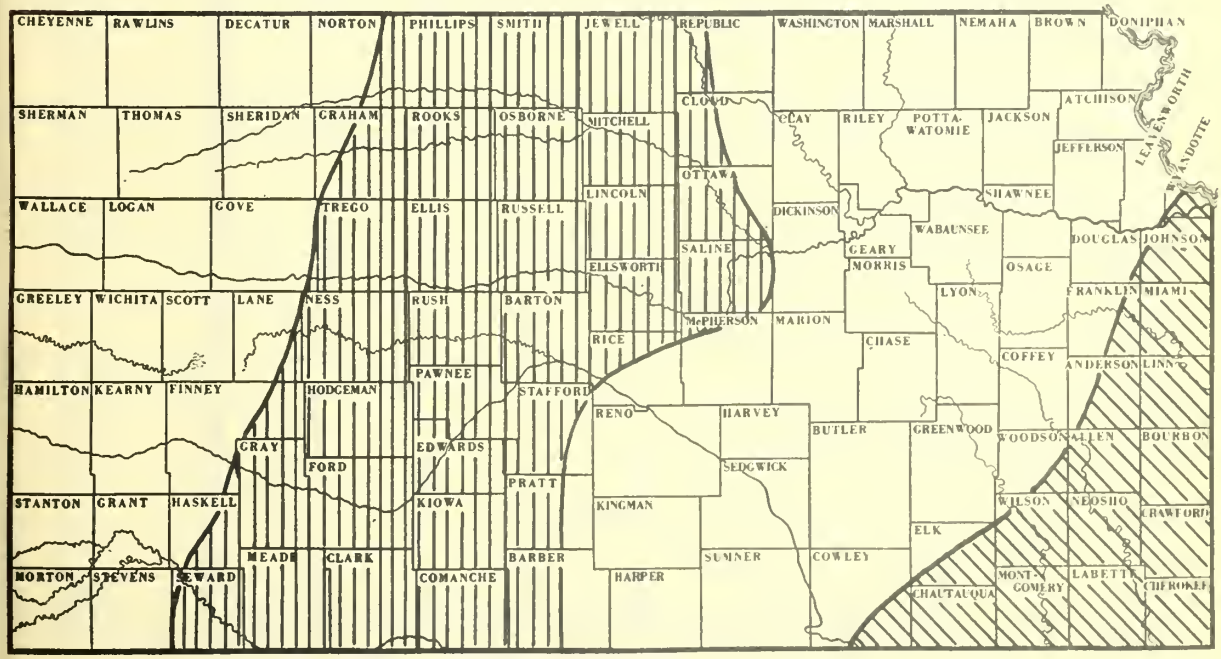
Figure 2: Maximum and minumum air temperatures, rainfall, and periods favorable to the development of stem rust at Manhattan, Kansas, from May 15 to June 24, 1935



Section	I	II	III	IV
Average percent loss	Trace	.95	3.51	27.14
Loss in bushels	90,695	461,620	1,458,010	9,161,140

Note: upper number = % of loss; lower number = loss in bushels: — Trace = .2%

Figure 3: Average percent loss and total loss in bushels due to stem rust infection on winter wheat in four sections of Kansas in 1937.



Second Growth

Water Logged Soil

Figure 4: Areas in Kansas where drought-injured winter wheat made second growth after rains in early June, and where wheat fields were water logged in mid-June.

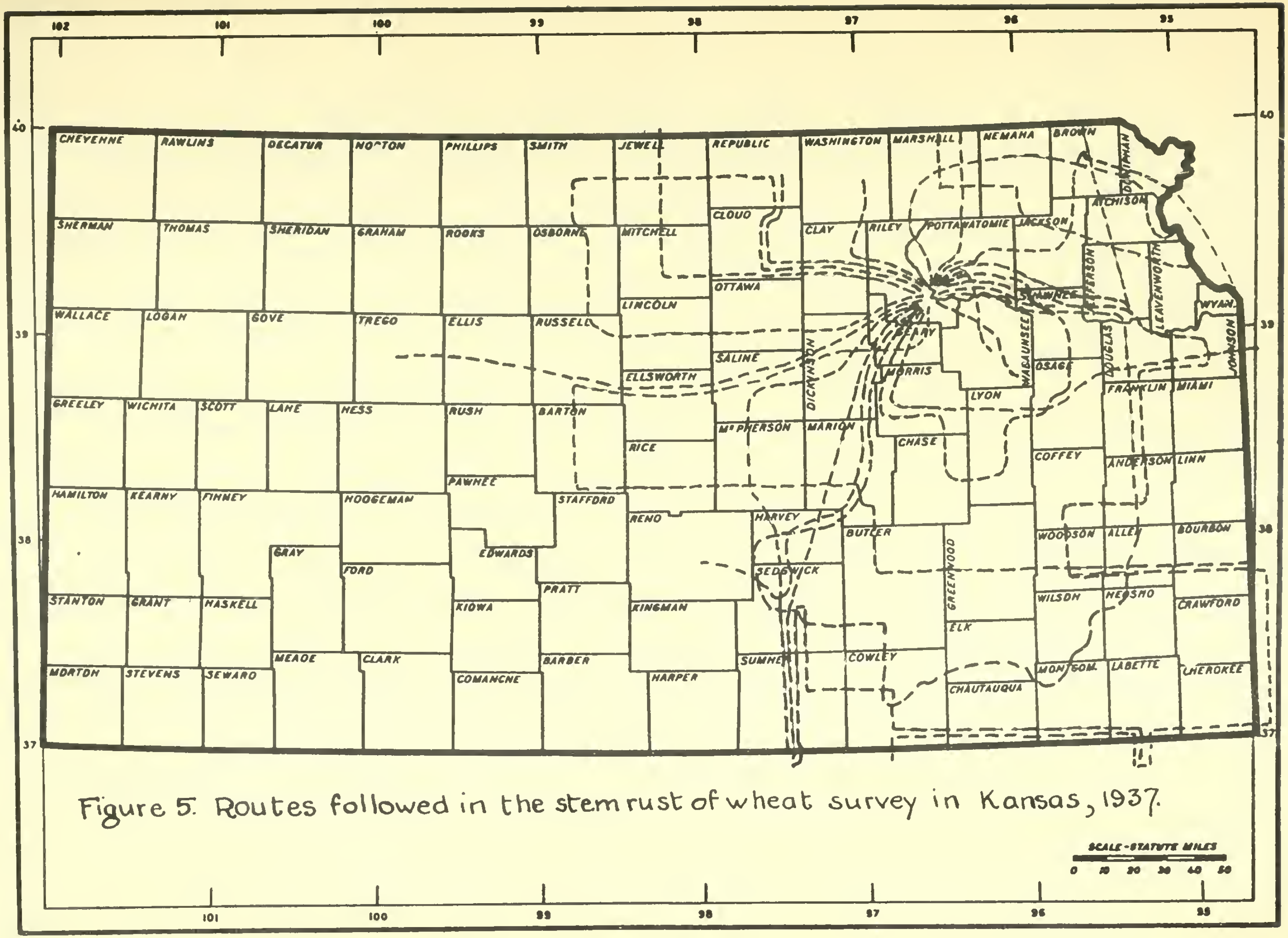


Figure 5. Routes followed in the stem rust of wheat survey in Kansas, 1937.

CROP LOSSES FROM PLANT DISEASES IN THE UNITED STATES IN 1937

Compiled by

Jessie I. Wood

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CONTENTS

Table 1. Estimated reduction in yield from scab (Gibberella saubinetii), leaf rust (Puccinia rubigo-vera tritici), stem rust (P. graminis), bunt (Tilletia spp.), loose smut (Ustilago tritici).

State	Production: 1,000 Bushels	Estimated reduction in yield due to diseases									
		Scab		Leaf Rust		Stem Rust		Bunt		Loose Smut	
		%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels
*Maine	76	-	-	-	-	-	-	-	-	-	-
N.Y.	8,276	-	-	20.	2,283	0.5	57	1.5	171	0.8	91
*N.J.	1,462	-	-	-	-	-	-	-	-	-	-
Pa.	23,573	1.	308	12.	3,698	3.	924	3.5	1,078	2.	616
Ohio	46,136	1.	508	5.	2,538	2.	1,015	1.	508	t	+
Ind.	34,718	0	0	10.	4,509	12.	5,411	t	+	1.	451
Ill.	45,724	0.3	180	5.	3,004	11.	6,609	0.3	180	1.	601
Mich.	18,658	0.5	105	5.	1,048	2.5	524	2.	419	0.5	105
Wis.	2,043	t	+	2.	53	19.8	524	1.	26	t	+
Minn.	35,784	t	+	1.	416	10.	4,161	0.5	208	0.5	208
Iowa	15,976	0.5	118	6.	1,414	19.	4,477	0.2	47	1.	236
Mo.	41,207	-	-	-	-	30.	17,660	-	-	-	-
N.D.	58,013	t	+	0.5	403	25.	20,144	0.3	242	0.2	161
S.D.	15,201	t	+	2.	380	12.	2,280	1.	190	3.	570
Nebr.	47,184	-	-	-	-	6.	3,012	-	-	-	-
Kans.	158,052	-	-	0.4	728	6.6	12,018	1.	1,821	0.2	364
*Del.	1,376	-	-	-	-	-	-	-	-	-	-
Md.	9,044	1.5	145	1.	97	t	+	2.5	242	1.5	145
Va.	9,720	1.5	162	0.5	54	2.	216	2.5	269	0.8	86
*W.Va.	2,736	-	-	-	-	-	-	-	-	-	-
N.C.	5,817	1.	69	7.	485	-	-	1.	69	1.	69
*S.C.	1,416	-	-	-	-	-	-	-	-	-	-
Ga.	1,445	-	-	30.	638	-	-	t	+	2.	43
Ky.	10,212	t	+	5.	549	t	+	1.	110	1.	110
Tenn.	6,750	t	+	2.	156	8.	624	3.	234	0.5	39
*Ala.	77	-	-	-	-	-	-	-	-	-	-
*Ark.	1,050	-	-	-	-	-	-	-	-	-	-
Okla.	65,462	-	-	1.	700	1.	700	1.5	1,050	3.	2,100
Texas	41,690	t	+	1.	423	t	+	-	-	-	-
Mont.	21,918	0	0	t	+	0	0	0.5	110	t	+
Idaho	28,360	0	0	t	+	t	+	5.	1,501	t	+
Wyo.	3,060	0	0	t	+	t	+	1.5	47	-	-
*Colo.	15,857	0	0	-	-	t	+	-	-	-	-
*N.M.	3,139	0	0	-	-	-	-	-	-	-	-
*Ariz.	1,035	0	0	-	-	-	-	-	-	-	-
*Utah	5,430	0	0	-	-	-	-	-	-	-	-
*Nev.	409	0	0	-	-	-	-	-	-	-	-
*Wash.	48,725	0	0	-	-	-	-	-	-	-	-
Oreg.	20,424	0	0	t	+	t	+	1.	208	0	0
*Calif.	16,758	0	0	-	-	-	-	-	-	-	-
U.S.	873,993	0.2	1,595	2.6	23,576	8.8	80,356	1.	8,730	0.7	5,995

* Omitted in calculations for U. S. percentage loss.

WHEAT (Continued)

Foot rots (various organisms), speckled leaf blotch (Septoria tritici), glume blotch (S. nodorum), and other diseases, 1937.

State	Foot Rots %	Foot Rots 1,000 Bushels	Speckled Leaf Blotch %	Speckled Leaf Blotch 1,000 Bushels	Glume Blotch %	Glume Blotch 1,000 Bushels	All Diseases %	All Diseases 1,000 Bushels
	Estimated reduction in yield due to diseases							
Maine	-	-	-	-	-	-	-	-
N.Y.	t	+	0.8	91	1.4	160	27.5	3,138
N.J.	-	-	-	-	-	-	-	-
Pa.	t	+	t	+	2.	616	23.5	7,240
Ohio	-	-	-	-	0.1	51	9.1	4,620
Ind.	-	-	t	+	0	0	23.	10,371
Ill.	-	-	6.	3,605	0.2	120	23.9	14,359
Mich.	-	-	0.2	42			11.	2,306
Wis.	-	-	t	+	-	-	22.8	603
Minn.	2.	832	0	0	0	0	14.	5,825
Iowa	5.	1,178	0.1	24	0.4	94	32.2	7,588
Mo.	-	-	-	-	-	-	30.	17,660
N.D.	2.	1,611	-	-	-	-	28.	22,561
S.D.	2.	380	-	-	-	-	20.	3,800
Nebr.	-	-	-	-	-	-	6.	3,012
Kans.	5.	9,104	-	-	-	-	13.2	24,035
Del.	-	-	-	-	-	-	-	-
Md.	t	+	-	-	t	+	6.5	629
Va.	0.5	54	1.	108	0.5	54	9.8	1,057
W.Va.	-	-	-	-	-	-	-	-
N.C.	t	+	-	-	1.	69	16.	1,107
S.C.	-	-	-	-	-	-	-	-
Ga.	-	-	-	-	-	-	32.	681
Ky.	-	-	-	-	t	+	7.	769
Tenn.	t	+	-	-	-	-	13.5	1,053
Ala.	-	-	-	-	-	-	-	-
Ark.	-	-	-	-	-	-	-	-
Okla.	-	-	-	-	-	-	6.5	4,550
Texas	-	-	-	-	-	-	1.5	635
Mont.	0.1	22	-	-	-	-	0.6	132
Idaho	t	+	-	-	0	0	5.5	1,651
Wyo.	-	-	-	-	-	-	1.5	47
Colo.	-	-	-	-	-	-	-	-
N.M.	-	-	-	-	-	-	-	-
Ariz.	-	-	-	-	-	-	-	-
Utah	-	-	-	-	-	-	-	-
Nev.	-	-	-	-	-	-	-	-
Wash.	-	-	-	-	-	-	-	-
Oreg.	0.5	104	0.1	21	0	0	1.6	333
Calif.	-	-	-	-	-	-	-	-
U.S.	1.5	13,285	0.4	3,891	0.1	1,164	15.4	139,762

Table 2. Estimated reduction in yield from stripe (Helminthosporium gramineum), spot blotch (Helminthosporium sativum), foot rots (Helminthosporium, Fusarium, Cercosporella, Ophiobolus, etc.), loose smut (Ustilago spp.), covered smut (U. hordei).

State	Production 1,000 Bushels	Estimated reduction in yield due to diseases									
		Stripe		Spot Blotch		Foot Rots		Loose Smut		Covered Smut	
		%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels
*Maine	112	-	-	-	-	-	-	-	-	-	-
*Vt.	120	-	-	-	-	-	-	-	-	-	-
N.Y.	3,059	-	-	t	+	-	-	0.4	14	3.	102
*N.J.	30	-	-	-	-	-	-	-	-	-	-
Pa.	1,827	0.3	6	1.	22	-	-	3.5	75	9.4	202
Ohio	800	t	+	-	-	-	-	0.5	4	1.	8
Ind.	648	-	-	-	-	-	-	t	+	t	+
Ill.	3,712	1.3	66	0.5	25	-	-	2.7	137	1.	51
Mich.	4,545	-	-	t	+	-	-	0.1	5	0.2	9
Wis.	22,022	0.3	67	0.8	179	-	-	1.6	358	0.8	179
Minn.	51,536	0.5	277	t	+	1.	554	t	+	0.5	277
Iowa	11,840	t	+	3.	559	6.	1,119	0.5	93	2.5	466
*Mo.	2,294	-	-	-	-	-	-	-	-	-	-
N.D.	21,120	t	+	t	+	1.	233	t	+	0.5	117
S.D.	20,068	1.	223	-	-	t	+	2.	446	4.	892
Nebr.	10,642	-	-	-	-	-	-	-	-	-	-
Kans.	3,129	-	-	-	-	-	-	-	-	4.	130
Md.	1,188	t	+	-	-	-	-	2.	25	3.	38
Va.	1,363	1.5	23	1.	15	0.5	8	2.5	39	3.	46
W.Va.	155	-	-	-	-	-	-	5.	8	7.5	12
N.C.	180	3.	6	2.	4	t	+	1.	2	1.	2
Ky.	910	-	-	-	-	-	-	t	+	4.	40
Tenn.	594	-	-	-	-	-	-	5.	35	10.	70
Okla.	2,048	-	-	-	-	-	-	5.	108		
*Texas	1,766	-	-	-	-	-	-	-	-	-	-
Mont.	2,093	0.1	2	0	0	t	+	t	+	1.	21
Idaho	3,708	t	+	-	-	t	+	t	+	t	+
Wyo.	1,380	0.1	1	-	-	-	-	0.1	1	1.5	21
*Colo.	8,772	-	-	-	-	-	-	-	-	-	-
*N.M.	147	-	-	-	-	-	-	-	-	-	-
*Ariz.	580	-	-	-	-	-	-	-	-	-	-
*Utah	2,379	-	-	-	-	-	-	-	-	-	-
*Nev.	304	-	-	-	-	-	-	-	-	-	-
*Wash.	2,074	-	-	-	-	-	-	-	-	-	-
Oreg.	4,160	t	+	t	+	1.	43	t	+	0.2	9
*Calif.	28,350	-	-	-	-	-	-	-	-	-	-
U. S.	219,635	0.3	671	0.4	804	1.	1,957	0.7	1,350	1.4	2,692

* Omitted in calculations for U. S. percentage loss.

Scab (Gibberella saubinetii), powdery mildew (Erysiphe graminis), leaf rust (Puccinia rubigo-vera tritici and P. anomala), stem rust (P. graminis), and other diseases, 1937.

State	Scab %	Scab 1,000 Bushels	Powdery Mildew %	Powdery Mildew 1,000 Bushels	Leaf Rust %	Leaf Rust 1,000 Bushels	Stem Rust %	Stem Rust 1,000 Bushels	All Diseases %	All Diseases 1,000 Bushels
Maine	-	-	-	-	-	-	-	-	-	-
Vt.	-	-	-	-	-	-	-	-	-	-
N. Y.	t	+	7.	239	t	+	t	+	10.4	355
N. J.	-	-	-	-	-	-	-	-	-	-
Pa.	t	+	-	-	0.5	11	0.5	11	15.2	327
Ohio	-	-	-	-	t	+	t	+	1.5	12
Ind.	-	-	t	+	t	+	0	0	t	+
Ill.	0.1	5	t	+	1.	51	20.	1,011	26.6	1,346
Mich.	0.5	23	-	-	t	+	t	+	0.8	37
Wis.	1.	224	0.5	112	-	-	12.	2,688	17.	3,807
Minn.	t	+	0	0	0	0	5.	2,771	7.	3,879
Iowa	0.5	93	1.	186	t	+	15.	2,797	36.5	6,805
Mo.	-	-	-	-	-	-	0	0	-	-
N. D.	t	+	-	-	-	-	8.	1,867	9.5	2,217
S. D.	t	+	-	-	t	+	3.	669	10.	2,230
Nebr.	-	-	-	-	-	-	2.	231	2.	231
Kans.	-	-	-	-	-	-	-	-	4.	130
Md.	1.5	19	t	+	-	-	t	+	6.5	82
Va.	1.	15	2.	31	0.5	8	0	0	12.	185
W. Va.	-	-	-	-	-	-	-	-	12.5	20
N. C.	t	+	1.	2	t	+	-	-	11.	22
Ky.	t	+	2.	20	2.	20	-	-	8.	80
Tenn.	-	-	-	-	-	-	-	-	15.	105
Okla.	-	-	-	-	-	-	-	-	5.	108
Texas	-	-	-	-	-	-	-	-	-	-
Mont.	-	-	-	-	-	-	-	-	1.1	23
Idaho	-	-	-	-	0	0	t	+	t	+
Wyo.	-	-	-	-	-	-	0.1	1	2.	27
Colo.	-	-	-	-	-	-	0	0	-	-
N. M.	-	-	-	-	-	-	-	-	-	-
Ariz.	-	-	-	-	-	-	-	-	-	-
Utah	-	-	-	-	-	-	-	-	-	-
Nev.	-	-	-	-	-	-	-	-	-	-
Wash.	-	-	-	-	-	-	-	-	-	-
Oreg.	0	0	0.2	9	-	-	-	-	3.4	147
Calif.	-	-	-	-	-	-	-	-	-	-
U. S.	0.2	379	0.3	599	t	90	6.2	12,046	11.3	22,175

Table 3. Estimated reduction in yield due to smut (Urocystis occulta), ergot (Claviceps purpurea), leaf rust (Puccinia rubigo-vera secalis), stem rust (P. graminis), foot rots (various organisms), anthracnose (Colletotrichum graminicolum), and other diseases, 1937.

State	Production 1,000 Bushels	Smut %	Smut 1,000 Bushels	Ergot %	Ergot 1,000 Bushels	Leaf Rust %	Leaf Rust 1,000 Bushels	Stem Rust %	Stem Rust 1,000 Bushels	Foot Rots %	Foot Rots 1,000 Bushels	Anthracnose %	Anthracnose 1,000 Bushels	All Diseases %	All Diseases 1,000 Bushels
N. Y.	508	-	-	-	-	-	-	t	+	-	-	-	-	-	-
N. J.	374	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pa.	1,185	t	+	t	+	5.	66	t	+	-	-	5.	66	10.	132
Ohio	580	t	+	t	+	2.	12	0	0	-	-	-	-	2.	12
Ind.	2,025	-	-	t	+	t	+	-	-	-	-	t	+	t	+
Ill.	1,827	0.5	10	t	+	2.	38	0	0	-	-	0.5	10	4.	77
Mich.	1,656	-	-	0.1	2	-	-	0	0	0.1	2	0.1	2	0.3	6
Wis.	4,590	t	+	1.	47	0.5	23	0	0	t	+	0.5	23	2.	93
Minn.	10,716	t	+	0.5	54	0	0	0	0	t	+	0	0	0.5	54
Iowa	3,534	0	0	0.7	26	0.1	4	0.1	4	2.1	77	0.1	4	3.1	115
Mo.	578	-	-	-	-	-	-	0	0	-	-	-	-	-	-
N. D.	6,720	0	0	0.5	34	0	0	0	0	t	+	-	-	0.5	34
S. D.	6,108	-	-	3.	189	-	-	0	0	-	-	-	-	3.	189
Nebr.	3,900	-	-	-	-	-	-	t	+	-	-	-	-	-	-
Kans.	966	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Del.	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Md.	208	-	-	0.5	1	-	-	-	-	-	-	-	-	0.5	1
Va.	525	0.1	+	0.1	+	0.5	3	0	0	0.5	3	-	-	1.2	6
W. Va.	108	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N. C.	465	-	-	-	-	t	+	-	-	t	+	5.	25	8.	40
S. C.	85	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ga.	94	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ky.	312	-	-	t	+	-	-	-	-	-	-	-	-	-	-
Tenn.	308	t	+	t	+	t	+	-	-	-	-	-	-	t	+
Okla.	306	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Rye (Continued).

State	Production 1,000 Bushels	Smut %	Smut 1,000 Bushels	Ergot %	Ergot 1,000 Bushels	Leaf Rust %	Leaf Rust 1,000 Bushels	Stem Rust %	Stem Rust 1,000 Bushels	Foot Rots %	Foot Rots 1,000 Bushels	Anthracnose %	Anthracnose 1,000 Bushels	All Diseases %	All Diseases 1,000 Bushels
*Texas	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mont.	198	-	-	t	+	0	0	0	0	t	+	-	-	t	+
*Idaho	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Wyo.	168	-	-	-	-	-	-	0	0	-	-	-	-	-	-
*Colo.	382	-	-	-	-	-	-	0	0	-	-	-	-	-	-
*Utah	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Wash.	162	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oreg.	600	0	0	t	+	t	+	t	+	0.1	1	0	0	0.1	1
*Calif.	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U. S.	49,449	t	10	0.8	353	0.3	146	t	4	0.2	83	0.3	130	1.8	760

* Omitted in calculations for U. S. percentage loss.

OATS

Table 4. Estimated reduction in yield due to loose smut (Ustilago avenae), covered smut (U. levis), stem rust (Puccinia graminis), crown rust (P. coronata), foot rot (Fusarium spp.), blast (non-parasitic), and other diseases, 1937.

State	Production 1,000 Bushels	Loose Smut %	Loose Smut 1,000 Bushels	Covered Smut %	Covered Smut 1,000 Bushels	Stem Rust %	Stem Rust 1,000 Bushels	Crown Rust %	Crown Rust 1,000 Bushels	Foot Rot %	Foot Rot 1,000 Bushels	Blast %	Blast 1,000 Bushels	All Diseases %	All Diseases 1,000 Bushels
*Maine	3,955	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N. H.	280	1.	3	-	-	-	-	-	-	-	-	-	-	1.	3
*Vt.	1,540	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Mass.	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*R. I.	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Conn.	174	2.	4	2.	4	-	-	5.	10	-	-	-	-	9.	18
N. Y.	18,800	1.5	606			2.	809	25.	10,108	-	-	15.	6,065	53.5	21,631
*N. J.	1,530	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pa.	24,705	14.	4,557			8.	2,604	0.1	33	-	-	1.	325	24.1	7,844
Ohio	35,511	1.	374	1.	374	t	+	3.	1,121	-	-	-	-	5.	1,869
Ind.	45,973	1.	469	1.	469	t	+	t	+	-	-	t	+	2.	938
Ill.	162,208	2.7	5,427			0	0	0.5	1,005	-	-	15.5	31,155	19.3	38,793
Mich.	34,272	1.	348	0.2	70	0.1	35	0.1	35	0.1	35	-	-	1.6	558
Wis.	79,360	4.	3,488	2.	1,744	0	0	2.	1,744	-	-	1.	872	9.	7,848
Minn.	165,321			3.	5,166	0	0	0	0	t	+	-	-	4.	6,888
Iowa	258,975	4.	11,384	1.	2,846	0.5	1,423	1.	2,846	0.5	1,423	0.5	1,423	9.	25,614
*Mo.	43,400	-	-	-	-	t	+	-	-	-	-	-	-	-	-
N. D.	29,902	0.5	152	0.5	152	0	0	t	+	t	+	0	0	1.5	456
S. D.	31,269	1.	319	1.	319	0	0	t	+	-	-	-	-	2.	638
*Nebr.	35,637	-	-	-	-	0	0	-	-	-	-	-	-	-	-
Kans.	35,376	3.5	1,283			t	+	t	+	-	-	-	-	3.5	1,283
*Del.	87	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Md.	1,083	5.	59	1.	12	t	+	2.	24	-	-	-	-	8.	95
Va.	1,680	3.	55	3.5	64	t	+	1.	18	t	+	0.5	9	8.5	155
*W. Va.	1,520	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N. C.	4,830	1.	55	-	-	-	-	5.	274	-	-	1.	55	12.	659
*S. C.	10,076	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Oats (Continued)

State	Production 1,000 Bushels	Loose Smut %	Loose Smut 1,000 Bushels	Covered Smut %	Covered Smut 1,000 Bushels	Stem Rust %	Stem Rust 1,000 Bushels	Crown Rust %	Crown Rust 1,000 Bushels	Foot Rot %	Foot Rot 1,000 Bushels	Blast %	Blast 1,000 Bushels	All Diseases %	All Diseases 1,000 Bushels
		Estimated reduction in yield due to diseases													
*Ga.	8,658	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Fla.	130	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Ky.	1,848	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tenn.	1,480	3.	48	3.	48	1.	16	-	-	-	-	-	-	7.	112
*Ala.	2,646	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Miss.	1,428	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Ark.	3,300	-	-	-	-	-	-	-	-	-	-	-	-	-	-
La.	1,395	1.	16			t	+	10.	159	-	-	-	-	12.	191
Okla.	27,347	6.	1,746			t	+	-	-	-	-	-	-	6.	1,746
Texas	30,432	-	-	-	-	t	+	1.	307	-	-	-	-	1.	307
Mont.	4,296	5.	2,335	-	-	0	0	0	0	-	-	2.	934	8.	3,736
Idaho	4,960	t	+	t	+	t	+	0	0	-	-	-	-	t	+
Wyo.	2,652	-	-	1.	27	0	0	-	-	-	-	-	-	1.	27
*Colo.	4,433	-	-	-	-	0	0	-	-	-	-	-	-	-	-
*N. M.	600	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Ariz.	234	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Utah	1,140	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Nev.	105	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Wash.	8,060	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oreg.	10,360	t	+	1.	107	0.1	11	0.2	21	1.	107	0.3	32	2.8	299
*Calif.	3,080	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U. S.	1,146,258	2.9	32,728	1.	11,402	0.4	4,898	1.6	17,705	0.1	1,565	3.6	40,870	10.7	121,708

* Omitted in calculations for U. S. percentage loss.

Table 5. Estimated reduction in yield due to smut (Ustilago zeae), foot and root rots and seedling blights (Gibberella, Fusarium, etc.), Diplodia stalk and ear rots (Diplodia spp.), ear rots (Fusarium, Nigrospora, etc., except Diplodia), stalk rots (Fusarium, etc., except Diplodia), bacterial wilt (Aplanobacter stewarti), and other diseases, 1937.

State	Production 1,000 Bushels	Smut %	Smut 1,000 Bushels	Foot Rots %	Foot Rots 1,000 Bushels	Diplodia %	Diplodia 1,000 Bushels	Ear Rots %	Ear Rots 1,000 Bushels	Stalk Rots %	Stalk Rots 1,000 Bushels	Bacterial Wilt %	Bacterial Wilt 1,000 Bushels	All Diseases %	All Diseases 1,000 Bushels
*Maine	333	-	-	-	-	-	-	-	-	-	-	0	0	-	-
*N. H.	630	-	-	-	-	-	-	-	-	-	-	0	0	-	-
*Vt.	2,960	-	-	-	-	-	-	-	-	-	-	0	0	-	-
*Mass.	1,640	-	-	-	-	-	-	-	-	-	-	0	)	-	-
*R. I.	400	-	-	-	-	-	-	-	-	-	-	0	0	-	-
Conn.	1,989	1.	20	-	-	-	-	-	-	-	-	0	0	1.	20
*N. Y.	23,856	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*N. J.	8,528	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pa.	62,928	4.	3,227	2.	1,614	t	+	10.	8,068	5.	4,034	-	-	22.	17,750
Ohio	163,228	0.5	837	1.5	2,511	0.2	335	0.2	335	0.1	167	-	-	2.5	4,185
Ind.	211,770	0.1	215	0.5	1,076	t	+	1.	2,152	t	+	-	-	1.6	3,443
Ill.	444,197	0.3	1,702	4.5	25,529	0.2	1,135	6.9	39,144	3.	17,019	-	-	21.7	123,105
Mich.	55,650	4.5	2,639	0.1	59	0.1	59	0.3	176	-	-	-	-	5.1	2,992
Wis.	76,356	2.	1,706	1.	853	-	-	1.5	1,280	6.	5,119	-	-	10.5	8,958
Minn.	172,368	7.	13,115	0.5	937	t	+	0.5	937	t	+	-	-	8.	14,989
Iowa	503,505	8.	50,288	8.	50,288	1.	6,286	2.	12,572	0.5	3,143	0.1	629	19.9	125,092
*Mo.	115,020	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N. D.	17,252	2.	356	-	-	-	-	0.5	89	0.5	89	-	-	3.	534
S. D.	44,170	5.	2,427	1.	485	1.	485	2.	970	-	-	-	-	9.	4,367
*Nebr.	82,992	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kans.	28,244	1.5	430	-	-	-	-	-	-	-	-	-	-	1.5	430
*Del.	4,147	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Md.	18,576	1.	199	2.5	497	0.5	99	1.5	298	1.	199	t	+	6.5	1,292
Va.	37,740	3.	1,279	3.	1,279	1.5	640	1.	426	1.	426	1.5	640	11.5	4,903
*W. Va.	14,245	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N. C.	45,357	3.	1,722	6.	3,445	2.	1,148	1.	574	2.	1,148	0	0	21.	12,056

Field Corn (Continued)

State	Production 1,000 Bushels	Estimated reduction in yield due to diseases													
		Smut		Foot Rots		Diplodia		Ear Rots		Stalk Rots		Bacterial Wilt		All Diseases	
		%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels
*S. C.	24,945	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Ga.	48,334	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Fla.	7,890	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ky.	75,556	1.	779	-	-	1.	779	1.	779	-	-	t	+	3.	2,337
Tenn.	66,528	1.	739	5.	3,696	2.	1,478	-	-	-	-	-	-	10.	7,391
*Ala.	46,792	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Miss.	45,378	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Ark.	40,640	-	-	-	-	-	-	-	-	-	-	-	-	-	-
La.	24,885	t	+	10.	2,998	1.	300	5.	1,499	-	-	-	-	17.	5,097
Okla.	30,960	3.	962	-	-	-	-	0.5	160	-	-	-	-	3.5	1,122
Texas	72,048	0.5	363	-	-	-	-	0.1	73	-	-	0.1	73	0.8	582
*Mont.	1,251	t	+	-	-	-	-	-	-	-	-	0	0	-	-
*Idaho	1,332	t	+	-	-	-	-	-	-	-	-	0	0	t	+
Wyo.	2,480	2.	51	-	-	-	-	-	-	-	-	0	0	2.	51
*Colo.	8,536	-	-	-	-	-	-	-	-	-	-	0	0	-	-
*N. M.	2,740	-	-	-	-	-	-	-	-	-	-	0	0	-	-
*Ariz.	495	-	-	-	-	-	-	-	-	-	-	0	0	-	-
*Utah	594	-	-	-	-	-	-	-	-	-	-	0	0	-	-
*Nev.	60	-	-	-	-	-	-	-	-	-	-	0	0	-	-
*Wash.	1,184	-	-	-	-	-	-	-	-	-	-	0	0	-	-
Oreg.	2,178	t	+	0.2	4	-	-	-	-	-	-	0	0	0.4	8
*Calif.	2,108	-	-	-	-	-	-	-	-	-	-	0	0	-	-
U. S.	2,644,995	3.3	83,056	3.8	95,271	0.5	12,744	2.8	69,532	1.3	31,344	0.1	1,342	13.7	340,704

* Omitted in calculations for U. S. percentage total.

SWEET CORN

Table 6. Estimated reduction in yield due to smut (*Ustilago zeae*), bacterial wilt (*Aplanobacter stewarti*), stalk and ear rot (*Diplodia zeae*), foot rots (various), and other diseases, 1937.

State	Production Short Tons	Smut %	Smut Short Tons	Bacterial Wilt %	Bacterial Wilt Short Tons	Diplodia %	Diplodia Short Tons	Foot Rot %	Foot Rot Short Tons	All Diseases %	All Diseases Short Tons
*Maine	63,700	-	-	0	0	-	-	-	-	-	-
*N.H.	2,900	-	-	0	0	-	-	-	-	-	-
*Vt.	3,100	-	-	0	0	-	-	-	-	-	-
Conn.		1.	+	5.	+	-	-	-	-	6.	+
*N.Y.	40,700	-	-	-	-	-	-	-	-	-	-
Pa.	17,600	6.	1,214	3.	607	-	-	3.	607	13.	2,630
Ohio	41,800	0.8	339	t	+	0.1	42	0.5	212	1.5	635
Ind.	107,900	0.1	108	t	+	t	+	-	-	0.1	108
*Ill.	196,700	-	-	-	-	-	-	-	-	-	-
Mich.	8,400	5.	443	0	0	0	0	-	-	5.2	461
Wis.	41,300	6.	2,784	0	0	2.	928	t	+	11.	5,104
Minn.	180,200	6.	11,752	0	0	1.	1,959	1.	1,959	8.	15,670
Iowa	114,000	10.	14,653	t	+	2.	2,931	-	-	22.2	32,530
N.D.		3.	+	0	0	-	-	-	-	3.5	+
S.D.		10.	+	0	0	-	-	-	-	10.	+
*Nebr.	2,900	-	-	-	-	-	-	-	-	-	-
*Del.	10,000	-	-	-	-	-	-	-	-	-	-
Md.	82,700	2.	1,852	0.7	648	3.	2,778	-	-	10.7	9,908
Tenn.	7,000	1.	76	-	-	-	-	5.	380	8.	608
Texas		0.5	+	t	+	-	-	-	-	0.6	+
Mont.		t	+	0	0	-	-	-	-	t	+
Idaho		t	+	0	0	-	-	-	-	t	+
Wyo.		4.	+	0	0	-	-	-	-	4.	+
Oreg.		-	-	0	0	-	-	t	+	t	+
*Other States[a]	31,200										
U.S.	952,100	5.	33,221	0.2	1,255	1.3	8,638	0.5	3,158	10.2	67,654

* Omitted in calculations for U. S. percentage loss.

[a] Includes Colorado, Idaho, Kansas, Kentucky, Missouri, Montana, Oklahoma, Oregon, South Dakota, Texas, Utah, Virginia, Washington, and Wyoming.

SWEET POTATO

Table 7. Estimated reduction in yield due to stem rot (Fusarium spp.), black rot (Ceratostomella fimbriata), scurf (Monilochaetes infuscans), foot rot (Plenodomus destruens), mottle necrosis (Pythium ultimum), soil rot or pox (Actinomyces sp.), and other diseases, and estimated losses in storage caused by soft rot and ring rot (Rhizopus spp.), surface rot (Fusarium oxysporum), and other organisms, 1937.

State	Production 1,000 Bushels	Stem Rot %	Stem Rot 1,000 Bushels	Black Rot %	Black Rot 1,000 Bushels	Scurf %	Scurf 1,000 Bushels	Foot Rot %	Foot Rot 1,000 Bushels	Mottle Necrosis %	Mottle Necrosis 1,000 Bushels	Soil Rot %	Soil Rot 1,000 Bushels	All Diseases %	All Diseases 1,000 Bushels	Soft Rot %	Soft Rot 1,000 Bushels	Surface Rot %	Surface Rot 1,000 Bushels	All Storage Rots %	All Storage Rots 1,000 Bushels
		Estimated reduction in yield due to diseases																			
°*N.J.	2,414	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pa.		t	+	t	+	-	-	1.	+	-	-	-	-	1.	+	-	-	-	-	-	-
°*Ind.	500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
°*Ill.	510	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
°*Iowa	270	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
°*Mo.	1,190	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kans.	240	6.	16	2.	5	-	-	-	-	-	-	1.	3	9.	24	2.	5	-	-	2.	5
°*Del.	780	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Md.	1,000	3.	32	2.	21	t	+	t	+	t	+	1.5	16	6.5	69	-	-	-	-	10.	100
Va.	5,070	7.	355	2.	101	2.	101	t	+	-	-	-	-	11.	557	5.	254	3.	152	11.	558
N.C.	8,160	15.	1,530	t	+	2.	204	-	-	1.	102	t	+	20.	2,040	10.	816	10.	816	20.	1,632
°*S.C.	5,130	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
°*Ga.	8,550	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
°*Fla.	1,365	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
° Ky.	2,160	t	+	t	+	5.	114	-	-	-	-	-	-	5.	114	-	-	-	-	-	-
° Tenn.	5,610	30.	3,060	15.	1,530	t	+	-	-	-	-	-	-	45.	4,590	-	-	-	-	-	-
°*Ala.	8,800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
°*Miss.	7,544	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
°*Ark.	3,515	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
La.	6,570	-	-	3.	210	-	-	-	-	-	-	1.	70	6.	420	2.5	164	2.	131	5.	328
Okla.	1,050	4.	44	1.	11	-	-	-	-	-	-	-	-	5.	55	1.	11	3.	32	4.	43
Texas	3,744	-	-	0.1	4	-	-	-	-	-	-	0.1	4	0.2	8	-	-	-	-	-	-
°*Calif.	1,221	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U.S.	75,393	12.1	5,037	4.5	1,882	1.	419	-	-	0.2	102	0.2	93	18.8	7,877	4.4	1,250	4.	1,131	9.4	2,666

* Omitted in calculations for U. S. percentage loss for reduction in yield. ° For storage rots.

Table 8. Estimated reduction in yield due to mosaic, leaf roll, and other virus diseases, late blight (<u>Phytophthora infestans</u>), rhizoctonia (<u>Rhizoctonia solani</u>), blackleg (<u>Bacillus phytophthorus</u>).

State	Production 1,000 Bushels	Estimated reduction in yield due to diseases											
		Mosaic		Leaf Roll		Other Virus		Late Blight		Rhizoctonia		Blackleg	
		%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels
Maine	48,503	2.	1,019	2.	1,019	0.1	51	2.	1,019	3.	1,528	1.5	76
N.H.	1,479	5.	85	2.	34	-	-	5.	85	-	-	1.	1
Vt.	2,194	2.	58	5.	145	-	-	1.	29	-	-	-	-
*Mass.	2,254	-	-	-	-	-	-	-	-	-	-	-	-
*R.I.	838	-	-	-	-	-	-	-	-	-	-	-	-
*Conn.	2,890	-	-	-	-	-	-	-	-	-	-	-	-
*N.Y.	28,375	-	-	-	-	-	-	-	-	-	-	-	-
*N.J.	10,080	-	-	-	-	-	-	-	-	-	-	-	-
Pa.	25,215	1.	337	3.	1,010	t	+	12.	4,040	2.	673	0.1	3
Ohio	10,030	t	+	t	+	t	+	0.2	21	t	+	t	+
Ind.	5,400	0.1	6	0.1	6	0.8	46	-	-	0.1	6	-	-
*Ill.	3,120	-	-	-	-	-	-	-	-	-	-	-	-
Mich.	28,634	t	+	t	+	0.3	126	0	0	1.	420	2.5	1,05
Wis.	18,525	t	+	0	0	10.	2,205	0	0	t	+	t	+
Minn.	24,411	5.	1,649					0	0	2.	660	1.	33
Iowa	5,040	8.	602	7.	527	2.	150	0	0	3.	226	1.	7
*Mo.	4,950	-	-	-	-	-	-	0	0	-	-	-	-
N.D.	11,662	1.	132	1.	132	1.	132	0	0	1.	132	1.5	19
*S.D.	1,534	-	-	-	-	-	-	0	0	-	-	-	-
*Nebr.	6,035	-	-	-	-	-	-	0	0	-	-	-	-
Kans.	2,233	-	-	-	-	-	-	0	0	5.	121	-	-
*Del.	475	-	-	-	-	-	-	-	-	-	-	-	-
Md.	3,480	1.5	66	1.5	66	t	+	8.	355	2.	89	t	+
Va.	10,920	2.	240	2.	240	0.5	60	2.	240	1.	120	1.	12
W.Va.	3,264	5.	326	5.	326	-	-	10.	653	3.	196	2.	13
N.C.	9,894	1.	108	2.	215	-	-	1.	108	2.	215	1.	10
*S.C.	3,120	-	-	-	-	-	-	-	-	-	-	-	-
*Ga.	1,188	-	-	-	-	-	-	-	-	-	-	-	-
Fla.	4,114	1.	51					8.	406	1.	51	2.	10
*Ky.	4,371	-	-	-	-	-	-	-	-	-	-	-	-
Tenn.	3,081	2.	69	t	+	-	-	t	+	1.	35	t	+
*Ala.	3,780	-	-	-	-	-	-	-	-	-	-	-	-
*Miss.	1,512	-	-	-	-	-	-	-	-	-	-	-	-
*Ark.	3,053	-	-	-	-	-	-	-	-	-	-	-	-
La.	2,728	3.	87	-	-	1.	29	-	-	-	-	-	-
Okla.	2,516	3.	81	-	-	1.	27	0	0	1.	27	t	+
Texas	3,456	0.1	4	0.1	4	1.	37	5.	185	-	-	0.1	4
Mont.	1,800	4.	80	0	0	1.	20	0	0	1.	20	t	+
Idaho	29,520	3.	932	t	+	t	+	0	0	1.	311	1.	311
Wyo.	2,592	2.	61	-	-	1.	31	0	0	2.	61	2.	61
*Colo.	15,688	-	-	-	-	-	-	0	0	-	-	-	-
*N.M.	432	-	-	-	-	-	-	0	0	-	-	-	-
*Ariz.	160	-	-	-	-	-	-	0	0	-	-	-	-
*Utah	2,128	-	-	-	-	-	-	0	0	-	-	-	-
*Nev.	345	-	-	-	-	-	-	0	0	-	-	-	-
*Wash.	9,400	-	-	-	-	-	-	-	-	-	-	-	-
*Oreg.	7,840	-	-	-	-	-	-	-	-	-	-	-	-
*Calif.	16,900	-	-	-	-	-	-	-	-	-	-	-	-
U.S.	391,159	1.9	5,993	1.2	3,724	0.9	2,914	2.2	7,141	1.5	4,891	1.	3,305

* Omitted in calculations for U. S. percentage loss.

Fusarium wilt (Fusarium spp.), "purple-top" wilt (undet.), tipburn and hopperburn (undet.), seed-piece decay (various causes), scab (Actinomyces scabies), and other diseases, 1937.

State	Estimated reduction in yield due to diseases													
	Fusarium Wilt		"Purple-top" Wilt		Tipburn & Hopperburn		Early Blight		Seed-piece Decay		Scab		All Diseases	
	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels
Maine	0	0	-	-	-	-	1.	509	3.	1,528	-	-	14.8	7,539
N.H.	-	-	-	-	-	-	t	+	-	-	-	-	13.	221
Vt.	-	-	-	-	10.	291	1.5	44	5.	145	-	-	24.5	712
Mass.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R.I.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Conn.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N.Y.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N.J.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pa.	1.	337	-	-	1.	337	1.	337	-	-	4.	1,347	25.1	8,452
Ohio	t	+	-	-	1.	104	t	+	2.	207	-	-	3.2	332
Ind.	-	-	-	-	3.	173	-	-	-	-	2.	115	6.1	352
Ill.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mich.	1.	420	-	-	10.	4,199	5.	2,099	-	-	12.	5,038	31.8	13,352
Wis.	1.	221	-	-	5.	1,103	t	+	-	-	-	-	16.	3,529
Minn.	1.	330	10.	3,299	3.	990	t	+	t	+	2.	660	26.	8,578
Iowa	t	+	-	-	7.	527	t	+	0	0	5.	376	33.	2,483
Mo.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N.D.	0.5	66	5.	659	0.5	66	t	+	-	-	t	+	11.5	1,517
S.D.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nebr.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kans.	-	-	-	-	-	-	-	-	2.	48	0.5	12	7.5	181
Del.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Md.	2.	89	-	-	1.	44	1.	44	t	+	4.	177	21.5	952
Va.	-	-	-	-	-	-	t	+	0.5	60	-	-	9.	1,080
W.Va.	t	+	-	-	15.	979	t	+	-	-	-	-	50.	3,264
N.C.	1.	108	-	-	3.	323	1.	108	2.	215	-	-	18.	1,938
S.C.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ga.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fla.	-	-	-	-	-	-	t	+	t	+	3.	152	19.	965
Ky.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tenn.	t	+	-	-	5.	173	3.	104	-	-	-	-	11.	381
Ala.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Miss.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ark.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
La.	-	-	-	-	0.5	15	0.5	15	-	-	-	-	6.	175
Okla.	1.	27	-	-	t	+	-	-	-	-	1.	27	7.	189
Texas	-	-	-	-	-	-	0.5	19	-	-	-	-	6.8	253
Mont.	2.	40	-	-	-	-	t	+	2.	40	-	-	10.	200
Idaho	t	+	-	-	0	0	t	+	t	+	t	+	5.	1,554
Wyo.	5.	153	-	-	-	-	t	+	2.	61	1.5	46	15.5	474
Colo.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N.M.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ariz.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Utah	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nev.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wash.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oreg.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calif.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U.S.	0.6	1,791	1.2	3,958	2.9	9,324	1.	3,279	0.7	2,304	2.5	7,950	18.3	58,673

Table 9. Tomatoes for manufacture; estimated reduction in yield due to septoria blight (S. lycopersici), fusarium wilt (F. bulbigenum lycopersici), bacterial wilt (Bacterium solanacearum), early blight (Alternaria solani), fruit rots (various organisms)

State	Production Short Tons°	Estimated reduction in yield due to diseases									
		Septoria		Fusarium Wilt		Bacterial Wilt		Early Blight		Fruit Rots	
		%	Short Tons	%	Short Tons	%	Short Tons	%	Short Tons	%	Short Tons
N.Y.	137,600	-	-	-	-	0	0	-	-	t	+
*N.J.	137,800	-	-	-	-	0	0	-	-	-	-
Pa.	58,000	2.	2,148	t	+	0	0	35.	37,592	5.	5,370
Ohio	64,600	5.	3,519	t	+	-	-	3.	2,111	0.2	141
Ind.	346,900	1.	3,898	2.	7,796	t	+	6.	23,387	1.	3,898
Ill.	58,800	2.	1,400	2.	1,400	-	-	4.	2,800	-	-
Mich.	20,200	20.	7,088	t	+	0	0	15.	5,316	5.	1,772
Iowa	30,100	5.	1,771	-	-	0	0	-	-	-	-
*Mo.	31,300	-	-	-	-	-	-	-	-	-	-
*Del.	40,300	-	-	-	-	-	-	-	-	-	-
Md.	165,800	t	+	1.5	3,148	t	+	8.	16,790	10.	20,987
Va.	62,500	1.	762	10.	7,622	2.	1,524	1.	762	1.	762
Ky.	12,600	5.	788	t	+	-	-	-	-	15.	2,363
Tenn.	25,900	10.	3,500	5.	1,750	-	-	5.	1,750	1.	350
*Ark.	31,200	-	-	-	-	-	-	-	-	-	-
*Colo.	21,400	0	0	-	-	-	-	-	-	-	-
*Utah	53,100	0	0	-	-	-	-	-	-	-	-
*Calif.	484,500	0	0	-	-	-	-	-	-	-	-
*Other States	76,000										
U.S.	1,858,600	2.1	24,874	1.8	21,716	0.1	1,524	7.6	90,508	3.	35,643

° Short tons, 2,000 pounds.
*Omitted in calculations for U. S. percentage loss.

TOMATOES (Continued)
(For Manufacture)

Blossom-end rot (non-parasitic), bacterial canker (<u>Aplanobacter michiganense</u>), mosaic, and other virus diseases, and other diseases, 1937.

State	Blossom-end Rot %	Blossom-end Rot Short Tons	Bacterial Canker %	Bacterial Canker Short Tons	Mosaic %	Mosaic Short Tons	Other Virus %	Other Virus Short Tons	All Diseases %	All Diseases Short Tons
N. Y.	0.8	1,110	t	+	-	-	-	-	0.8	1,110
N. J.	-	-	-	-	-	-	-	-	-	-
Pa.	1.	1,074	t	+	1.	1,074	t	+	46.	49,406
Ohio	-	-	t	+	t	+	-	-	8.2	5,771
Ind.	-	-	-	-	-	-	-	-	11.	42,877
Ill.	-	-	0.5	350	5.	3,500	0.5	350	16.	11,200
Mich.	t	+	t	+	1.	354	t	+	43.	15,239
Iowa	8.	2,833	-	-	2.	708	-	-	15.	5,312
Mo.	-	-	-	-	-	-	-	-	-	-
Del.	-	-	-	-	-	-	-	-	-	-
Md.	0.5	1,049	t	+	t	+	-	-	21.	44,073
Va.	-	-	t	+	1.	762	-	-	18.	13,718
Ky.	-	-	-	-	t	+	-	-	20.	3,151
Tenn.	-	-	-	-	t	+	-	-	26.	9,100
Ark.	-	-	-	-	-	-	-	-	-	-
Colo.	-	-	-	-	-	-	-	-	-	-
Utah	-	-	t	+	-	-	t	+	-	-
Calif.	-	-	-	-	-	-	-	-	-	-
Other States										
U. S.	0.5	6,066	t	350	0.5	6,398	t	350	16.7	200,957

Estimated reduction in yield due to diseases

Table 10. Tomatoes for market; estimated reduction in yield due to septoria blight (S. lycopersici), fusarium wilt (F. bulbigenum lycopersici), bacterial wilt (Bacterium solanacearum), early blight (Alternaria solani), fruit rots (various organisms)

State	Production 1,000 °Bushels	Septoria %	Septoria 1,000 Bushels	Fusarium Wilt %	Fusarium Wilt 1,000 Bushels	Bacterial Wilt %	Bacterial Wilt 1,000 Bushels	Early Blight %	Early Blight 1,000 Bushels	Fruit Rots %	Fruit Rots 1,000 Bushels
Conn.		5.	+	-	-	0	0	15.	+	-	-
N.Y.	1,872	-	-	-	-	-	-	-	-	0.1	2
*N.J.	2,100	-	-	-	-	-	-	-	-	-	-
Pa.	380	2.	12	t	+	-	-	25.	149	5.	30
Ohio	373	5.	20	t	+	-	-	3.	12	0.2	1
Ind.	660	1.	7	2.	15	t	+	6.	44	1.	7
Ill.	131	2.	3	2.	3	-	-	4.	6	-	-
Mich.	476	20.	167	t	+	0	0	15.	125	5.	42
Wis.		t	+	0	0	0	0	5.	+	5.	+
Minn.		t	+	t	+	-	-	t	+	-	-
Iowa	81	5.	5	-	-	0	0	-	-	-	-
*Mo.	550	-	-	-	-	-	-	-	-	-	-
N.D.		-	-	-	-	-	-	t	+	1.	+
Kans.		-	-	1.	+	-	-	-	-	-	-
*Del.	24	-	-	-	-	-	-	-	-	-	-
Md.	832	t	+	1.5	14	t	+	6.	58	5.	48
Va.	608	1.	7	10.	74	2.	15	1.	7	1.	7
N.C.	72	3.	3	3.	3	6.	6	1.	1	3.	3
*S.C.	488	-	-	-	-	-	-	-	-	-	-
*Ga.	180	-	-	-	-	-	-	-	-	-	-
*Fla.	2,746	-	-	t	+	-	-	-	-	-	-
Ky.	276	5.	17	t	+	-	-	-	-	15.	52
Tenn.	770	10.	104	5.	52	-	-	5.	52	1.	10
*Miss.	912	-	-	-	-	-	-	-	-	-	-
*Ark.	240	-	-	-	-	-	-	-	-	-	-
La.	223	-	-	2.	5	-	-	2.	5	-	-
Texas	2,844	t	+	5.	224	-	-	2.	90	9.	403
Mont.		-	-	t	+	-	-	-	-	-	-
Idaho		0	0	0	0	0	0	-	-	t	+
*Colo.	636	-	-	-	-	-	-	-	-	-	-
*Utah	80	-	-	-	-	-	-	-	-	-	-
*Wash.	216	-	-	-	-	-	-	-	-	-	-
Oreg.	294	-	-	-	-	-	-	-	-	-	-
*Calif.	3,281	-	-	-	-	-	-	-	-	-	-
U.S.	21,350	2.7	345	3.	390	0.2	21	4.2	549	4.7	605

° Bushels of 53 pounds.

* Omitted in calculations for U. S. percentage loss.

TOMATOES (Continued)
(For Market)

Blossom-end rot (non-parasitic), bacterial canker (Aplanobacter michiganense), mosaic, and other virus diseases, and other diseases, 1937.

State	Blossom-end Rot %	Blossom-end Rot 1,000 Bushels	Bacterial Canker %	Bacterial Canker 1,000 Bushels	Mosaic %	Mosaic 1,000 Bushels	Other Virus %	Other Virus 1,000 Bushels	All Diseases %	All Diseases 1,000 Bushels
	Estimated reduction in yield due to diseases									
Conn.	1.	+	-	-	5.	+	-	-	26.	+
N. Y.	0.8	15	0.1	2	-	-	-	-	1.2	23
N. J.	-	-	-	-	-	-	-	-	-	-
Pa.	1.	6	t	+	1.	6	-	-	36.	215
Ohio	-	-	t	+	t	+	-	-	8.2	33
Ind.	-	-	-	-	-	-	-	-	11.	80
Ill.	-	-	0.5	1	5.	8	0.5	1	16.	25
Mich.	t	+	t	+	1.	8	t	+	43.	359
Wis.	1.	+	1.	+	t	+	t	+	13.	+
Minn.	4.	+	-	-	2.	+	-	-	6.	+
Iowa	8.	8	-	-	2.	2	-	-	15.	15
Mo.	-	-	-	-	-	-	-	-	-	-
N. D.	1.	+	-	-	1.	+	-	-	3.	+
Kans.	-	-	-	-	-	-	-	-	1.	+
Del.	-	-	-	-	-	-	-	-	-	-
Md.	0.5	5	t	+	t	+	-	-	13.5	130
Va.	-	-	-	-	1.	7	-	-	18.	132
N. C.	3.	3	t	+	2.	2	-	-	28.	28
S. C.	-	-	-	-	-	-	-	-	-	-
Ga.	-	-	-	-	-	-	-	-	-	-
Fla.	-	-	-	-	-	-	-	-	-	-
Ky.	-	-	-	-	t	+	-	-	20.	69
Tenn.	-	-	-	-	t	+	-	-	26.	270
Miss.	-	-	-	-	-	-	-	-	-	-
Ark.	-	-	-	-	-	-	-	-	-	-
La.	3.	8	-	-	5.	13	-	-	14.	36
Texas	-	-	t	+	1.	45	5.	224	36.5	1,635
Mont.	t	+	-	-	t	+	-	-	1.	+
Idaho	t	+	0	0	-	-	10.	+	10.	+
Colo.	-	-	-	-	-	-	-	-	-	-
Utah	-	-	t	+	-	-	t	+	-	-
Wash.	-	-	-	-	-	-	-	-	-	-
Oreg.	-	-	-	-	-	-	2.5	8	2.5	8
Calif.	-	-	-	-	-	-	-	-	-	-
U. S.	0.4	45	t	3	0.7	91	1.8	233	23.7	3,058

Table 11. Snap beans for market and manufacture; estimated reduction in yield due to anthracnose (Colletotrichum lindemuthianum), bacterial blights (common, Bacterium phaseoli; halo, B. medicaginis phaseolicola; wilt, B. flaccumfaciens), mosaic (virus)

State	Production 1,000 °Bushels	Anthracnose %	Anthracnose 1,000 Bushels	Bacterial Blight %	Bacterial Blight 1,000 Bushels	Halo Blight %	Halo Blight 1,000 Bushels	Bacterial Wilt %	Bacterial Wilt 1,000 Bushels	Mosaic %	Mosaic 1,000 Bushels
*Maine	253	-	-	-	-	-	-	-	-	-	-
*N.Y.	1,445	0	0	-	-	-	-	-	-	-	-
*N.J.	1,391	-	-	-	-	-	-	-	-	-	-
Pa.	730	1.	8	0.4	3	-	-	-	-	4.	32
Ohio		0.5	+	0.2	+	0.1	+	-	-	1.	+
*Ind.	180	-	-	-	-	-	-	-	-	-	-
Ill.	80	2.	2	2.	2	-	-	-	-	1.	1
*Mich.	618	0	0	-	-	-	-	-	-	-	-
*Wis.	553	t	+	t	+	-	-	-	-	-	-
Minn.		-	-	2.	+					3.	+
Iowa		3.	+	6.	+					t	+
N.D.		0	0	0	0	-	-	-	-	2.5	+
*Del.	123	-	-	-	-	-	-	-	-	-	-
Md.	1,394	t	+	2.	29	-	-	-	-	0.5	7
Va.	631	0	0	1.	8	2.	15	0	0	t	+
N.C.	451	2.	11	0	0	5.	27	0	0	2.	11
*S.C.	262	-	-	-	-	-	-	-	-	-	-
*Ga.	180	-	-	-	-	-	-	-	-	-	-
Fla.	4,688	-	-	-	-	-	-	-	-	-	-
Ky.		-	-	5.	+	-	-	-	-	-	-
Tenn.	331	t	+	-	-	-	-	-	-	-	-
*Ala.	50	-	-	-	-	-	-	-	-	-	-
*Miss.	393	t	+	-	-	-	-	-	-	-	-
*Ark.	318	-	-	-	-	-	-	-	-	-	-
La.	794	-	-	2.	19	10.	93	-	-	-	-
Okla.		t	+	2.	+			-	-	-	-
Texas	480	t	+	-	-	-	-	-	-	t	+
Idaho		0	0	t	+	t	+	-	-	5.	+
Wyo.		0	0	0.5	+	20.	+	1.5	+	4.	+
Colo.	592	0	0	15.	122			-	-	-	-
*Utah	220	0	0	-	-	-	-	-	-	-	-
*Wash.	300	0	0	-	-	-	-	-	-	-	-
*Oreg.	733	0	0	-	-	-	-	-	-	-	-
*Calif.	1,979	0	0	-	-	-	-	-	-	-	-
*Other States	560										
U.S.	19,729	0.2	21	1.6	183	1.2	135	-	-	0.5	51

° Bushels of 30 pounds. Production of beans for manufacture given in short tons reduced to thousands of bushels.

* Omitted in calculations for U. S. percentage loss.

SNAP BEANS (Continued).

Curly-top (virus), dry root rot (Fusarium martii phaseoli), stem canker (Rhizoctonia solani), rust (Uromyces phaseoli typica), powdery mildew (Erysiphe polygoni), and other diseases, 1937.

State	Curly-top %	Curly-top 1,000 Bushels	Dry Root Rot %	Dry Root Rot 1,000 Bushels	Stem Canker %	Stem Canker 1,000 Bushels	Rust %	Rust 1,000 Bushels	Powdery Mildew %	Powdery Mildew 1,000 Bushels	All Diseases %	All Diseases 1,000 Bushels
Maine	0	0	-	-	-	-	-	-	-	-	-	-
N.Y.	0	0	-	-	-	-	t	+	-	-	-	-
N.J.	0	0	-	-	-	-	t	+	-	-	-	-
Pa.	0	0	4.	32	-	-	t	+	t	+	9.4	75
Ohio	0	0	-	-	-	-	t	+	-	-	1.8	+
Ind.	0	0	-	-	-	-	-	-	-	-	-	-
Ill.	0	0	-	-	-	-	-	-	-	-	5.	5
Mich.	0	0	-	-	t	+	0	0	-	-	-	-
Wis.	0	0	-	-	-	-	0	0	-	-	-	-
Minn.	0	0	-	-	5.	+	-	-	-	-	10.	+
Iowa	0	0	t	+	-	-	-	-	-	-	9.	+
N.D.	0	0	-	-	-	-	-	-	-	-	2.5	+
Del.	0	0	-	-	-	-	-	-	-	-	-	-
Md.	0	0	2.	29	t	+	t	+	-	-	4.5	65
Va.	0	0	2.	15	2.	15	7.	54	4.	31	18.5	142
N.C.	0	0	0	0	2.	11	5.	27	1.	5	17.	92
S.C.	0	0	-	-	-	-	-	-	-	-	-	-
Ga.	0	0	-	-	-	-	-	-	-	-	-	-
Fla.	0	0	-	-	-	-	8.	408	-	-	8.	408
Ky.	0	0	5.	+	-	-	t	+	-	-	10.	+
Tenn.	0	0	-	-	t	+	t	+	-	-	t	+
Ala.	0	0	-	-	-	-	-	-	-	-	-	-
Miss.	0	0	-	-	-	-	-	-	-	-	-	-
Ark.	0	0	-	-	-	-	-	-	-	-	-	-
La.	0	0	-	-	1.	9	-	-	-	-	14.5	135
Okla.	-	-	-	-	-	-	-	-	-	-	2.	+
Texas	0.5	2	-	-	-	-	t	+	1.	5	2.5	12
Idaho	10.	+	t	+	t	+	0	0	0	0	15.	+
Wyo.	-	-	-	-	-	-	-	-	-	-	26.	+
Colo.	-	-	10.	81			2.	16	-	-	27.	219
Utah	-	-	-	-	-	-	-	-	-	-	-	-
Wash.	-	-	-	-	-	-	t	+	-	-	-	-
Oreg.	-	-	-	-	-	-	-	-	-	-	-	-
Calif.	-	-	-	-	-	-	t	+	-	-	-	-
Other States												
U.S.	t	2	1.4	157	0.3	35	4.5	505	0.4	41	10.3	1,153

DRY BEANS

Table 12. Estimated reduction in yield due to anthracnose (<u>Colletotrichum lindemuthianum</u>), bacterial blights (common, <u>Bacterium phaseoli</u>; halo, <u>B. medicaginis phaseolicola</u>; wilt, <u>B. flaccumfaciens</u>), mosaic (virus)

State	a/ Production 1,000 Bags°	Anthracnose %	Anthracnose 1,000 Bags	Bacterial Blight %	Bacterial Blight 1,000 Bags	Halo Blight %	Halo Blight 1,000 Bags	Bacterial Wilt %	Bacterial Wilt 1,000 Bags	Mosaic %	Mosaic 1,000 Bags
*Maine	80	-	-	-	-	-	-	-	-	-	-
*Vt.	20	-	-	-	-	-	-	-	-	-	-
*N.Y.	1,264	-	-	-	-	-	-	-	-	-	-
Mich.	4,559	0	0	2.	93	0.1	5	0.1	5	0.1	5
Wis.	15	0	0	1.	+	1.	+	0	0	5.	1
Minn.	10	t	+	2.	+					3.	+
*Nebr.	220	-	-	-	-	-	-	-	-	-	-
Mont.	276	0	0	2.	6	5.	16	t	+	3.	9
Idaho	1,932	0	0	t	+	t	+	-	-	2.	42
Wyo.	649	0	0	0.5	4	10.	73	-	-	-	-
Colo.	781	0	0	20.	223			-	-	-	-
*N.M.	612	0	0	-	-	-	-	-	-	-	-
*Ariz.	38	0	0	-	-	-	-	-	-	-	-
*Oreg.	14	0	0	-	-	-	-	-	-	-	-
*Calif.	5,369	0	0	-	-	-	-	-	-	-	-
U.S.	15,839	-	-	3.7	326	1.1	94	t	5	0.6	57

a/ Includes beans grown for seed.
° Bags of 100 pounds.
* Omitted in calculations for U. S. percentage loss.

DRY BEANS (Continued)

Curly-top (virus), dry root rot (*Fusarium martii phaseoli*), stem canker (*Rhizoctonia solani*), rust (*Uromyces phaseoli typica*), powdery mildew (*Erysiphe polygoni*), and other diseases, 1937.

State	Curly-top %	Curly-top 1,000 Bags	Dry Root Rot %	Dry Root Rot 1,000 Bags	Stem Canker %	Stem Canker 1,000 Bags	Rust %	Rust 1,000 Bags	Powdery Mildew %	Powdery Mildew 1,000 Bags	All Diseases %	All Diseases 1,000 Bags
	Estimated reduction in yield due to diseases											
Maine	0	0	-	-	-	-	-	-	-	-	-	-
Vt.	0	0	-	-	-	-	-	-	-	-	-	-
N.Y.	0	0	-	-	-	-	-	-	-	-	-	-
Mich.	0	0	t	+	t	+	-	-	-	-	2.3	108
Wis.	0	0	1.	+	1.	+	0	0	0	0	9.	1
Minn.	0	0	-	-	5.	1	-	-	t	+	10.	1
Nebr.	0	0	-	-	-	-	-	-	-	-	-	-
Mont.	-	-	1.	3	-	-	-	-	-	-	11.	34
Idaho	5.	104	t	+	t	+	0	0	0	0	7.	146
Wyo.	-	-	-	-	-	-	-	-	-	-	10.5	77
Colo.	-	-	10.	112			-	-	-	-	30.	335
N.M.	-	-	-	-	-	-	-	-	-	-	-	-
Ariz.	-	-	-	-	-	-	-	-	-	-	-	-
Oreg.	-	-	-	-	-	-	-	-	-	-	-	-
Calif.	-	-	-	-	-	-	-	-	-	-	-	-
U.S.	1.2	104	1.3	115	t	1	-	-	-	-	7.9	702

Table 13. Green peas for manufacture; estimated reduction in yield due to bacterial blight (Bacterium pisi), wilt (Fusarium orthoceras pisi), "near wilt" (Fusarium spp.), ascochyta blights (A. pisi, Mycosphaerella pinodes, A. pinodella), root rots (Aphanomyces euteiches, Fusarium spp., and others), stem canker (Rhizoctonia solani), virus diseases, and other diseases, 1937.

State	Production	Estimated reduction in yield due to diseases															
		Bacterial Blight		Wilt		"Near Wilt"		Ascochyta Blights		Root Rots		Stem Canker		Virus Diseases		All Diseases	
	Short Tons	%	Short Tons	%	Short Tons	%	Short Tons	%	Short Tons	%	Short Tons	%	Short Tons	%	Short Tons	%	Short Tons
*Maine	3,310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N.Y.	21,490	0.1	29	0.1	29	-	-	0.3	88	25.	7,310	-	-	-	-	26.5	7,748
Pa.	6,400	-	-	1.	73	-	-	t	+	11.	800	-	-	t	+	12.	873
Ohio	4,880	-	-	-	-	-	-	0.2	10	0.1	5	0.2	10	-	-	0.5	25
*Ind.	7,950	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ill.	12,530	-	-	-	-	-	-	-	-	-	-	-	-	5.	659	5.	659
Mich.	11,300	0.1	11	0.1	11	-	-	0.1	11	1.	115	-	-	-	-	1.3	148
Wis.	71,810	0	0	1.	764	1.	764	0	0	2.	1,528	0	0	2.	1,528	6.	4,584
*Minn.	18,340	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Del.	1,720	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Md.	18,220	t	+	t	+	t	+	0.3	58	5.	962	-	-	t	+	5.3	1,020
*Va.	3,540	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Texas		-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.	+
Mont.	3,030	0	0	-	-	t	+	1.	32	3.5	111	t	+	t	+	4.5	143
Idaho		0.1	+	0.1	+	0.1	+	-	-	0.2	+	-	-	0.1	+	0.6	+
Wyo.		t	+	-	-	-	-	-	-	-	-	-	-	t	+	t	+
*Colo.	3,030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Utah	18,500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Wash.	28,230	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Oreg.	15,480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Other °States	15,430																
U.S.	265,190	t	40	0.5	877	0.5	764	0.1	199	6.6	10,831	t	10	1.3	2,187	9.2	15,200

* Omitted in calculations for U. S. percentage loss.

° Includes California, Idaho, Iowa, Kansas, Nebraska, New Jersey, Oklahoma, Tennessee, Texas, and Wyoming.

Table 14. Green peas for market; estimated reduction in yield due to bacterial blight (Bacterium pisi), wilt (Fusarium orthoceras pisi), "near wilt" (Fusarium spp.), ascochyta blights (A. pisi, Mycosphaerella pinodes, A. pinodella), root rots (Aphanomyces euteiches, Fusarium spp., and others), stem canker (Rhizoctonia solani), virus diseases, and other diseases, 1937.

State	Production 1,000 °Bushels	Estimated reduction in yield due to diseases: Bacterial Blight %	Bacterial Blight 1,000 Bushels	Wilt %	Wilt 1,000 Bushels	"Near Wilt" %	"Near Wilt" 1,000 Bushels	Ascochyta Blights %	Ascochyta Blights 1,000 Bushels	Root Rots %	Root Rots 1,000 Bushels	Stem Canker %	Stem Canker 1,000 Bushels	Virus Diseases %	Virus Diseases 1,000 Bushels	All Diseases %	All Diseases 1,000 Bushels
N.Y.	331	0.1	+	0.1	+	-	-	0.3	1	25.	113	-	-	-	-	26.5	119
*N.J.	121	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Md.	15	0.2	+	t	+	t	+	2.	+	5.	1	-	-	t	+	7.2	1
*Va.	231	-	-	-	-	-	-	-	-	-	-	-	-	t	+	-	-
N.C.	224	2.	5	0	0	0	0	t	+	3.	7	1.	2	t	+	6.	14
S.C.	194	-	-	-	-	-	-	-	-	2.	4	t	+	t	+	2.	4
*Fla.	310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Ala.	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Miss.	213	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*La.	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Texas	450	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.	9
Mont.		0	0	-	-	t	+	1.	+	3.5	+	t	+	t	+	4.5	+
Idaho	484	0.1	+	0.1	+	0.1	+	-	-	0.2	1	-	-	0.1	+	0.6	1
*Colo.	969	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Ariz.	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Wash.	936	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Oreg.	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Calif.	4,724	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U.S.	9,395	0.3	5	-	-	-	-	0.1	1	6.8	126	0.1	2	-	-	8.1	148

° Bushels of 30 pounds.
* Omitted in calculations for U. S. percentage loss.

Table 15. Estimated reduction in yield due to anthracnose (Glomerella gossypii), angular leaf spot (Bacterium malvacearum), fusarium wilt (F. vasinfectum), verticillium wilt (Verticillium sp.), root knot (Heterodera marioni), Texas root rot (Phymatotrichum omnivorum), seedling blight and damping-off (various organisms), boll rots (various), deficiency diseases, and other diseases, 1937.

State	Production 1,000 Bales°	Estimated reduction in yield due to diseases: Anthracnose %	Anthracnose 1,000 Bales	Angular Leaf Spot %	Angular Leaf Spot 1,000 Bales	Fusarium Wilt %	Fusarium Wilt 1,000 Bales	Verticillium Wilt %	Verticillium Wilt 1,000 Bales	Root Knot %	Root Knot 1,000 Bales	Texas Root Rot %	Texas Root Rot 1,000 Bales	Seedling Blight and Damping-off %	Seedling Blight and Damping-off 1,000 Bales	Boll Rots %	Boll Rots 1,000 Bales	Deficiency Diseases %	Deficiency Diseases 1,000 Bales	All Diseases %	All Diseases 1,000 Bales
*Mo.	370	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Va.	41	2.5	1	4.5	2	1.5	1	-	-	t	+	0	0	2.	1	1.5	1	1.5	1	13.5	7
N.C.	775	t	+	3.	38	6.	75	-	-	2.	25	0	0	15.	188	t	+	12.	150	38.	476
*S.C.	1,025	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-
*Ga.	1,490	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-
*Fla.	40	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-
Tenn.	640	1.	7	0.5	4	3.	22	-	-	t	+	0	0	1.	7	-	-	5.	36	11.	80
*Ala.	1,610	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-
*Miss.	2,625	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-
*Ark.	1,830	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
La.	1,080	1.	12	t	+	2.	23	-	-	-	-	0	0	1.	12	t	+	4.	47	8.	94
Okla.	825	-	-	3.	35	3.	35	-	-	0.5	6	3.	35	10.	117	-	-	10.	117	29.5	345
Texas	5,230	t	+	3.	218	3.	218	t	+	1.	73	5.	363	10.	726	3.	218	1.	73	28.	2,034
*N.M.	157	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Ariz.	280	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Calif.	710	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*All Others	18																				
U.S.	18,746	0.2	20	2.6	297	3.2	374	-	-	0.9	104	3.4	398	9.	1,051	1.9	219	3.6	424	26.1	3,036

° Bales of 500 pounds.
* Omitted in calculations for U. S. percentage loss.

Table 16. Estimated reduction in yield due to downy mildew (Peronospora tabacina), black root rot (Thielaviopsis basicola), mosaic (virus), wildfire (Bacterium tabacum), angular leaf spot (B. angulatum), deficiency diseases, and other diseases, 1937.

State	Production 1,000 Pounds	Downy Mildew %	Downy Mildew 1,000 Pounds	Black Root Rot %	Black Root Rot 1,000 Pounds	Mosaic %	Mosaic 1,000 Pounds	Wildfire %	Wildfire 1,000 Pounds	Angular Leaf Spot %	Angular Leaf Spot 1,000 Pounds	Deficiency Diseases %	Deficiency Diseases 1,000 Pounds	All Diseases %	All Diseases 1,000 Pounds
*Mass.	8,399	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Conn.	23,586	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*N. Y.	1,215	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pa.	28,520	t	+	t	+	2.	992	40.	19,840	0	0	0.5	248	42.5	21,080
Ohio	26,238	-	-	-	-	0.1	27	1.	265	t	+	t	+	1.1	292
*Ind.	8,363	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wis.	23,888	0	0	2.	498	1.	249	0	0	0	0	1.	249	4.	996
*Minn.	460	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Mo.	5,400	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Kans.	425	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Md.	25,200	15.	6,462	1.	431	7.	3,015	7.	3,015	t	+	6.5	2,800	41.5	17,877
Va.	104,421	20.	30,267	t	+	2.	3,027	-	-	t	+	2.	3,027	31.	46,914
*W. Va.	2,590	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N. C.	593,745	5.	40,667	t	+	2.	16,267	0	0	1.	8,133	5.	40,667	27.	219,603
*S. C.	106,275	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Ga.	77,878	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Fla.	14,014	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ky.	343,865	t	+	2.	7,815	2.	7,815	5.	19,538			2.	7,815	12.	46,891
Tenn.	111,280	3.	4,106	10.	13,688	2.	2,738	t	+	0.5	684	1.	1,369	18.7	25,596
U. S.	1,505,762	5.	81,502	1.4	22,432	2.1	34,130	2.6	42,658	0.5	8,817	3.4	56,175	23.2	379,2[illegible]9

* Omitted in calculations for U. S. percentage loss.

Table 17. Estimated reduction in yield due to fire blight (Bacillus amylovorus), scab (Venturia pyrina), leaf blight (Fabraea maculata), black-end (non-parasitic), and other diseases, 1937.

State	Production 1,000 Bushels	Fire Blight %	Fire Blight 1,000 Bushels	Scab %	Scab 1,000 Bushels	Leaf Blight %	Leaf Blight 1,000 Bushels	Black End %	Black End 1,000 Bushels	All Diseases %	All Diseases 1,000 Bushels
*Maine	8	-	-	-	-	-	-	-	-	-	-
*N.H.	15	-	-	-	-	-	-	-	-	-	-
*Vt.	6	-	-	-	-	-	-	-	-	-	-
*Mass.	65	-	-	-	-	-	-	-	-	-	-
*R.I.	12	-	-	-	-	-	-	-	-	-	-
Conn.	48	1.	+	-	-	-	-	-	-	1.	+
N.Y.	1,305	0.1	1	0.1	1	0.1	1	-	-	0.5	6
*N.J.	56	-	-	-	-	-	-	-	-	-	-
Pa.	817	15.	146	1.	10	t	+	0	0	16.	156
Ohio	992	0.1	1	t	+	t	+	0	0	0.1	1
Ind.	630	10.	70	-	-	-	-	0	0	10.	70
Ill.	999	10.	111	-	-	t	+	0	0	10.	111
Mich.	1,300	0.1	1	0.1	1	0.1	1	0	0	0.3	3
Wis.		1.	+	2.	+	t	+	0	0	3.	+
Iowa	144	1.	1	0	0	-	-	0	0	1.	1
*Mo.	684	-	-	-	-	t	+	-	-	-	-
*Nebr.	43	-	-	-	-	-	-	-	-	-	-
*Kans.	220	-	-	-	-	-	-	-	-	-	-
*Del.	10	-	-	-	-	-	-	-	-	-	-
Md.	73	10.	8	1.5	1	1.5	1	0	0	13.	10
Va.	416	1.	4	t	+	t	+	0	0	1.2	5
*W.Va.	111	-	-	-	-	-	-	-	-	-	-
N.C.	281	4.	13	t	+	10.	33	t	+	14.	46
*S.C.	72	-	-	-	-	-	-	-	-	-	-
*Ga.	244	-	-	-	-	-	-	-	-	-	-
*Fla.	127	-	-	-	-	-	-	-	-	-	-
*Ky.	411	-	-	-	-	-	-	-	-	-	-
Tenn.	284	50.	284	-	-	-	-	0	0	50.	284
*Ala.	211	-	-	-	-	-	-	-	-	-	-
*Miss.	157	-	-	-	-	-	-	-	-	-	-
*Ark.	214	-	-	-	-	-	-	-	-	-	-
*La.	70	-	-	-	-	-	-	-	-	-	-
Okla.	141	1.	1	-	-	-	-	-	-	1.	1
Texas	412	0.5	2	-	-	-	-	-	-	1.	4
Idaho	56	7.	5	0	0	0	0	2.	1	16.	11
*Colo.	153	-	-	-	-	-	-	-	-	-	-
*N.M.	59	-	-	-	-	-	-	-	-	-	-
*Ariz.	3	-	-	-	-	-	-	-	-	-	-
*Utah	64	-	-	-	-	-	-	-	-	-	-
*Nev.	4	-	-	-	-	-	-	-	-	-	-
*Wash.	5,694	t	+	-	-	-	-	-	-	-	-
*Oreg.	3,621	t	+	t	+	-	-	-	-	-	-
*Calif.	9,822	-	-	-	-	-	-	-	-	-	-
U.S.	30,139	7.5	648	0.1	13	0.4	36	t	1	8.1	709

* Omitted in calculations for U. S. percentage loss.

CHERRY

Table 18. Estimated reduction in yield due to brown rot (Sclerotinia fructicola), leaf spot (Coccomyces hiemalis), California blight (Coryneum beijerinckii), buck skin and mottle leaf (virus), and other diseases, 1937.

State	Production Tons	Estimated reduction in yield due to diseases									
		Brown Rot		Leaf Spot		California Blight		Virus Diseases		All Diseases	
		%	Tons	%	Tons	%	Tons	%	Tons	%	Tons
N.Y.	21,750	-	-	0.5	110	-	-	0	0	1.	220
Pa.	9,890	20.	3,353	20.	3,353	-	-	0	0	41.	6,874
Ohio	7,340	1.	78	5.	390	-	-	0	0	6.	468
Ind.		0.5	+	5.	+	-	-	0	0	5.5	+
Ill.		2.	+	10.	+	-	-	0	0	12.	+
Mich.	35,840	t	+	10.	3,982	0	0	t	+	10.	3,982
Wis.	13,500	t	+	2.	276	0	0	0	0	2.	276
Md.		4.	+	5.	+	-	-	0	0	9.	+
Va.		8.5	+	2.5	+	-	-	-	-	11.5	+
W. Va.		t	+	0.5	+	-	-	0	0	1.	+
N.C.		15.	+	t	+	-	-	0	0	15.	+
Tenn.		t	+	20.	+	-	-	-	-	20.	+
Mont.	340	-	-	t	+	-	-	-	-	t	+
Idaho	1,760	0	0	0	0	t	+	0.5	92	2.5	45
*Colo.	3,460	-	-	-	-	-	-	-	-	-	-
*Utah	2,100	-	-	-	-	-	-	-	-	-	-
*Wash.	13,500	-	-	-	-	-	-	-	-	-	-
*Oreg.	12,400	-	-	-	-	-	-	-	-	-	-
*Calif.	20,000	-	-	-	-	-	-	-	-	-	-
12 States	141,880	3.4	3,431	7.9	8,111	-	-	t	9	11.6	11,865

* Omitted in calculations for U. S. percentage loss.

Table 19. Estimated reduction in yield due to bitter rot (Glomerella cingulata), black rot (Physalospora obtusa), blotch (Phyllosticta solitaria), rusts (Gymnosporangium spp.), fire blight (Bacillus amylovorus), scab (Venturia inaequalis), and other diseases, 1937.

State	Production 1,000 Bushels	Bitter Rot %	Bitter Rot 1,000 Bushels	Black Rot %	Black Rot 1,000 Bushels	Blotch %	Blotch 1,000 Bushels	Rusts %	Rusts 1,000 Bushels	Fire Blight %	Fire Blight 1,000 Bushels	Scab %	Scab 1,000 Bushels	All Diseases %	All Diseases 1,000 Bushels
Maine	1,147	-	-	-	-	0	0	-	-	-	-	2.	23	2.	23
N.H.	1,204	t	+	t	+	t	+	-	-	t	+	10.	134	10.	134
*Vt.	1,175	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Mass.	3,465	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*R.I.	345	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Conn.	2,122	-	-	-	-	-	-	2.	48	-	-	10.	241	12.	289
N.Y.	24,700	-	-	0.1	26	0.1	26	0.5	132	0.1	26	5.	1,318	6.3	1,660
*N.J.	5,463	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pa.	16,728	t	+	4.5	1,028	1.	229	1.3	297	1.5	343	15.	3,429	26.8	6,126
Ohio	12,636	0.5	76	t	+	t	+	1.	151	t	+	15.	2,270	16.5	2,497
Ind.	3,757	0.1	4	0.1	4	0.1	4	2.5	104	0.1	4	7.	292	10.	416
Ill.	8,960	t	+	2.	197	t	+	t	+	t	+	5.	492	9.	886
Mich.	14,432	0	0	t	+	0	0	-	-	t	+	5.	760	5.	760
Wis.	2,080	t	+	t	+	t	+	1.	22	1.	22	3.	66	5.	110
Minn.	737	0	0	0	0	0	0	2.	16	2.	16	1.5	12	6.	48
Iowa	1,174	0	0	1.	13	t	+	1.	13	3.	39	5.	65	10.	130
Mo.	4,214	-	-	-	-	t	+	0.5	22	-	-	2.	86	2.5	108
N.D.		-	-	-	-	-	-	t	+	1.5	+	t	+	1.5	+
*S.D.	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Nebr.	477	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Kans.	1,449	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Del.	2,750	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Md.	2,847	3.	101	2.	67	0.5	17	1.	34	1.5	51	5.	168	15.5	522
Va.	18,000	0.5	102	t	+	t	+	1.	204	0.2	41	8.5	1,733	12.7	2,590
W.Va.	10,004	0.1	10	0.1	10	0.1	10	0.5	52	0.1	10	1.	103	3.	308
N.C.	4,505	3.	183	t	+	5.	304	1.	61	2.	122	10.	609	26.	1,583
*S.C.	363	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Apple (Continued)

State	Production	Bitter Rot		Black Rot		Blotch		Rusts		Fire Blight		Scab		All Diseases	
	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels	%	1,000 Bushels
*Ga.	1,483	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ky.	3,870	5.	265	t	+	2.	106	t	+	5.	265	10.	530	27.	1,431
Tenn.	3,354	6.	261	1.	44	1.	44	t	+	5.	218	10.	436	23.	1,003
*Ala.	878	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Miss.	219	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Ark.	2,295	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*La.	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Okla.	648	-	-	-	-	3.	20	t	+	1.	7	1.	7	5.	34
Texas	170	-	-	-	-	t	+	0.5	1	0.5	1	t	+	1.	2
Mont.	562	-	-	-	-	-	-	-	-	3.	17	t	+	3.	17
Idaho	5,124	0	0	0	0	0	0	0	0	t	+	t	+	1.	52
Wyo.	48	-	-	-	-	-	-	-	-	5.	+	-	-	5.	+
*Colo.	1,457	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*N.M.	1,132	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Ariz.	91	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Utah	500	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Nev.	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Wash.	30,340	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Oreg.	3,763	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Calif.	10,292	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U. S.	211,060	0.6	1,002	0.8	1,389	0.5	760	0.7	1,157	0.7	1,182	7.8	12,774	12.6	20,729

Estimated reduction in yield due to diseases (column group heading over Bitter Rot through All Diseases)

* Omitted in calculations for U. S. percentage loss.

PEACH

Table 20. Estimated reduction in yield due to leaf curl (Taphrina deformans), brown rot (Sclerotinia fructicola), California blight (Coryneum beijerinckii), scab (Cladosporium carpophilum), bacterial spot (Bacterium pruni), virus diseases, and other diseases, 1937.

State	Production 1,000 Bushels	Leaf Curl %	Leaf Curl 1,000 Bushels	Brown Rot %	Brown Rot 1,000 Bushels	California Blight %	California Blight 1,000 Bushels	Scab %	Scab 1,000 Bushels	Bacterial Spot %	Bacterial Spot 1,000 Bushels	Virus Diseases %	Virus Diseases 1,000 Bushels	All Diseases %	All Diseases 1,000 Bushels
*N. H.	24	-	-	-	-	0	0	-	-	-	-	-	-	-	-
*Mass.	107	-	-	-	-	0	0	-	-	-	-	-	-	-	-
*R. I.	27	-	-	-	-	0	0	-	-	-	-	-	-	-	-
Conn.	177	0	0	5.	10	0	0	5.	10	1.	2	1.	2	12.	24
N. Y.	1,806	1.	19	1.5	28	0	0	t	+	t	+	t	+	2.5	47
*N. J.	1,651	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pa.	2,673	2.	53	10.	267	0	0	3.	80	t	+	0.1	3	16.1	430
Ohio	1,296	t	+	5.	68	t	+	t	+	t	+	t	+	5.	68
Ind.	402	0.1	+	0.5	2	-	-	0.1	+	-	-	-	-	0.7	2
Ill.	2,117	-	-	3.	66	0	0	t	+	1.	22	-	-	4.	88
Mich.	2,652	5.	156	10.	312	t	+	t	+	0	0	t	+	15.	468
Iowa	87	2.	2	0	0	0	0	5.	5	-	-	0	0	7.	7
Mo.	1,728	t	+	0.5	9	-	-	-	-	-	-	-	-	0.5	9
*Nebr.	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Kans.	256	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Del.	398	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Md.	448	3.	16	8.	43	t	+	2.	11	0.5	3	0.5	3	14.	76
Va.	1,599	1.	17	2.	33	-	-	t	+	0.5	8	t	+	3.5	58
W. Va.	528	0.5	3	0.5	3	-	-	0.5	3	-	-	t	+	2.	12
N. C.	1,984	t	+	11.	266	-	-	1.	24	3.	73	-	-	18.	436
*S. C.	1,080	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Ga.	2,730	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Fla.	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ky.	1,369	t	+	5.	76	-	-	5.	76	-	-	0	0	10.	152
Tenn.	1,860	2.	42	10.	211	-	-	t	+	t	+	t	+	12.	253

Peach (Continued)

State	Production 1,000 Bushels	Leaf Curl %	Leaf Curl 1,000 Bushels	Brown Rot %	Brown Rot 1,000 Bushels	California Blight %	California Blight 1,000 Bushels	Scab %	Scab 1,000 Bushels	Bacterial Spot %	Bacterial Spot 1,000 Bushels	Virus Diseases %	Virus Diseases 1,000 Bushels	All Diseases %	All Diseases 1,000 Bushels
*Ala.	990	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Miss.	474	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Ark.	2,288	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*La.	269	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Okla.	1,073	1.	11	2.	23	-	-	1.	11	1.	11	t	+	5.	56
Texas	1,392	0.1	1	5.	75	-	-	-	-	0.1	1	1.5	22	6.7	99
Idaho	14	0.5	+	0	0	2.	+	0	0	0	0	0	0	12.5	2
*Colo.	1,522	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*N. M.	92	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Ariz.	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Utah	72	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Nev.	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Wash.	935	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Oreg.	241	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Calif.	23,141	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U. S.	59,626	1.3	320	5.9	1,492	-	-	0.9	220	0.5	120	t	30	9.	2,287

* Omitted in calculations for U. S. percentage loss.

Table 21. Estimated reduction in yield due to leaf spot (Mycosphaerella fragariae), leaf scorch (Diplocarpon earliana), black root rot (various), dwarf (Aphelenchoides fragariae), fruit rots (Botrytis, Rhizoctonia, and others), virus diseases, and other diseases, 1937.

State	Production 1,000 Crates°	Estimated reduction in yield due to diseases													
		Leaf Spot		Leaf Scorch		Black Root Rot		Dwarf		Fruit Rots		Virus Diseases		All Diseases	
		%	1,000 Crates	%	1,000 Crates	%	1,000 Crates	%	1,000 Crates	%	1,000 Crates	%	1,000 Crates	%	1,000 Crates
Maine		1.	+	-	-	2.	+	-	-	0.5	+	0.5	+	4.	+
Conn.		-	-	-	-	-	-	-	-	15.	+	-	-	15.	+
N. Y.	280	t	+	-	-	-	-	-	-	-	-	-	-	t	+
*N. J.	380	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pa.	480	1.5	9	3.	17	12.	69	-	-	-	-	-	-	16.5	95
Ohio	328	t	+	t	+	t	+	-	-	2.	7	-	-	2.	7
Ind.	182	0.1	+	t	+	-	-	-	-	-	-	-	-	0.1	+
Ill.	216	1.	2	t	+	5.	12	-	-	-	-	-	-	6.	14
Mich.	945	2.	25	t	+	20.	245	-	-	-	-	-	-	22.	270
Wis.	168	t	+	t	+	-	-	-	-	-	-	t	+	t	+
Minn.		2.	+	0	0	5.	+	0	0	-	-	t	+	9.	+
*Iowa	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Mo.	135	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N. D.		t	+	-	-	-	-	-	-	-	-	-	-	t	+
*Kans.	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Del.	338	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Md.	616	2.	15	1.	7	6.	44	t	+	3.	22	-	-	15.	110
Va.	630	5.	36	1.	7	5.	36	-	-	-	-	-	-	12.	86
N. C.	644	15.	153	10.	102	0	0	5.	51	5.	51	0	0	37.	377
*S. C.	45	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Ga.	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Fla.	572	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Strawberry (Continued)

State	Production 1,000 Crates°	Estimated reduction in yield due to diseases													
		Leaf Spot		Leaf Scorch		Black Root Rot		Dwarf		Fruit Rots		Virus Diseases		All Diseases	
		%	1,000 Crates	%	1,000 Crates	%	1,000 Crates	%	1,000 Crates	%	1,000 Crates	%	1,000 Crates	%	1,000 Crates
*Ky.	275	-	-	-	-	-	-	-	-	t	+	-	-	-	-
Tenn.	923	2.	28	10.	140	10.	140	t	+	12.	168	t	+	34.	476
*Ala.	197	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Miss.	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Ark.	259	-	-	-	-	-	-	-	-	-	-	-	-	-	-
La.	1,443	10.	217	3.	65	-	-	0.5	11	20.	434	-	-	33.5	727
Okla.	6	2.	+	t	+	-	-	-	-	-	-	-	-	2.	+
Texas	148	0.1	+	-	-	1.5	2	-	-	-	-	-	-	1.7	2
Mont.		t	+	-	-	5.	+	-	-	-	-	5.	+	10.	+
Idaho		1.	+	-	-	10.	+	-	-	10.	+	1.	+	27.5	+
*Utah	91	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Wash.	900	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oreg.	1,050	0.2	3	0	0	3.	48	0	0	4.	64	25.	399	34.2	546
*Calif.	837	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U. S.	12,221	4.5	488	3.1	338	5.5	596	0.6	62	6.9	746	3.7	399	25.1	2,710

° 24-quart crate, 36 pounds.
* Omitted in calculations for U. S. percentage loss.

GRAPE

Table 22. Estimated reduction in yield due to black rot (Guignardia bidwellii), powdery mildew (Uncinula necator), downy mildew (Plasmopara viticola), crown gall (Bacterium tumefaciens), fruit rots (various organisms), and other diseases, 1937.

State	Production Tons	Estimated reduction in yield due to diseases											
		Black Rot		Powdery Mildew		Downy Mildew		Crown Gall		Fruit Rots		All Diseases	
		%	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%	Tons
*Maine	30		-	-	-	-	-	-	-	-	-	-	-
*N. H.	120	-	-	-	-	-	-	-	-	-	-	-	-
*Vt.	50	-	-	-	-	-	-	-	-	-	-	-	-
*Mass.	900	-	-	-	-	-	-	-	-	-	-	-	-
*R. I.	370	-	-	-	-	-	-	-	-	-	-	-	-
Conn.	2,520	10.	280	-	-	-	-	-	-	-	-	10.	280
N. Y.	89,100	1.	914	0.5	457	1.	914	t	+	-	-	2.5	2,285
*N. J.	4,000	-	-	-	-	-	-	-	-	-	-	-	-
Pa.	26,000	20.	6,582	t	+	1.	329	-	-	-	-	21.	6,911
Ohio	37,800	1.	382	t	+	t	+	-	-	-	-	1.	382
Ind.	5,300	4.	221	-	-	0.1	6	-	-	-	-	4.1	227
Ill.	8,600	2.	176	0	0	t	+	-	-	-	-	2.	176
Mich.	67,200	5.	3,733	t	+	t	+	-	-	-	-	10.	7,466
Wis.	450	t	+	-	-	t	+	t	+	t	+	t	+
*Minn.	260	-	-	-	-	-	-	-	-	-	-	-	-
Iowa	5,000	2.	105	t	+	3.	158	-	-	-	-	5.	263
*Mo.	12,300	-	-	-	-	-	-	-	-	-	-	-	-
*Nebr.	1,800	-	-	-	-	-	-	-	-	-	-	-	-
*Kans.	3,600	-	-	-	-	-	-	-	-	-	-	-	-
*Del.	2,200	-	-	-	-	-	-	-	-	-	-	-	-
Md.	750	12.	105	1.	9	1.	9	t	+	-	-	14.	123
Va.	3,000	20.	811	2.	81	4.	162	-	-	-	-	26.	1,054
*W. Va.	1,900	-	-	-	-	-	-	-	-	-	-	-	-
N. C.	8,100	15.	1,736	5.	579	t	+	t	+	10.	1,157	30.	3,472
*S. C.	1,990	-	-	-	-	-	-	-	-	-	-	-	-

Grape (Continued)

State	Production Tons	Estimated reduction in yield due to diseases											
		Black Rot		Powdery Mildew		Downy Mildew		Crown Gall		Fruit Rots		All Diseases	
		%	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%	Tons
*Ga.	1,800	-	-	-	-	-	-	-	-	-	-	-	-
Fla.	710	10.	85	-	-	0	0	-	-	-	-	16.	136
*Ky.	2,960	-	-	-	-	-	-	-	-	-	-	-	-
Tenn.	2,650	10.	294	t	+	t	+	t	+	-	-	10.	294
*Ala.	1,680	-	-	-	-	-	-	-	-	-	-	-	-
*Miss.	320	-	-	-	-	-	-	-	-	-	-	-	-
*Ark.	12,800	-	-	-	-	-	-	-	-	-	-	-	-
*La.	50	-	-	-	-	-	-	-	-	-	-	-	-
Okla.	4,000	4.	167	-	-	-	-	t	+	-	-	4.	167
Texas	2,900	10.	324	t	+	t	+	t	+	-	-	10.4	337
Idaho	470	0	0	0	0	0	0	t	+	-	-	5.	25
*Colo.	570	-	-	-	-	-	-	-	-	-	-	-	-
*N. M.	1,180	-	-	-	-	-	-	-	-	-	-	-	-
*Ariz.	560	-	-	-	-	-	-	-	-	-	-	-	-
*Utah	630	-	-	-	-	-	-	-	-	-	-	-	-
*Nev.	100	-	-	-	-	-	-	-	-	-	-	-	-
*Wash.	4,100	-	-	-	-	-	-	-	-	-	-	-	-
*Oreg.	2,100	-	-	-	-	-	-	-	-	-	-	-	-
*Calif.	2,409,000	-	-	-	-	-	-	-	-	-	-	-	-
U. S.	2,731,980	5.5	15,915	0.4	1,126	0.5	1,578	t	+	0.4	1,157	8.1	23,598

* Omitted in calculations for U. S. percentage loss.

PROCEEDINGS OF THE ROOT-KNOT-NEMATODE CONFERENCE

Held at Atlanta, Georgia, February 4, 1938

Edited by
Jocelyn Tyler, U. S. Department of Agriculture

Plant Disease Reporter
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G. M. Armstrong	South Carolina Experiment Station
K. C. Barrons	Alabama Experiment Station
H. P. Barss	U.S.D.A., Washington, D. C.
A. N. Brooks	Florida Experiment Station (Lakeland)
Edna M. Buhrer	U.S.D.A., Washington, D. C.
E. E. Clayton	U.S.D.A., Washington, D. C.
H. A. Edson	U.S.D.A., Washington, D. C.
S. B. Fenne	Extension Division, Tifton, Georgia.
S. R. Gibbons	U.S.D.A., Birmingham, Alabama
R. J. Haskell	U.S.D.A., Washington, D. C.
H. H. Hume	Florida Experiment Station
C. C. Johnson	Innis, Speiden and Co., New York
D. G. A. Kelbert	Florida Experiment Station (Bradenton)
S. G. Lehman	North Carolina Experiment Station
M. B. Linford	Pineapple Experiment Station, Honolulu, Hawaii
A. Meyer	Tennessee Experiment Station
E. G. Moss	Tobacco Station, Oxford, North Carolina
W. C. Nettles	South Carolina Experiment Station
C. F. Poole	U.S.D.A., Charleston, South Carolina
R. F. Poole	North Carolina Experiment Station
E. S. Prevost	South Carolina Experiment Station
N. A. Schappelle	South Carolina Experiment Station
C. D. Sherbakoff	Tennessee Experiment Station
F. L. Stark	Rhode Island Experiment Station
G. Steiner	U.S.D.A., Washington, D. C.
H. P. Stuckey	Georgia Experiment Station
A. L. Taylor	U.S.D.A., Tifton, Georgia
Jocelyn Tyler	U.S.D.A., Washington, D. C.
G. B. Vandenberg	Rohm and Haas Co., Philadelphia, Pennsylvania
B. L. Wade	U.S.D.A., Charleston, South Carolina
L. M. Ware	Alabama Experiment Station
G. F. Weber	Florida Experiment Station
R. Weindling	Clemson, South Carolina
C. B. Williams	North Carolina Experiment Station
S. A. Wingard	Virginia Experiment Station
V. H. Young	Arkansas Experiment Station

INTRODUCTION

The conference was called to order by Chairman H. Harold Hume with the following introductory remarks:

Those interested in nematode investigations can render a service by awakening other agricultural research workers to the gravity of the problems in this field. On many occasions the results of research work affecting horticulture - such as fertilizer and variety trials - are confused by the entrance of the root-knot problem into the experiments. Root-knot is one of the most insidious and unsuspected drawbacks in the entire research field, because the effects of the underground organism are often attributed to other factors.

A word to the crop breeder: Any program that does not take nematode resistance into consideration is started off on a false basis. Tobacco varieties have been bred for resistance to black shank, and watermelon for resistance to wilt, but nematode resistance must still be developed in these plants. If a broader view of the needs had been taken in the beginning, the work would now be farther ahead, and on a sounder basis. As soon as nematode resistance is found in any variety, this factor must be brought at once into the breeding program.

Perhaps the question of eliminating nematodes from the soil has received too much emphasis. Our chairman is not interested in the complete elimination of nematodes from any piece of soil in the southern area, since they inevitably appear even in virgin soil after it has been worked for 2 or 3 years. Sanitation is important, if the measures are practical. The problem is to obtain sufficient freedom to grow a crop, and to learn how to get along with the remaining population.

The work of the U. S. Department of Agriculture, though excellent, is but a gimlet hole in a mountain. The larger phases of the problem affect the entire group of agricultural research men, - horticulturists, agronomists, plant pathologists, entomologists, soil scientists. Those who don't recognize this fact must be educated to it.

If there were no nematodes in the South and they should suddenly appear in their present numbers, they would be seen as the pestilence they are. Funds for their control would be supplied quickly and in large amount. Such was the situation which allowed complete eradication of the Mediterranean fruit fly. But the nematode problem rouses no particular interest. Nematodes are always working havoc, taking their toll of crops, sometimes causing complete destruction. We blind ourselves by accepting them as a matter of course. The problem is here; we live with it; but that is no solution. There must be a general awakening all along the line to the magnitude of this situation.

CHEMICAL AND HEAT TREATMENTS

Mr. A. L. Taylor reported on chemical treatments of field plots at Tifton, Georgia. Chlorpicrin fumigation was much more successful in 1936, in warm, dry soil covered with mulch paper, than in 1937 in damp soil, with a soil temperature of only 19° C and no cover. In the most heavily treated of the 1937 plots, at 150 and 200 pounds per acre, 2 plantings of indicator crops totaling 110 days showed that the infestation was much reduced.

The 1937 tests of carbon disulfide confirmed the previous conclusion that the most efficient amount to use is 500 pounds per acre. To accomplish the same degree of control with carbon disulfide emulsion required 2,720 pounds of carbon disulfide per acre.

The following gave no nematode control: formalin, up to 1,088 gallons per acre, applied in furrows; cyanamid at 4,000 pounds per acre, carefully distributed through the soil; and a commercial preparation of the Cold Smoke Company called Root-Knot Control, up to 12,000 pounds per acre, which acted only as a fertilizer.

Dr. E. E. Clayton reported for Mr. J. G. Gaines, of the U. S. Department of Agriculture at Tifton, Georgia. Of the chemical treatments tested over several years in tobacco seed beds, chlorpicrin gave the best nematode control, and mercurials also appeared effective except that their toxic action persisted for a long time. Though too expensive for the average grower, a permanent buried-tile system at Tifton has proved a very effective way to sterilize the soil in plant beds. Mr. K. J. Shaw, working at Oxford, North Carolina, has combined various chemicals with the fertilizer for their temporary effect in giving the plants a good start. Red mercuric oxide at 50 pounds per acre reduced nematodes but was toxic to plants. Ferric oxide helped plant growth without killing nematodes. Various amounts of cyanogas, napthalene, and other materials had little effect on the amount of root-knot.

Mr. H. P. Barss presented for discussion a schedule of treatments proposed by Dr. G. H. Godfrey, of the Texas Experiment Station at Weslaco, to prepare 300 acres in East Texas for peaches. Areas shown by an indicator crop to be infested will be treated with 48 cc of chlorpicrin in each tree site. Trees are expected to become well established by the growth stimulation of the fumigant in addition to the relative freedom from root-knot, and thereby capable of withstanding later infestation. Dr. Godfrey's directions for the use of chlorpicrin included a warning that poisonous effects on the worker may be cumulative and have even been known to be fatal following exposures on successive days. Old plant remains in the soil should be disintegrated before treatment. The soil should be reasonably dry, should be loosened to the desired depth, and should be covered immediately with glue-coated paper - impervious, when unbroken, to chlorpicrin gas. A barrier of wet soil at the edge of the treated area is urged.

Mr. F. L. Stark, conducting tests of chlorpicrin at the Rhode Island Experiment Station for Innis, Speiden & Co., has found a gas mask unnecessary, even in making greenhouse applications. The effective dose was at least 2 cc per cubic foot of soil, at average greenhouse soil temperatures and with roughly 20 percent soil moisture. A cover is important for nematode control, less so for fungi. The most serious injury by nematodes is to the young plants. The "partial-sterilization effect" of the chlorpicrin treatment more than doubled the yield of tomatoes. Tomato plants in untreated, infested soil grew to only 12 inches in 2 months, while those in treated soil grew to 4 feet or higher.

Mr. C. C. Johnson, of Innis, Speiden & Co., presented the first quarterly issue of the Larvacide Log, a collection of reprints on the use of chlorpicrin in agriculture, which will be sent to all who request it. Mr. Johnson reported that the minimum lethal dose of chlorpicrin for dogs is 120 parts per million for 30 minutes. Test men were forced out in 2 minutes from a concentration of 22 p.p.m. The presence of the gas is noticeable well below 1 p.p.m. The experience of the company's demonstrators indicate no injury in more than 10 years. Warning is, however, given against the use of chlorpicrin by persons subject to chronic pulmonary troubles.

A Vermorel injector for applying chlorpicrin costs about $35. Innis, Speiden & Co. has a new valveless type of applicator ready for testing.

Dr. G. Steiner remarked that stimulation to plant growth is not always an advantage. A field treatment on Long Island, for control of the bulb-and-stem nematode, increased available nitrogen in the soil, which in turn increased injury by basal rot which was brought in with the plants. Dr. M. B. Linford questioned whether the stimulating effect would carry over to a second year. No information was available on this point.

In relation to the treatment of individual tree sites, Mr. K. C. Barrons inquired how rapidly root-knot larvae can travel. Mr. Taylor reported his last summer's preliminary experiment on this subject. Nematodes from an inoculum of infested roots failed to reach the nearest plants, less than 18 inches away, in 4 months. Dr. Clayton stated that when tobacco beds are pan-steamed 8 to 10 inches deep, nematodes come up from below unless the seedlings are gotten off quickly.

Dr. Linford reported that the indicator plants in soil that had been treated, some time previously to planting, with a light application of tetrachlorethane, not sufficient to kill the nematodes, showed actually more galls of 1 nematode generation than did the plants in the control, untreated soil, which had stood fallow during the same period. Miss Jocelyn Tyler reported similar observations following soil treatment with light dosages of certain organic mercury compounds.

BIOLOGICAL CONTROL OF ROOT-KNOT

Dr. Linford presented his paper on natural enemies of the root-knot nematode, with lantern illustrations. A complex soil population has been found in Hawaii, composed of 12 species of nematode-trapping fungi - apparently the most important and the most widespread group of enemies; also 6 non-trapping parasitic fungi; a *Penicillium* which parasitizes almost every exposed egg mass to some extent; 24 predacious nematodes of the genera *Mononchus*, *Aphelenchoides*, *Diplogaster*, and *Dorylaimus* with its related genera; 6 predacious mites; 3 predacious tardigrades; and a possibly harmless ectoparasitic protozoan. The abundance and distribution of nematode enemies in agricultural soils in the continental United States should be studied. The wheat nematode, because available in large numbers, was suggested for use as a food supply in such a study. These enemies may be introduced into water-agar cultures with nematode-infested roots, with soil, or with a concentrated suspension of nematodes from soil. After incubation for a week or two, the enemies predominate in those plates in which the major available food supply consists of nematodes.

The decomposition of organic matter in the soil by bacteria and fungi furnishes food for the increase of free-living nematodes, which in turn feed whatever nematode parasites or predators are present so that the latter increase. In one experiment an enormous population of predacious mites was built up in this way. Nematodes washed from these soils frequently carry fungous parasites. As the enemies increase in numbers and in activity, they attack root-knot larvae as well as free-living nematodes. Experiments on the addition of organic matter to infested soils, showing the increase of saprophytic and predacious nematodes and the ultimate decrease of root-knot, are reported in Soil Science for February, 1938. Desirable trapping fungi can be added to root-knot infested soils - one of the practical applications that will repay further study along the many lines suggested in this important work.

CULTURAL AND SANITATION PRACTICES

Dr. Clayton presented another report from Mr. Gaines. Removal of old roots and drying of soil with frequent stirring in hot weather have given a slight reduction of root-knot but no indication of practical control. A winter cover of rye has increased the value of the tobacco crop by adding organic matter, without any indication of nematode control. In infested soil, early planting gives the best chance of a good crop. Probably the time of nematode penetration in relation to the growth of the plants is important. Mr. W. M. Lunn at Florence, South Carolina, has observed that a high potash fertilization gives a better tobacco crop because it prevents some of the destructive decay of galls.

Dr. Steiner remarked that heavy potash fertilization is reported to decrease the damage to sugar beets by the nematode Heterodera schachtii. The mechanism is not fully understood. Potash increases the oxygen consumption of the roots by increasing the iron metabolism. In this way root formation and root growth are favored.

Dr. Clayton and Dr. R. F. Poole reported further experiments of Mr. Shaw. The tobacco yield was sometimes doubled by applying fertilizer under the plants rather than in bands at the side, and by application just before planting rather than 10 days earlier. Ridge cultivation reduced damage to tobacco by stimulating root growth.

Mr. Taylor observed, on the other hand, that in ridging lima beans no secondary roots were produced, and that stems as well as roots became filled with nematodes.

Dr. Steiner discussed the problems of forest nurseries in the shelberbelt area established without considering the presence of root-knot in the sites. Evergreen stock formerly grown for soil conservation presented no nematode problem. Pine has only once been reported as a host of the root-knot nematode. (If it is again found infested, the information and specimens should be sent to Dr. Steiner's office). Mulberry seedlings are tolerant of root-knot, and appeared to grow normally in these nurseries although their roots were beaded with galls. Black-locust seedlings, on the other hand, suffered from the infestation by blinding of root tips and cracking of the root cortex. The main problem here involved is not that of the amount of damage caused by root-knot on these mulberry, catalpa, or black-locust seedlings. It is a problem of sanitation and prevention. Even if the infestation is slight when these seedlings are distributed, by persisting at the new planting site it becomes a permanent source of contamination, particularly if the trees are planted in erosion gulleys from where runoff water may further distribute the infestation. Black-locust seedlings appear to tolerate the standard hotwater treatment for the control of root-knot (118° F. for 1/2 hour). Small-scale experiments gave 100 percent control,but under commercial conditions the results may be less satisfactory and further increase the production costs to an unprofitable level. The importance of selecting clean nursery sites and of enforcing strict sanitation is therefore emphasized. Certain nurseries in root-knot-free regions have benefited enormously by marketing clean stocks of ornamentals.

Professor Hume reported that virgin "flatwoods soils" in Florida are free from root-knot until contaminated. Clean peach seed in such soil will give one crop of clean seedlings without particular sanitary precautions. The second crop is doubtful. Thereafter the land is unfit for nurseries.

Dr. B. L. Wade mentioned that certain California quarantine inspectors certify shipments as "relatively" rather than "absolutely" free from root-knot. Dr. Steiner mentioned the tuberose industry of North Carolina, where virgin lands have been used so far. The seed tubers have, however, become infested, and the usual hot-water treatment at 118° F. appears inadequate. Nematode egg masses are protected inside the woody tissues, especially after the tubers have been dried all winter. However, growth and blooming are actually improved by a treatment of 30 minutes at 126° F. which also controls satisfactorily the root-knot infestation.

DISEASE RESISTANCE

Miss Edna M. Buhrer reported 133 additions to the host list since the Nashville meeting last year, including plants of 5 families not previously reported, bringing the total to 1288 hosts. A supplement to the list published in 1933 has been issued in the Plant Disease Reporter for July 1, 1938 (vol. 22, no. 12).

Professor Hume stressed the importance of information on resistant species and varieties in susceptible genera and species. Dr. Clayton reported progress in the broad-scale tobacco-breeding program. Several types of Nicotiana tabacum show little evidence of nematode infestation. Other types show abundant galls which seem not to injure the plant because they are small and do not decay. The root-knot-resistant varieties come from Central America.

Miss Tyler made a progress report on experiments with resistant ornamentals. None of the 29 marigold varieties tested remained free from infestation though in many cases the few galls were so small that it required the most minute search to find them. The conclusion from one summer's observations is that African varieties (Tagetes erecta), including all odorless marigolds, seem relatively resistant, while more infestation was found in the French varieties (T. patula), all odorous. After a long season under greenhouse conditions, some plants became heavily infested with normal gall formation and the production of viable eggs. The 37 varieties of zinnias tested were all heavily infested except possibly the Mexican varieties. Tolerance of a heavy infestation is still to be determined.

Mr. Barrons told of his discovery that very young seedlings of so-called resistant plants, such as Crotalaria, Alabama No. 1 bean, cowpea varieties Conch, Victor, and Iron, rye, wheat, oats, and other grasses, were entered by larvae equally with seedlings of okra, tomatoes, Kentucky Wonder bean, and other susceptible plants, when seeds were planted in heavily inoculated soil in the greenhouse. Not all the seedlings of any plant were attacked, but there was no significant statistical difference between the different kinds of plants tested in numbers of larvae found in the roots. Further development of the nematodes in these young plants was not tested.

Mr. Barrons quoted Dr. Linford's suggestion made in this connection at the meeting of the Horticulture Section, that if larvae should enter a resistant plant and fail to develop, our conception of the trap crop might be so changed as to combine the functions of trap crop and green manure in one resistant species.

Mr. Barss expressed the opinion that freedom from infestation is less significant from a practical standpoint than is the satisfactory growth of plants which are necessarily infested. He considers the search for tolerant plant varieties 100 percent worth while.

Dr. Wade told of the Vegetable Breeding Laboratory established 2 years ago at Charleston, South Carolina. The probable value of nematode-resistance studies in connection with the program as a whole was discussed at that time. Reports on resistant plants and on biological control of nematodes now give encouragement that much should come from strictly scientific work on varietal resistance. Within our large host list there is needed an exhaustive study of the reactions of species, varieties, and horticultural types. The experimental inoculation of these plants of course presents difficulties, in view of our present lack of information on nematode strains and populations. The Charleston laboratory has collected hardy plant materials from a number of sources, for testing by 13 collaborating stations. Interest in nematode resistance in combination with other breeding programs has recently trebled, since root-knot has vitiated some of the studies on resistance to other diseases. There seems to be no nematode problem in the commercial trucking areas around Charleston, where potash fertilizers have been used too heavily for the best production of beans, cabbage, and other crops. The relation of nematodes to soil types should be analyzed.

Dr. H. A. Edson offered, in view of the dearth of information on varietal resistance within plant species, to open the Plant Disease Reporter to lists of more or less resistant varieties. Observations need not be checked, but should be accompanied by a brief, informative statement of the growing conditions. Dr. Steiner suggested, with Dr. Edson's approval, that the Plant Disease Reporter also invite exact calculations of the damage done by root-knot to specific crops. Data are not now available for answering frequent inquiries, such as how root-knot might affect the yields of tung-oil trees in a 30,000-acre planting in Mississippi.

Mr. Barss suggested that the stations which are breeding vegetables for southern conditions should work individually and together to institute uniform and dependable tests on nematode resistance, searching endless progeny lines to find possible resistance, as was done, for example in the case of barley scab. He also suggested that Mr. Barrons' summary of crops already bred for nematode resistance be published with the proceedings of this meeting. Mr. Barrons mentioned the pertinent fact that the occurrence of soil infestations is often spotty and leads the unwary to erroneous conclusions. Dr. Linford's findings on nematode enemies may be of significance in this connection. Dr. Clayton supported the recommendation that spottily infested soils should be avoided in experiments on resistance or on the effects of soil treatments. There are areas where nematode populations can not be built up. In a plot near Raleigh, North Carolina, where the surface soil was of a uniform type, tobacco roots developed a uniformly heavy infestation over the friable Norfolk-loam subsoil, but only a spotty infestation over the adjacent Marlboro-clay subsoil. Where the indicator crop showed spotting, Mr. Barrons solved the problem for his purposes by mixing large amounts of inoculum (chopped galls) in the row at planting time, equal amounts over equal areas. Professor Hume suggested that we may in the end be forced to pot experiments, where soils can be mixed uniformly.

Professor Hume warned against condemning certain plants because of occasional reports of nematodes found in them. There are undoubtedly groups of plants in which resistance is the rule, infestation the exception. For example, in handling many hundreds of Hemerocallis plants, of many varieties, Professor Hume has found only 1 sample infested. In this case, resistance is the positive situation, and it is misleading to list such a plant as a host.

ORGANIZATION

Chairman Hume announced the organizing committee for the coming year: Doctors Clayton, R. F. Poole, Sherbakoff, Steiner, Stuckey, Wingard, and Mr. Barrons. Professor Hume was again drafted as chairman. One-year leaders were appointed for special subjects, to correlate the projects of scattered workers and to arrange for reports at the next meeting:

Breeding for resistance - Mr. Barrons.

Host plants - Miss Buhrer.

Chemical and heat treatments - Mr. Taylor.

Rotations - Mr. Gaines.

Cultural practices - Mr. K. J. Shaw.

Biological control - Dr. J. N. Couch.

--And may Dr. Linford and Dr. Wade not forget us!

VARIETAL DIFFERENCES IN RESISTANCE TO ROOT-KNOT IN ECONOMIC PLANTS

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INTRODUCTORY REMARKS

Observations on varietal differences in resistance to root-knot in economic plants are here compiled from the viewpoint of the plant breeder. This list of more or less resistant plants includes certain species of little immediate economic value because they might be of use in breeding work or as understocks for clonal propagation. For the purposes of this review the term "resistant" is intended to indicate some ability to resist the root-knot disease or injury caused by the nematode, Heterodera marioni. Recent experiments by the writer (3) indicate that root-knot-nematode larvae enter the roots of certain resistant plants at as great a rate as they enter susceptible plants. Resistance to root-knot therefore appears to be due to something within the plant that either kills the larvae or counteracts their gall-inducing effect. It is, therefore, suggested that the term "root-knot-resistant" is more specific than "nematode-resistant".

Steiner (26) has pointed out cases of host specialization and host preference among different populations of H. marioni. Cases have been known where certain plants appeared resistant to one nematode population and susceptible to another. Assuming that this host specialization may be extended to varieties within a plant species, it is possible that certain ones of the varieties mentioned in the literature as resistant may prove susceptible when tested under other circumstances. Hereditary variations or strain differences within a plant variety may also account for discrepancies between reports in literature and observations subsequently made by other experimenters. Iron and Brabham cowpeas (q.v.) are an example.

LIST OF PLANTS REPORTED AS EXHIBITING RESISTANCE TO ROOT-KNOT

Amygdalus communis L. (Almond)

Tufts and Day (28) in California tested 15 commercial varieties, seedlings of several crosses of known parentage, and two "bitter" almond seedlings. No lot proved uniformly resistant; however, certain individual seedling plants did not develop root-knot. According to Currie (9) the above workers are attempting to breed a resistant strain from these seedlings.

Amygdalus persica L. (Peach and Nectarine)

McClintock (20, 21) reported that the seedlings of a certain old seedling peach tree growing in Florida were highly resistant to root-knot.

Tufts and Day (27, 28) in California reported that seedlings of the Shalil and Bokhara peaches were practically immune from root-knot, while the Honey and the Saucer types were somewhat less susceptible than the average peach. Later tests indicated that the Bokhara seedlings were not so resistant as previously supposed (9), which, together with the fact that they are relatively shy bearers, has led this variety to be discarded as a possible rootstock for general use. As peach seedlings make good rootstocks for most of the stone fruits, trees of the Shalil variety are being planted rather extensively for seed propagation. Seedlings of certain introductions from Yunnan Province, China, also appeared resistant.

Among the 44 nectarines tested by Tufts and Day (28), seedlings of the Quetta variety were tentatively classed as resistant.

Hutchins (14) at Fort Valley, Georgia reported seedling rootstocks of Shalil highly resistant to root-knot and very satisfactory in other respects. Both seedling understocks and clonally propagated rootstocks of F.P.I. 61302 (a cross between Bolivian Cling and Quetta nectarine) have proved resistant and have produced trees of a vigorous growth.

Ananas sativus Schult. f. (Pineapple)

Collins and Hagan (7, 12) made statistical analyses of the growth of different parts of diseased and non-diseased plants. Considering the development of the entire plant and the extent of root injury, Wild Brazil and Lot 520 - a vegetatively reproduced hybrid of Cayenne x Wild Brazil - were the most tolerant to nematode attack. The other varieties tested, in order of decreasing tolerance, were Wild Kailua, Natal, Pernambuco, Hilo, Cayenne, Ruby, and Taboga. Of the two varieties grown commercially in Hawaii, Hilo consistently appeared slightly superior to Cayenne although both are quite susceptible.

Avena sativa L. (Oats)

Bessey (5) stated that some oat varieties (names not mentioned) were resistant but others susceptible.

Citrus spp.

Neal (22) recommended the so-called sour orange as nearly "disease-proof" with respect to root-knot. He also reported Citrus trifoliata and Satsuma orange to be resistant on the basis of brief trials.

Webber and Orton (29) stated that one of the writers dug oranges in all parts of Florida without finding evidences of root-knot. Citrus species are generally considered resistant at the present time.

Cydonia spp. (Quince)

Tufts and Day (28) reported that cuttings of the following varieties stood in the nursery two years without developing a single root knot: Rea, Orange, Burbank, Angers (= Gregory), S.P.I. 33214, and the East Malling stocks A, C, and D.

Dahlia spp. (Dahlia)

Schmidt (24) reported 13 varieties of dahlias as severely, 9 as moderately, and the following 19 as lightly infested: Jane Cowl, Fort Monmouth, Jean Trimbee, City of Trenton, White Wonder, Alice Whittier, Lady Moyra Ponsonby, Mrs. Bruce Collins, Robert Emmett, Ida Perkins, Long Hill, Dancing Sultana, Monmouth Radiance, Satan, Fordhook Marvel, Little Edith (Pompon), Gertrude (Pompon), Atom (Pompon), Yankee King.

Dianthus spp. (Pink, carnation, etc.)

Goff (11) noted considerable variation, possibly due to hereditary differences in susceptibility, between different types of Dianthus and within certain types (variety names not mentioned), and suggested developing highly resistant strains by selection.

Diospyros spp. (Persimmon)

According to Hume (4), native persimmons are quite free from root-knot damage and make good rootstocks for the Oriental varieties, some of which may also prove resistant.

Ficus spp. (Fig)

Bessey and Byars (6) mentioned that the figs Celeste and Poulette were claimed to be less susceptible than other varieties.

Gossypium spp. (Cotton)

King (4) reported that Acala has replaced Egyptian varieties in Arizona owing in part, at least, to its resistance to root-knot. Certain first-generation hybrids have also been found resistant, but segregation occurred in succeeding generations.

Ipomoea batatas Poir. (Sweetpotato)

Weimer and Harter (30) in California found the varieties Red Jersey, Yellow Belmont, and Southern Queen to be resistant. Only a few galls were found on Little Stem Jersey, Big Stem Jersey, and Porto Rico. In Nancy Hall and Red Brazil there was a considerable decrease in yield.

Poole and Schmidt (23) in North Carolina found the Jersey and Porto Rico varieties to be highly resistant, while Norton Yam, Yellow Yam, Southern Queen, Red Bermuda, Nancy Hall and other varieties were susceptible.

Ligustrum spp. (Privet)

Hume (4) stated that L. quihoui has been found free from root-knot and is useful as an understock for other species of this genus.

Lycopersicum esculentum Mill. (Tomato)

Malloch (19) found 98 tomato varieties and 8 hybrids to be susceptible, but made no attempt to distinguish degrees of susceptibility.

The writer has observed in four separate plantings in naturally infested soil during two successive years that the varieties Stone and Red Rock produced healthier plants than other common varieties. Galls on these roots averaged smaller, terminal galls were fewer, and the root system as a whole was better developed. These observations could not be confirmed in tests subsequently conducted in artificially inoculated soil where a heavy primary infestation took place. Apparently these two varieties are tolerant to a moderate root-knot infestation, owing to their general vigor and extensive root systems. If a large number of larvae enter the roots when the plants are still young, then root growth is impeded and large galls are formed.

Magnolia spp.

Hume (4) suggested M. grandiflora as a resistant rootstock for the deciduous magnolias.

Malus spp. (Apple)

In one small test of apple trees made by Tufts and Day (28) seedlings of the variety Rainier (M. sylvestris) were not attacked.

Nicotiana spp. (Tobacco)

According to Garner, Allard, and Clayton (10) all domestic varieties are susceptible except a strain of Orinoco known as Faucette Special, which shows moderate resistance.

Bessey and Byars (6) reported "some strains" of tobacco developed by selection as not diseased. Such strains are not known at present.

Phaseolus lunatus L. (Lima bean)

Hopi 155, bred by W. W. Mackie of the California Experiment Station, is being used for the commercial production of baby limas in certain root-knot-infested areas in California and is available for seed purposes from a few growers. Among the limas recently sent out for trial by the California Station, Hopi 5987, 5988, and 5992 proved superior in root-knot resistance to Hopi 155 in a one-year test by the writer at Auburn. The Hopi limas possess resistance to a notable degree when compared with the common lima bean varieties, but less than Alabama No. 1 and Alabama No. 2 common beans (17). At the Alabama Station, Hopi limas are being used as breeding material in an attempt to develop lima-bean varieties especially adapted to southern conditions and highly resistant to root-knot.

King reported (4) having collected highly resistant but mottled lima-bean strains from the Hopi Indians.

Phaseolus vulgaris L. (Bean)

Two strains of beans - since named Alabama No. 1 and Alabama No. 2 - were reported by Isbell (15) to be highly resistant to root-knot. They have been carefully tested at the Alabama Experiment Station over a period of five years in naturally infested soil as well as under conditions of artificial inoculation. On only a few occasions have they been observed to develop root-knot galls. For the most part these have been found on old plants which had ceased production.

As reported by Isbell and Barrons (17) Alabama No. 1 is being introduced by the Alabama Experiment Station in 1938 and will be available through commercial sources in subsequent years. A number of new root-knot-resistant strains have been developed at the Alabama Station by utilizing Alabama No. 1 and Alabama No. 2 in hybridization and selection work. The best of these will be introduced after adequate tests. In resistance studies with more than 30 varieties of beans the writer (2) found Surecrop Stringless Wax also slightly resistant. These 3 were the only varieties exhibiting sufficient resistance to be of possible use in breeding work.

Prunus spp. (Apricot)

The apricot has long been known to be resistant to root-knot (28), and has been used with fair success as a rootstock for plum and peach. Tufts and Day (28) tested 48 varieties of P. armeniaca, P. mume, and P. dasycarpa for two to three years; no root-knot developed. Hutchins (14) found the common apricot and the Japanese apricot (P. mume) and also a plum (P. hortulana) resistant but unsatisfactory as peach understocks.

Prunus spp. (Cherry)

Tufts and Day (28) found no infestation on seedlings of Mazzard, English Morello, Stockton Morello, Montmorency Monarch, and _P. demissa_ in tests extending over one or two seasons.

Prunus spp. (Plum)

The Marianna plum has been used with success as a rootstock for various cultivated plums and peaches in infested soil. Neal (22) reported this plum as free from root-knot during a three-year test. McClintock (20) also found its seedlings resistant. Tufts and Day (28) found rooted cuttings from 25 different Marianna seedlings to be free from galls. Rooted stem cuttings of Myrobalan from different sources showed considerable variation in degree of infestation. Three of these clones proved vigorous and offer possibilities as rootstocks. The wildgoose plum, _P. munsoniana_, was also free from root-knot in their nursery.

Pyrus spp. (Pear)

According to Tufts and Day (28) seedlings of the varieties P. Barry, Easter Beurre, and Hardy showed less root-knot than others in a two-year test of ten varieties. In a one-year test seedlings of _Pyrus variolosa_ were free.

Rosa spp. (Rose)

According to Hume (4), much variation exists in root-knot injury to roses although none are immune. Mme. Plantier of the China rose group, often used as a rootstock in the South, was mentioned as "not badly affected".

Soja max (L.) Piper (Soybean)

McClintock (20) stated that the Biloxi, Laredo, and O-too-tan soybeans are resistant to root-knot, and they have been so described in numerous seed catalogs. The writer has observed that Biloxi is almost free from galls even in artificially inoculated soil.

Solanum tuberosum L. (Potato)

Cunningham (8) found that Green Mountain, Bliss Triumph, and Irish Cobbler were equally susceptible to root injury, but that the latter variety showed much less tuber injury.

Vigna sinensis (Torner) Savi (Cowpea)

Webber and Orton (29) demonstrated that the Iron variety was resistant to root-knot. It has now been in commerce for 35 years and has commonly been known as a resistant strain suitable for rotations. The writer tested samples from five different sources in uniformly inoculated soil. Two of the samples were uniformly resistant, two developed root-knot galls to a mild degree, and one appeared susceptible although the galls were not so large nor so numerous as on many other cowpea varieties. Variations were found also with respect to date of maturity and habit of growth, indicating that there are definite strains of the Iron cowpea now in commerce.

Brabham is another resistant variety which is reported to be the result of a cross between Iron and Whippoorwill. Taylor (4) has found infestation in both Iron and Brabham, and considers this due to impurity in commercial seeds. The resistant Victor cowpea is the result of a more recent cross, by the United States Department of Agriculture, between varieties Brabham and Groit (13).

Isbell (16) tested 21 varieties of cowpeas in soil badly infested with root-knot, comparing the important table varieties with a few field varieties. Conch was the most resistant variety tested; California Black Eye, Extra Early Black Eye, Purple Hull, and Six Weeks were all less susceptible than many other varieties; Victor was only slightly resistant.

Kendrick (18) reported the Calva Blackeye as resistant to wilt and to root-knot. Numbered strains have been distributed for testing.

The Kilgore Seed Company of Plant City, Florida, catalogs a variety called Suwannee, which "ranks with Iron and Brabham in resistance to root-knot".

Viola spp. (Violet)

Webber and Orton (29) quoted a Mr. P. H. Dorsett as observing great differences in susceptibility of greenhouse violet plants. No varieties were mentioned.

Vitis spp. (Grape)

Neal (22) stated that V. cordifolia and vulpina stocks proved superior for vinifera grapes owing to the high susceptibility of the latter roots. Bessey and Byars (6) reported American grapes to be more resistant than European varieties.

Snyder (25) reported some inherent resistance to root-knot in stocks of *V. doaniana*, *V. champini*, *V. longi*, *V. cinerea*. Those most promising as useful resistant rootstocks were the varieties Dog Ridge (*V. champini*), Salt Creek (*V. doaniana*), and hybrid 1613 from the cross Solonis (*V. longi*) x Othello (*V. riparia* x *V. labrusca*) x *V. vinifera*).

Warneria spp. (Gardenia)

According to a note in Florist's Review (1), J. E. Hendry of Fort Meyers, Florida, has found *W. thunbergia* to be resistant to root-knot. In subsequent correspondence Mr. Hendry has stated that this species is continuing to prove resistant after a number of years of testing, and is a suitable rootstock for *W. augusta* (*G. florida*) as well as for a number of varieties of *W. veitchi*.

LITERATURE CITED

1. Anonymous. Top-worked gardenia. Florists' Rev. 78(2006):13. 1936.
2. Barrons, K. C. A method of determining root-knot resistance in beans and cowpeas in the seedling stage. Jour. Agr. Research (U.S.) 57: 363-370. 1938.
3. ____________ Studies on the nature of root-knot resistance. Jour. Agr. Research (U.S.) (in press).
4. Barss, H. P., and others (editors). Proceedings of the root-knot nematode conference. U.S.D.A. Plant Disease Rep. Sup. 102. 1937.
5. Bessey, E. A. Root-knot and its control. U.S.D.A. Bur. Plant Indus. Bull. 217. 1911.
6. ____________ and L. P. Byars. The control of root-knot. U.S.D.A. Farmers' Bull. 648. 1915.
7. Collins, J. L., and H. R. Hagan. Nematode resistance of pineapples. Varietal resistance of pineapple roots to the nematode *Heterodera radicicola* (Greef) Müller. Jour. Heredity 23: 459-465; 503-511. 1932.
8. Cunningham, H. S. The root-knot nematode (*Heterodera marioni*) in relation to the potato industry on Long Island. N. Y. (Geneva) Agr. Expt. Sta. Bull. 667. 1936.
9. Currie, J. H. Looking over nematode resistant rootstocks. Pacific Rural Press 133: 628. 1937.
10. Garner, W. W., H. A. Allard, and E. E. Clayton. Superior germ plasm in tobacco. U.S.D.A. Yearbook 1936: 785-830. 1936.
11. Goff, C. C. Relative susceptibility of some annual ornamentals to root-knot. Florida Agr. Expt. Sta. Bull. 291. 1936.

12. Hagan, H. R., and J. L. Collins. Studies on varietal resistance of pineapple plants. Part II. Plant resistance to Heterodera marioni (Cornu) Goodey. Jour. Heredity 26: 35-46. 1935.
13. Hayes, H. K., and R. J. Garber. Breeding crop plants. (Ed. 2) 438 pp. McGraw-Hill Book Company, New York and London. 1927.
14. Hutchins, L. M. Nematode-resistant peach rootstocks of superior vigor. Amer. Soc. Hort. Sci. Proc. 34: 330-338. (1936). 1937.
15. Isbell, C. L. Nematode-resistance studies with pole snap beans. Jour. Heredity 22: 191-198. 1931.
16. ____________ Nematode injury to the roots of table varieties of cowpeas. Ala. Agr. Expt. Sta. Ann. Rept. 45: 29-30. 1934.
17. ____________, and K. C. Barrons. Breeding root-knot resistant beans for southern growers. Southern Seedsman 1: 7, 26-27. 1938.
18. Kendrick, J. B. A cowpea resistant to fusarium wilt and nematode root knot. (Abstract) Phytopath. 26: 98. 1936.
19. Malloch, W. S. The problem of breeding nematode-resistant plants. Phytopath. 13: 436-450. 1923.
20. McClintock, J A. Report on resistant plants for root-knot nematode control. Georgia Agr. Expt. Sta. Circ. 77. 1922.
21. ______________ The transmission of nematode resistance in the peach. Science (n.s.) 58: 466-467. 1923.
22. Neal, J. C. The root-knot disease of the peach, orange, and other plants in Florida. U.S.D.A. Div. of Ento. Bull 20 (old ser.) 1889.
23. Poole, R. F., and R. Schmidt. The nematode disease of sweet potatoes. Phytopath. 17: 549-554. 1927; North Carolina Agr. Expt. Sta. Bull. 265. 1929.
24. Schmidt, R. Relative susceptibility of certain varieties of dahlias to root-knot nematode. U.S.D.A. Plant Disease Reptr. 21: 32-33. 1937.
25. Snyder, E. Susceptibility of grape rootstocks to root knot nematode. U.S.D.A. Circ. 405. 1936.
26. Steiner, G. The problem of host selection and host specialization of certain plant-infesting nemas and its application in the study of nemic pests. Phytopath. 15: 499-534. 1925.
27. Tufts, W. P. Nematode resistance of certain peach seedlings. Amer. Soc. Hort. Sci. Proc. (1929) 26: 98-100. 1930.
28. __________, and L. H. Day. Nematode resistance of certain deciduous fruit tree seedlings. Amer. Soc. Hort. Sci. Proc. 31 (suppl.): 75-82. 1934.
29. Webber, H. J., and W. A. Orton. A cowpea resistant to root-knot (Heterodera radicicola). U.S.D.A. Bur. Plant Indus. Bull. 17, article 2. 1902.
30. Weimer, J. L., and L. L. Harter. Varietal resistance of sweet potatoes to nematodes, Heterodera radicicola (Greef.) Müller, in California. Phytopath. 15: 423-426. 1925.

DISEASES OF PLANTS IN THE UNITED STATES IN 1937

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Agricultural & Mechanical College, Stillwater - R. Stratton, K. Starr Chester.
State Board of Agriculture, Oklahoma City - T. B. Gordon.

OREGON, Agricultural Experiment Station, Corvallis - C. E. Owens, S. M. Zeller.
Hood River College, Hood River - LeRoy Childs.

PENNSYLVANIA, Agricultural Experiment Station, State College - F. D. Kern, E. L. Nixon.
Pennsylvania Field Laboratory, Bustleton - W. S. Beach.
Pennsylvania State College, State College - R. S. Kirby, H. W. Thurston, G. L. Zundel.

RHODE ISLAND, Rhode Island State College, Kingston - H. W. Browning, F. L. Howard.

SOUTH CAROLINA, Agricultural Experiment Station, Clemson - G. M. Armstrong.
South Carolina Agricultural College, Clemson - W. C. Nettles, D. B. Rosenkrans.
State Crop Pest Commission, Clemson - M. B. Stevenson, Jr.

SOUTH DAKOTA, Northville - J. F. Brenckle.
State College, Brookings - S. P. Swenson.

TENNESSEE, Agricultural Experiment Station, Knoxville - C. D. Sherbakoff.
University of Tennessee, Knoxville - J. O. Andes, L. R. Hesler.

TEXAS, Agricultural Experiment Station, College Station - W. N. Ezekiel, J. J. Taubenhaus, P. A. Young.
Sub-Station No. 15, Weslaco, W. J. Bach, G. H. Godfrey.
Temple Sub-Station, Temple - Colonel Hoyt Rogers.

UTAH, Utah Agricultural College, Logan - B. L. Richards.

VERMONT, Agricultural Experiment Station, Burlington - M. B. Cummings, B. F. Lutman.

VIRGINIA, Agricultural Experiment Station, Blacksburg - James Godkin, J. G. Harrar, R. G. Henderson, A. B. Massey, G. M. Shear, S. A. Wingard.
Virginia Truck Experiment Station, Norfolk - H. T. Cook.
Field Laboratory, Winchester - A. B. Groves.
Field Laboratory, Staunton - R. H. Hurt.
Hampton Institute, Hampton - T. W. Turner.
Virginia Experiment Station, Chatham - J. A. Pinckard, Jr.

WASHINGTON, Agricultural Experiment Station, Pullman - F. D. Heald.
Longbeach - D. J. Crowley.
Washington State College, Pullman - L. K. Jones.
Western Washington Experiment Station, Puyallup - G. A. Huber.

WEST VIRGINIA, West Virginia College of Agriculture, Morgantown - C. R. Orton.
Agricultural Experiment Station, Morgantown - A. Berg, E. C. Sherwood.

WISCONSIN, Agricultural Experiment Station, Madison - L. R. Jones.
University of Wisconsin, Madison - G. W. Keitt, A. J. Riker, R. E. Vaughan.

WYOMING, Agricultural Experiment Station, Laramie - Aven Nelson, W. G. Solheim, G. H. Starr.

HAWAII, Pineapple Experiment Station, Honolulu - C. P. Sideris.

PUERTO RICO, Insular Experiment Station, Rio Piedras - M. T. Cook.

INTRODUCTION

The influence of weather on the distribution and development of plant diseases is so great as to require some form of presentation of weather data in connection with any summary of disease occurrence, but it is also so complex as to preclude an adequate discussion in the small space available. The method of presentation employed in this summary is as formerly--by means of maps showing, by States, the departures from normal temperatures and the percentage of normal precipitation during each of the four seasons, and graphs showing accumulated and monthly temperatures and rainfall at six stations selected so as to be representative of the different regions of the country (Figs. 1 to 8, and 9 to 20, respectively).

In dealing with any particular disease in any particular region this method is admittedly inadequate, since it fails to show the sometimes very considerable variations within State boundaries, neglects factors other than temperature and precipitation such as evaporation rate, cloudiness, humidity, wind movement, etc., and through presentation by seasons obscures the effect of shorter periods which are decisive in many cases. However, there is no method that could be at once brief, as it must be, and detailed, and in any event, most of the reports on which these summaries are based are not themselves specific enough to require detailed discussion of weather factors effective in restricted areas or during limited periods of time. Other factors operate within the regions determined by temperature and precipitation, and the method used shows whether each of the four seasons and the year as a whole was warmer and wetter, or drier and cooler, etc., than the standard usually referred to in describing weather, that is, the "normal" or average.

Although, of course, there is really no such thing as "average" weather, nevertheless it is true that the longtime action of temperature and rainfall and of other factors included in weather is evidenced in concrete form in more than one way. The climate of a region is the sum of its weather, and this sum is made visible in the characteristic natural landscape resulting from the year to year action of weather on topography, soils, and vegetation. In this sense, the "normal" or average becomes a reality and a thoroughly useful standard of comparison.

In this sense of visible expression of climatic effects the average is also the basis of most classifications of climate, including that of Thornthwaite, from whose map of climates of the United States Figure 21 is adapted. The justification for such classifications, according to Thornthwaite et al.[1], is their usefulness. They say, "No classification of any

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1/ Adapted from Figure 1 in Thornthwaite, C. W., Benjamin Holzman, and David I. Blumenstock. Climatic research in the Soil Conservation Service. U. S. Dept. Agr. Weather Bureau Monthly Weather Rev. 66: 351-368. Nov. 1938. and from a much more detailed reproduction of Thornthwaite's map, in color, combined with plant growth regions of the United States, as given in "Native woody plants of the United States", by William Van Dersal, U. S. Dept. Agr. Misc. Publ. 303. 1938. The designations for seasonal type of effective precipitation have been added from the latter map.

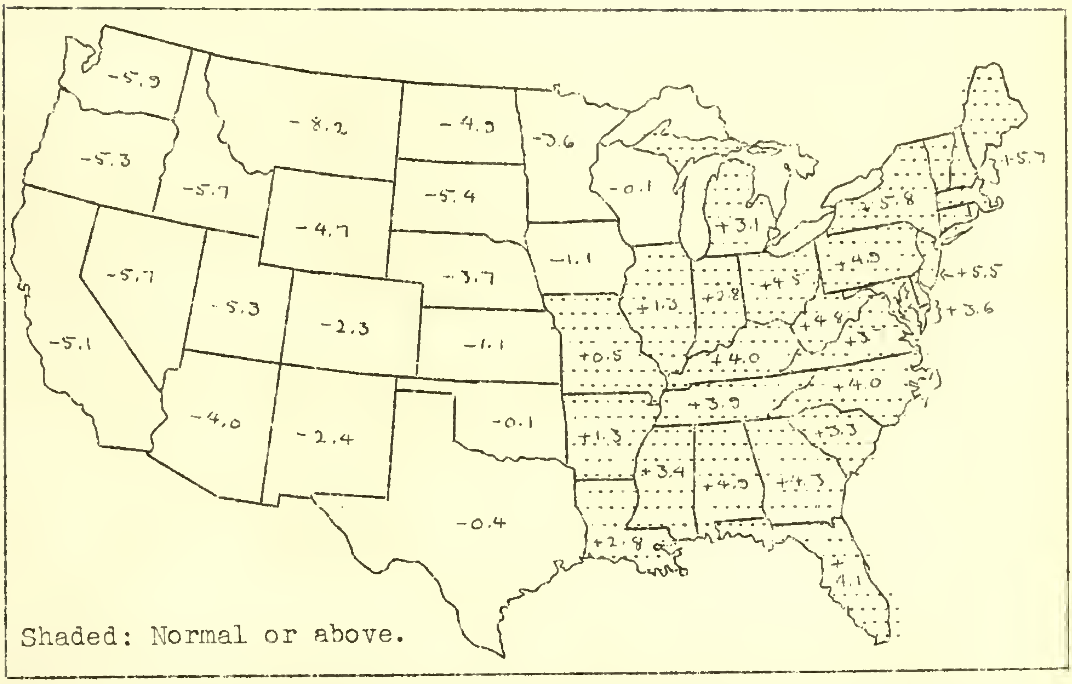

Fig. 1. Departure from the normal temperature for the winter, December 1936 to February 1937, inclusive.

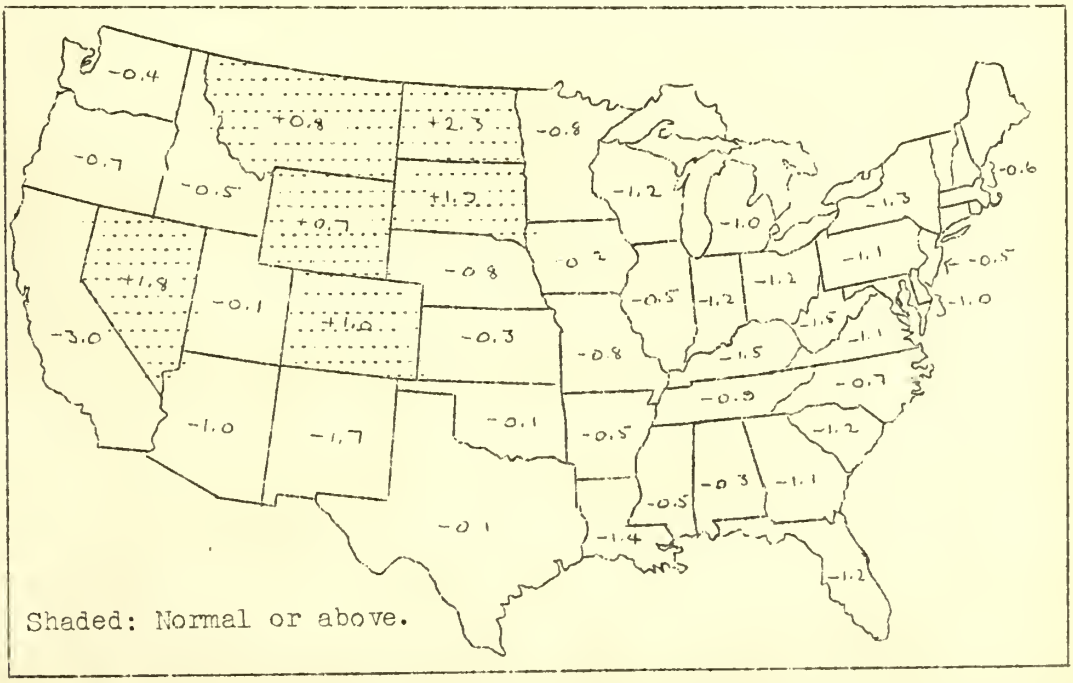

Fig. 2. Departure from the normal temperature for the spring, 1937, March to May, inclusive.

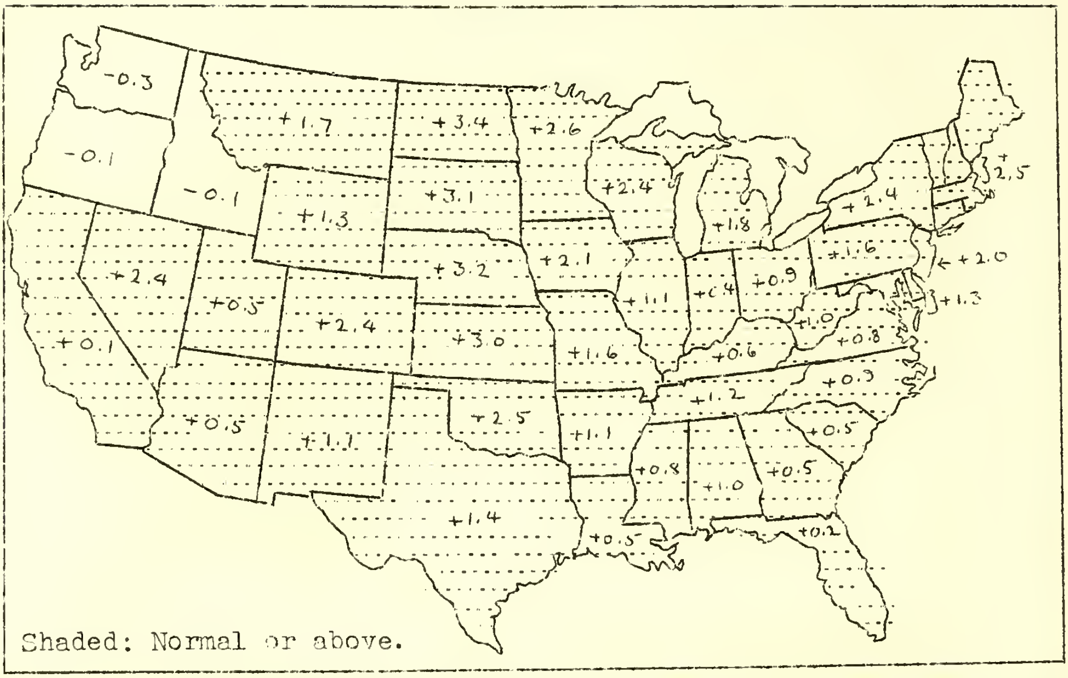

Fig. 3. Departure from the normal temperature for the summer, 1937, June to August, inclusive.

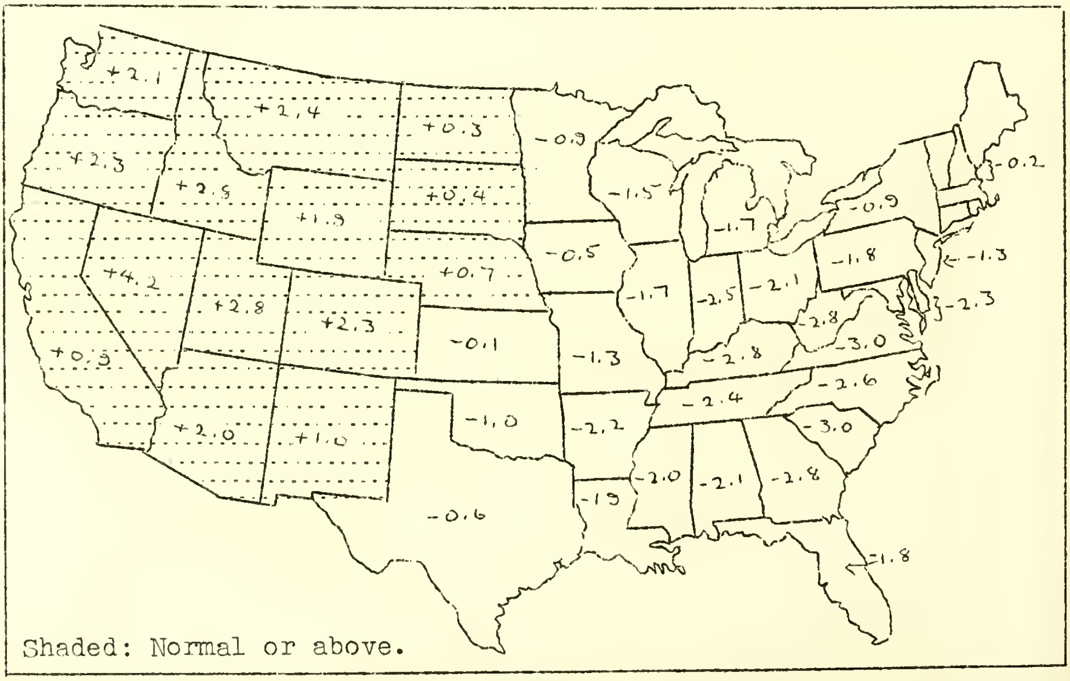

Fig. 4. Departure from the normal temperature for the autumn, 1937, September to November, inclusive.

PRECIPITATION

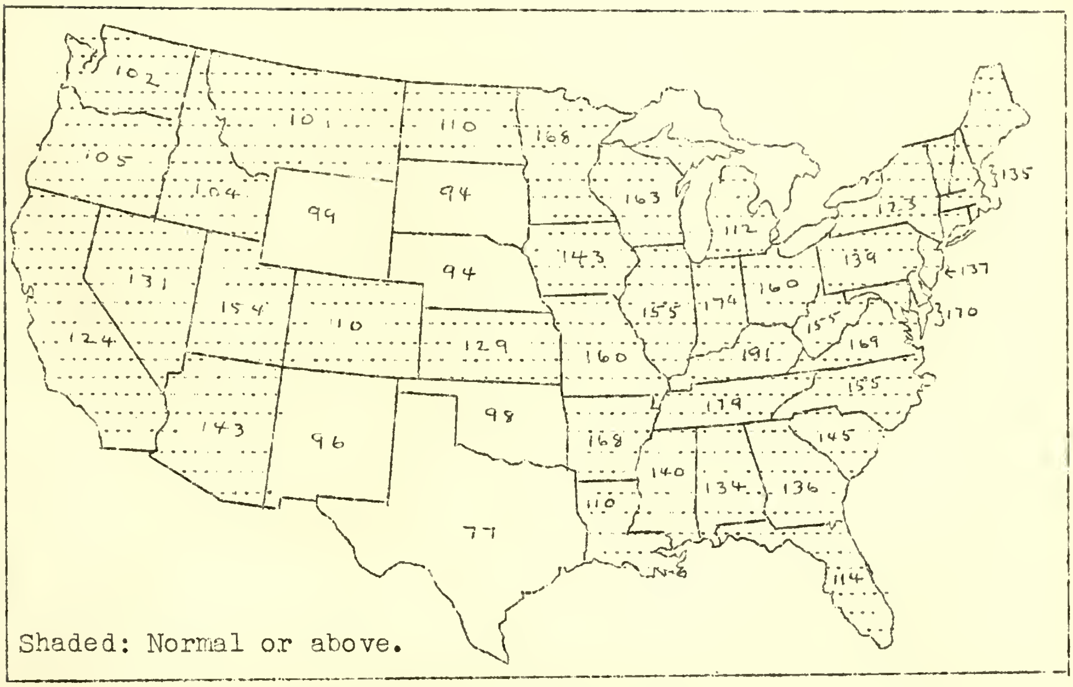

Fig. 5. Percentage of normal precipitation for the winter, December 1936 to February 1937, inclusive.

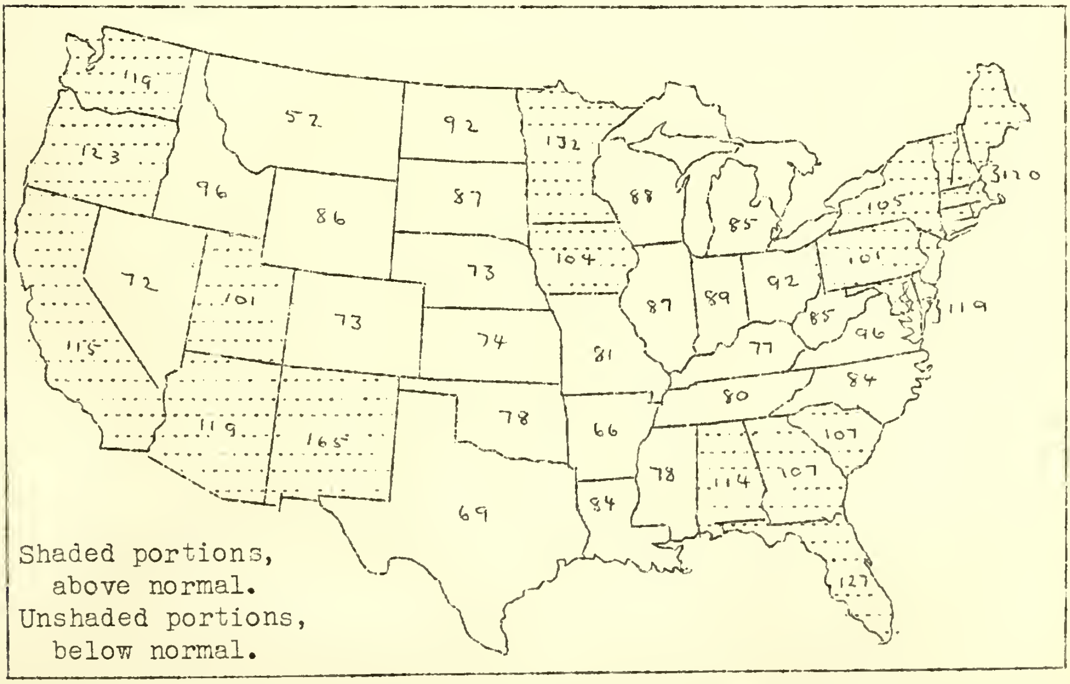

Fig. 6. Percentage of normal precipitation for the spring, March to May 1937, inclusive. (From Weekly Weather and Crop Bulletin, June 15, 1937).

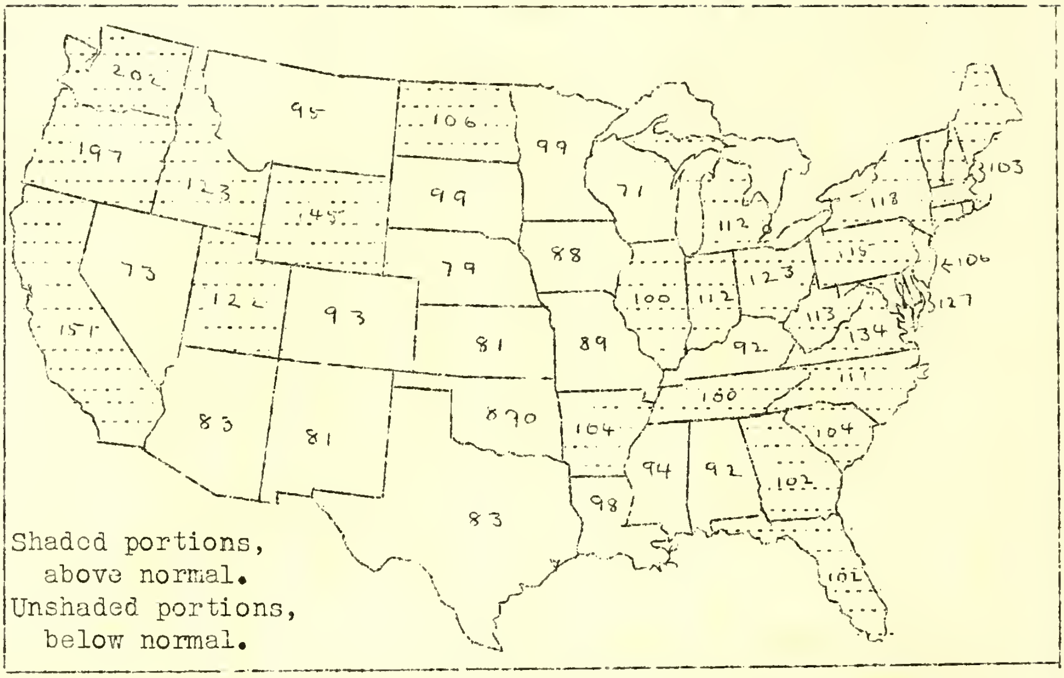

Fig. 7. Percentage of normal precipitation for the summer, June to August, inclusive, 1937. (From Weekly Weather and Crop Bulletin, September 14, 1937).

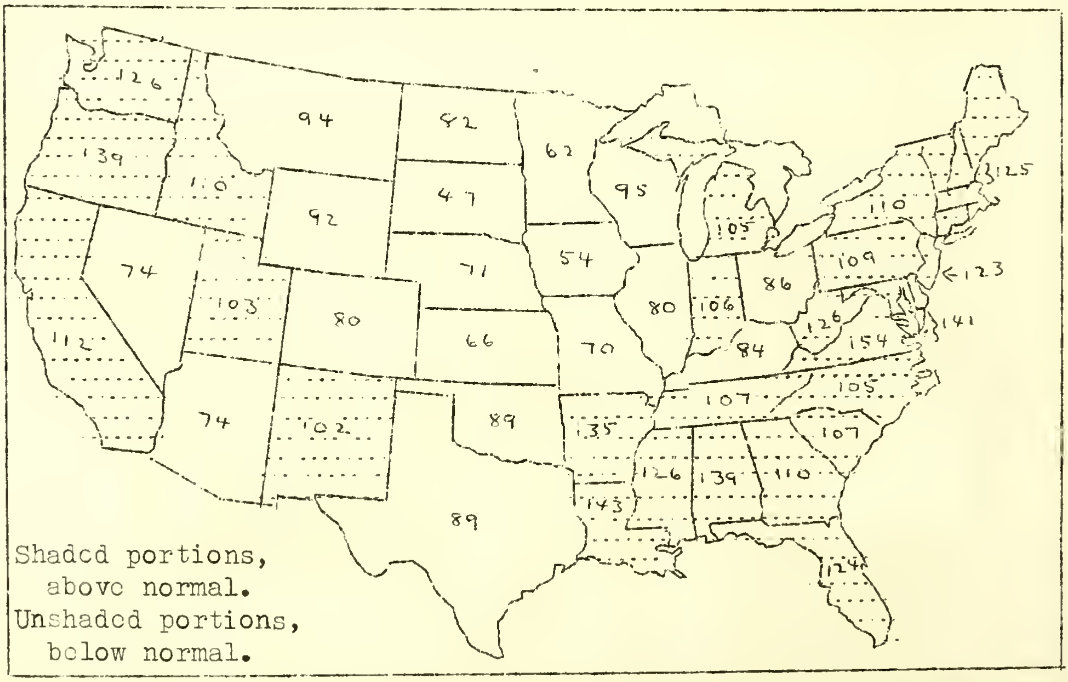

Fig. 8. Percentage of normal precipitation for the autumn, September to November, inclusive, 1937. (From Weekly Weather and Crop Bulletin, December 14, 1937).

HARRISBURG, PENNSYLVANIA

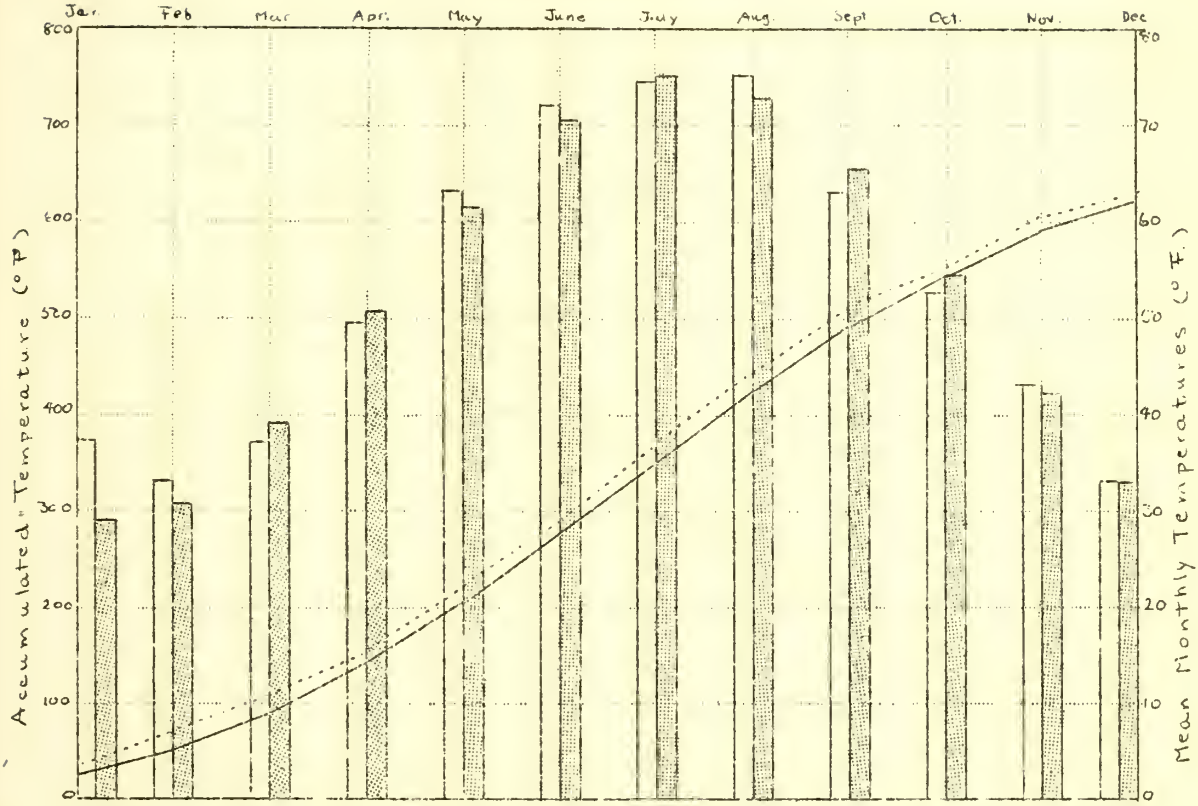

Fig. 9. Accumulated temperature in degrees F. at Harrisburg, Pennsylvania, for the year 1937 (dotted line) compared with normal (solid line), and mean monthly temperatures (plain bars) compared with normal (shaded bars).

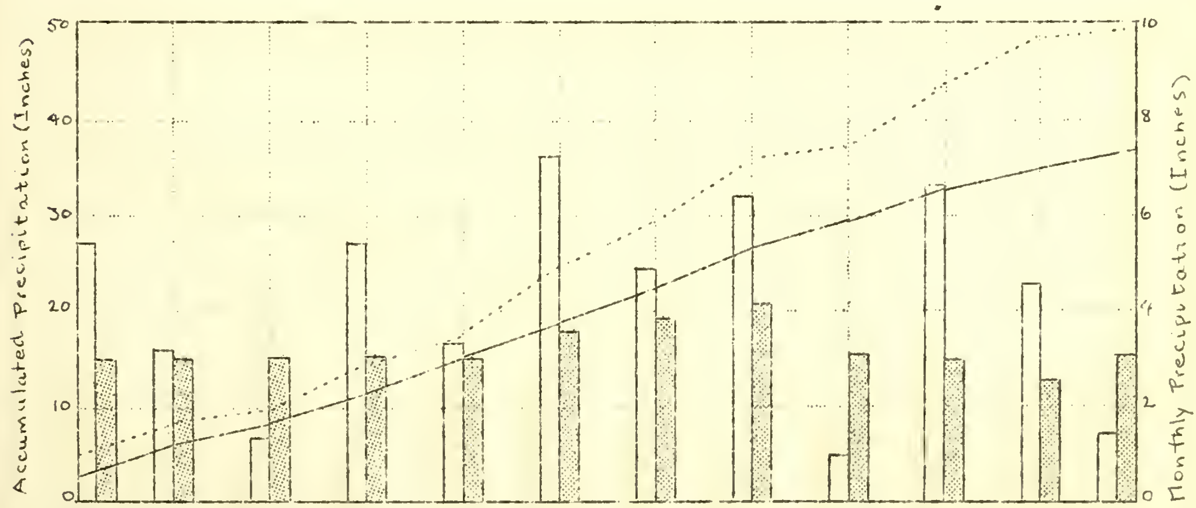

Fig. 10. Accumulated precipitation in inches at Harrisburg, Pennsylvania, for the year 1937 (dotted line) compared with normal (solid line), and monthly precipitation (plain bars) compared with normal (shaded bars).

ATLANTA, GEORGIA

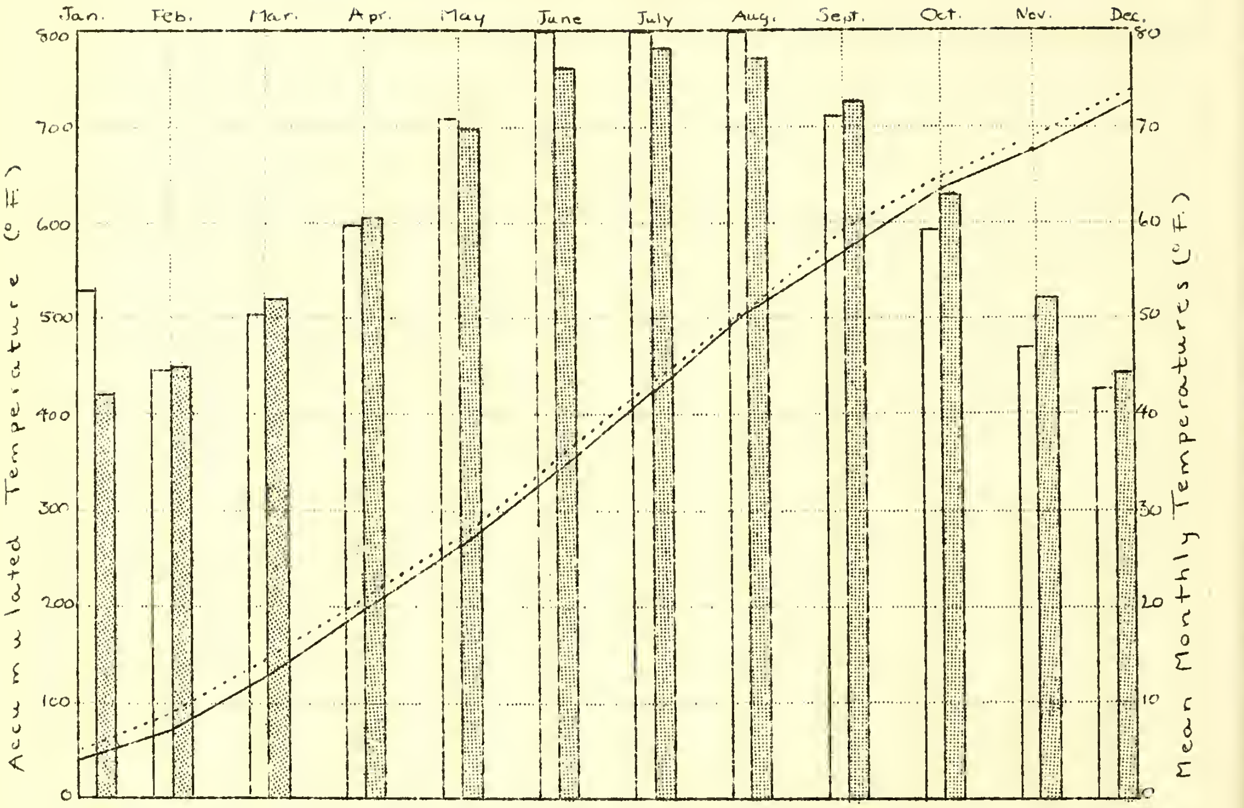

Fig. 11. Accumulated temperature in degrees F. at Atlanta, Georgia, for the year 1937 (dotted line) compared with normal (solid line), and mean monthly temperatures (plain bars) compared with normal (shaded bars).

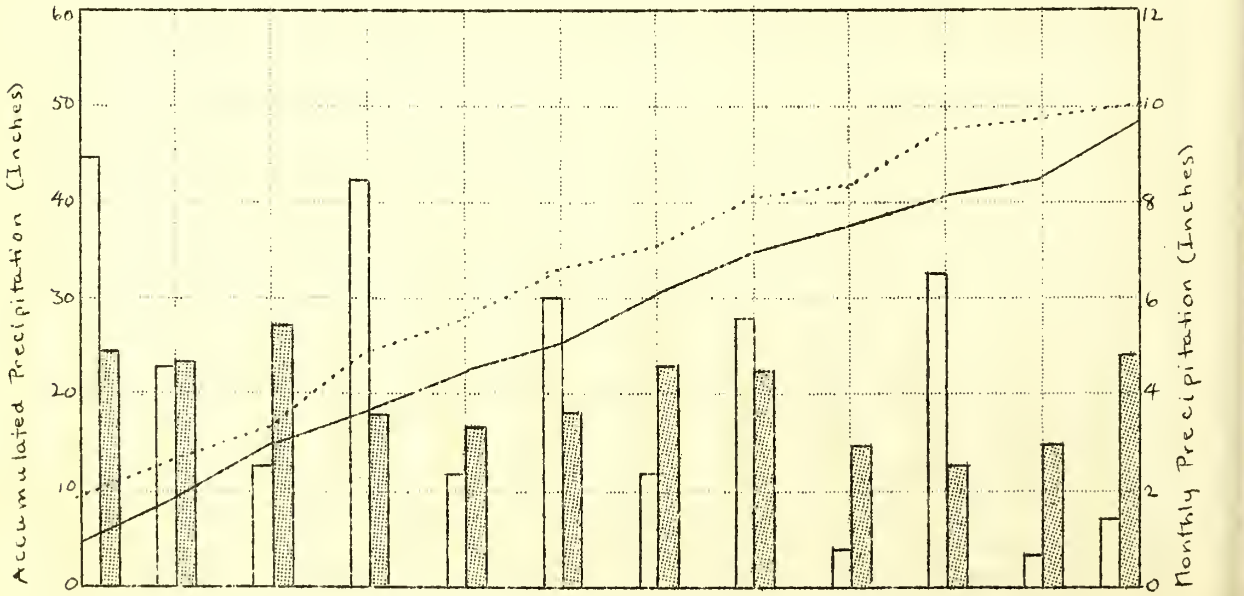

Fig. 12. Accumulated precipitation in inches at Atlanta, Georgia, for th year 1937 (dotted line) compared with normal (solid line), and monthly precipitation (plain bars) compared with normal (shaded bars).

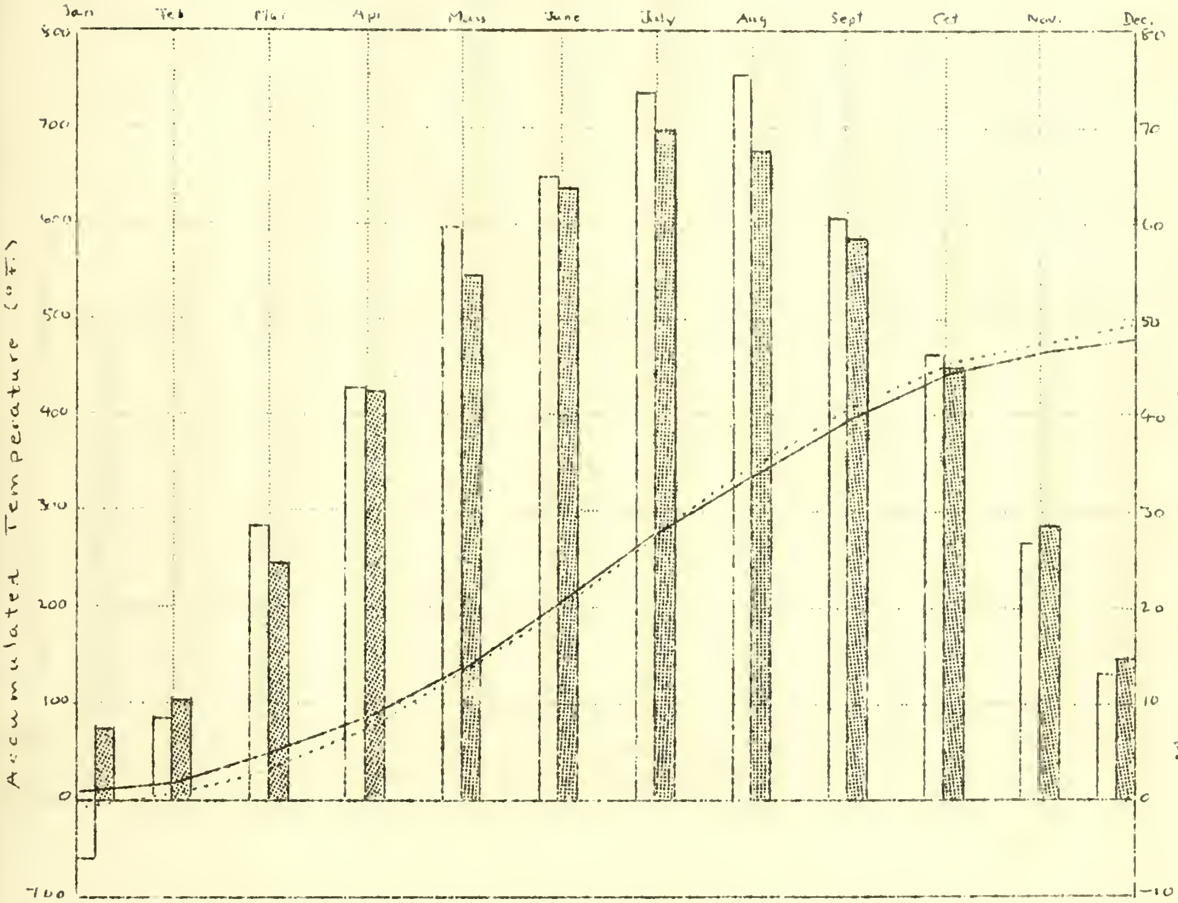

Fig. 13. Accumulated temperature in degrees F. at Bismarck, North Dakota for the year 1937 (dotted line) compared with normal (solid line), and mean monthly temperatures (plain bars) compared with normal (shaded bars).

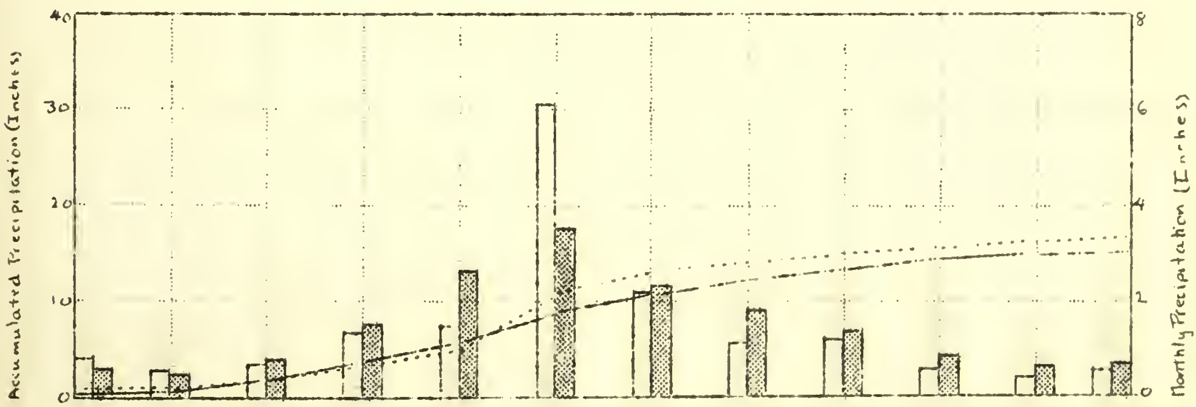

Fig. 14. Accumulated precipitation in inches at Bismarck, North Dakota for the year 1937 (dotted line) compared with normal (solid line), and monthly precipitation (plain bars) compared with normal (shaded bars).

LITTLE ROCK, ARKANSAS

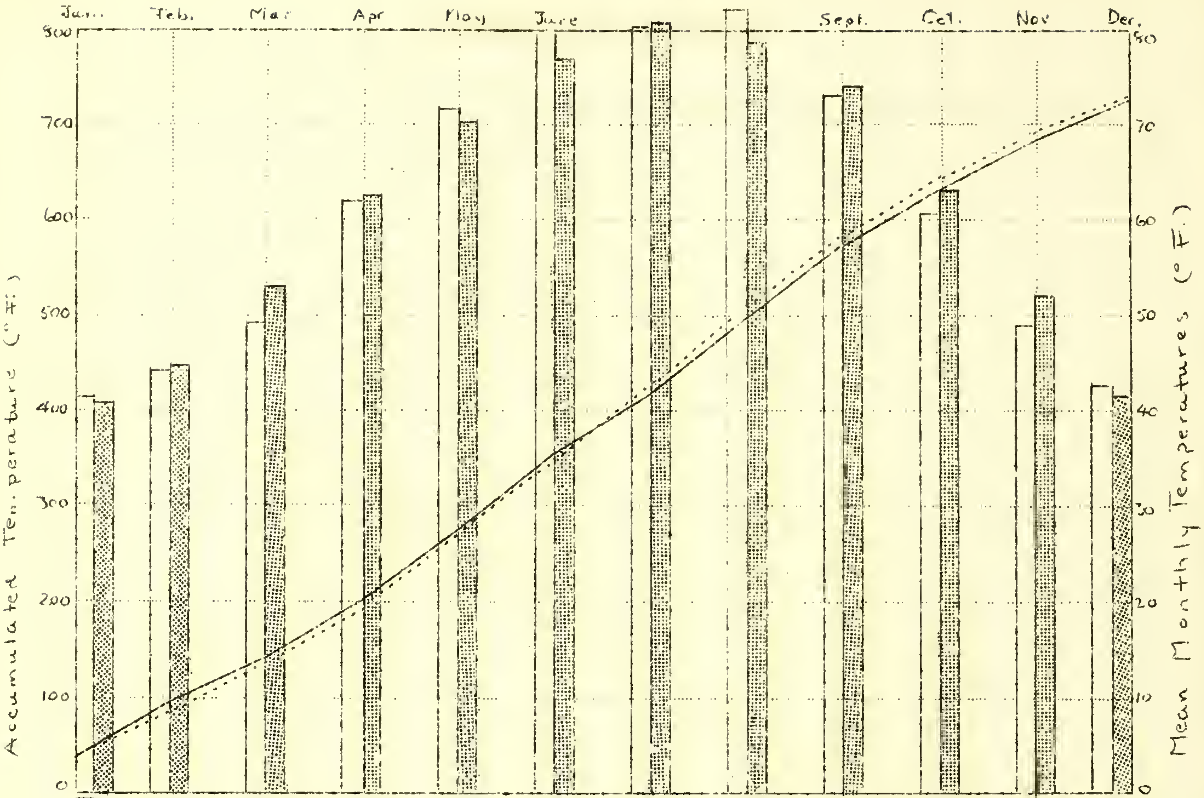

Fig. 15. Accumulated temperature in degrees at Little Rock, Arkansas for the year 1937 (dotted line) compared with normal (solid line), and mean monthly temperatures (plain bars) compared with normal (shaded bars).

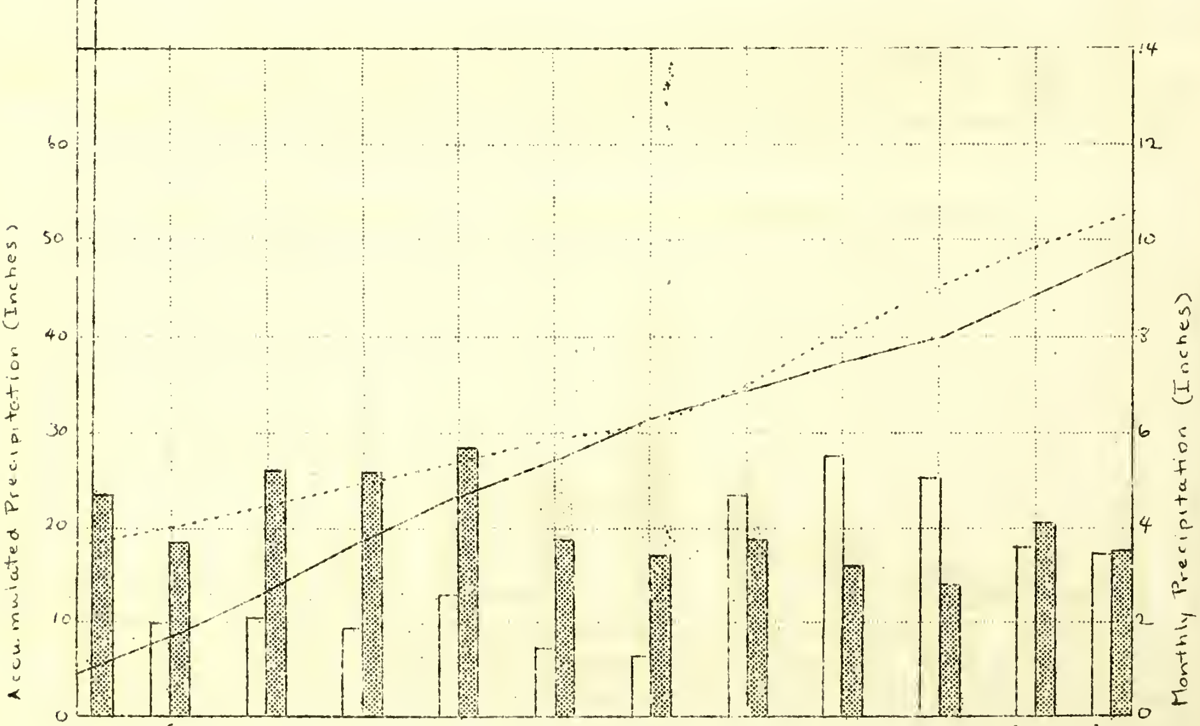

Fig. 16. Accumulated precipitation in inches at Little Rock, Arkansas for the year 1937 (dotted line) compared with normal (solid line), and monthly precipitation (plain bars) compared with normal (shaded bars).

PORTLAND, OREGON

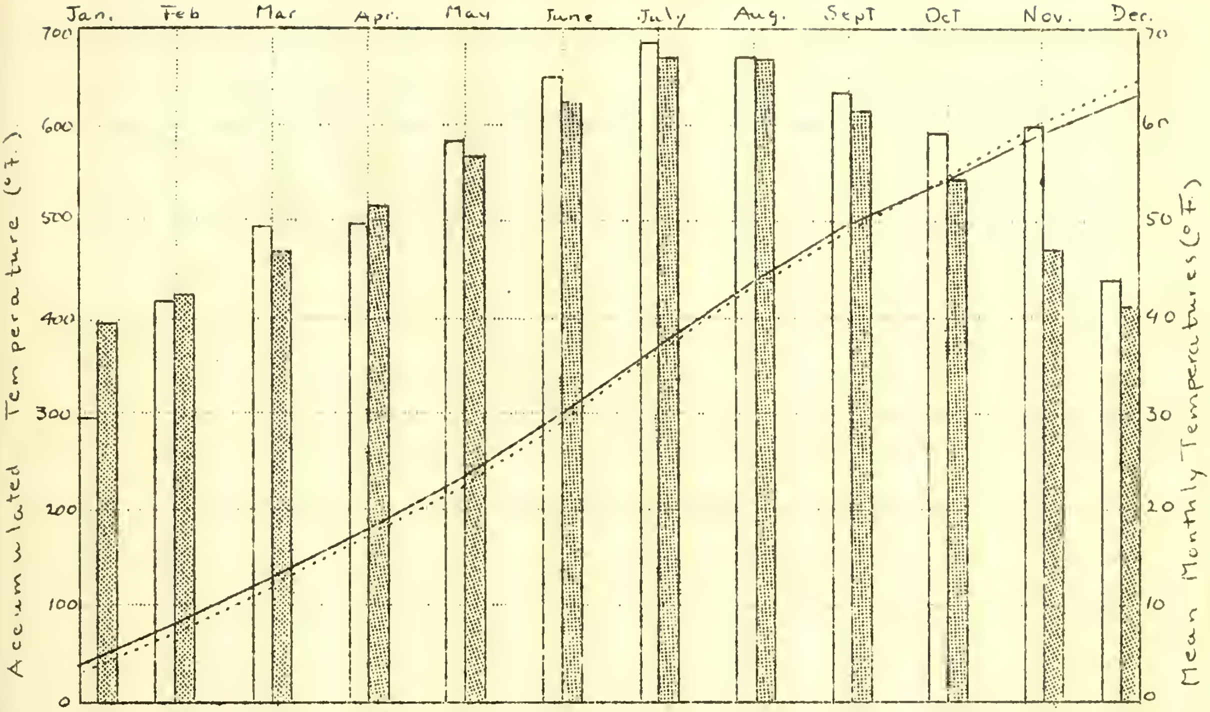

Fig. 17. Accumulated temperature in degrees F. at Portland, Oregon for the year 1937 (dotted line) compared with normal (solid line), and mean monthly temperatures (plain bars) compared with normal (shaded bars).

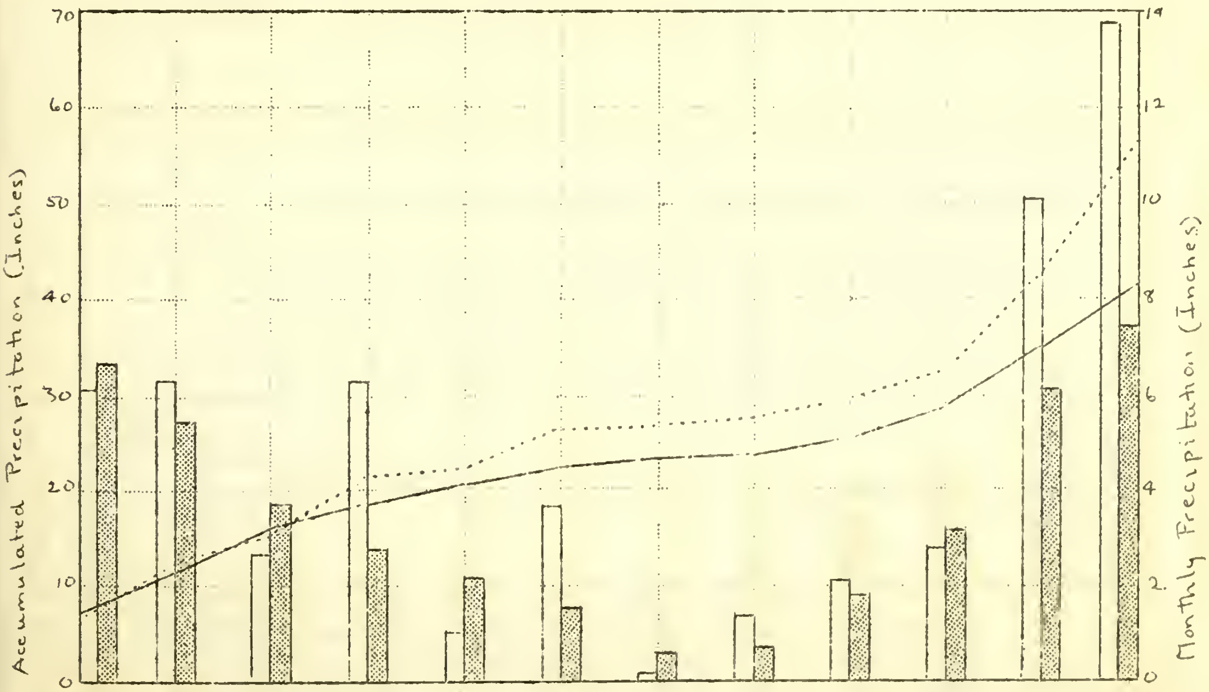

Fig. 18. Accumulated precipitation in inches at Portland, Oregon for the year 1937 (dotted line) compared with normal (solid line), and monthly precipitation (plain bars) compared with normal (shaded bars).

SACRAMENTO, CALIFORNIA

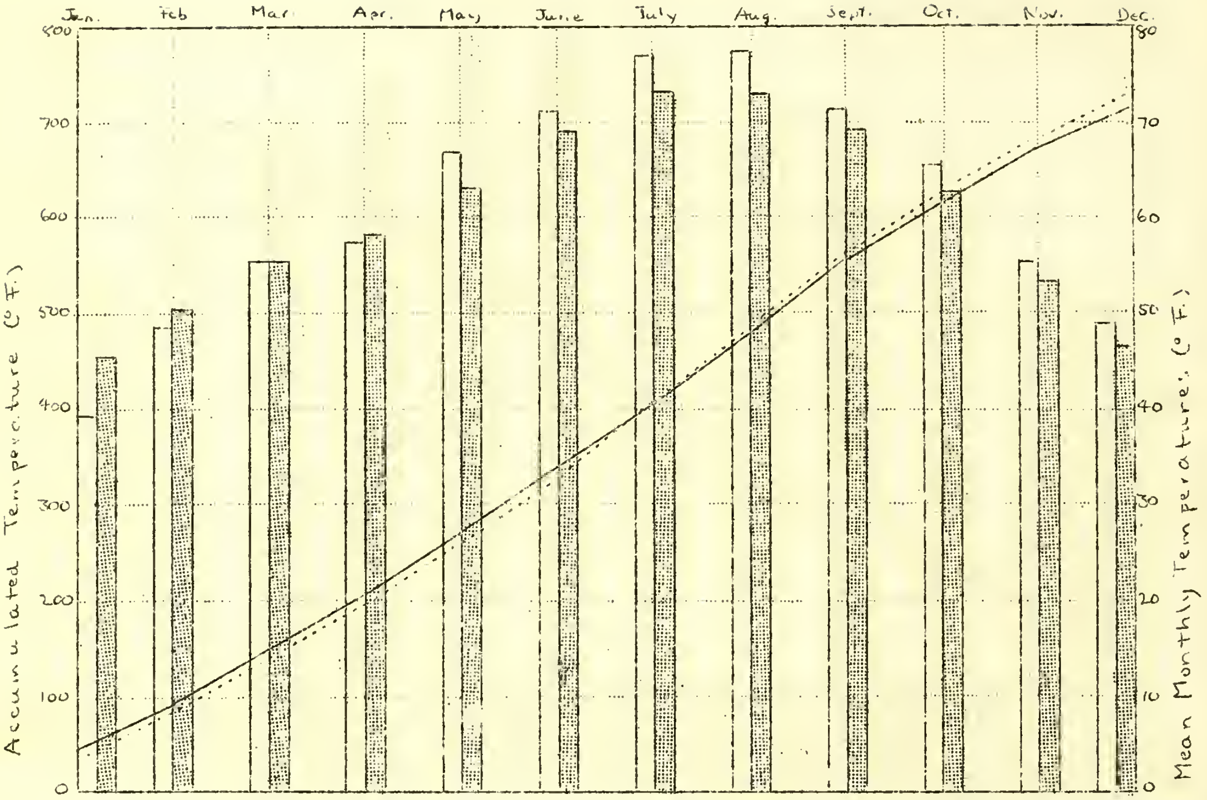

Fig. 19. Accumulated temperature in degrees F. at Sacramento, California for the year 1937 (dotted line) compared with normal (solid line), and mean monthly temperatures (plain bars) compared with normal (shaded bars).

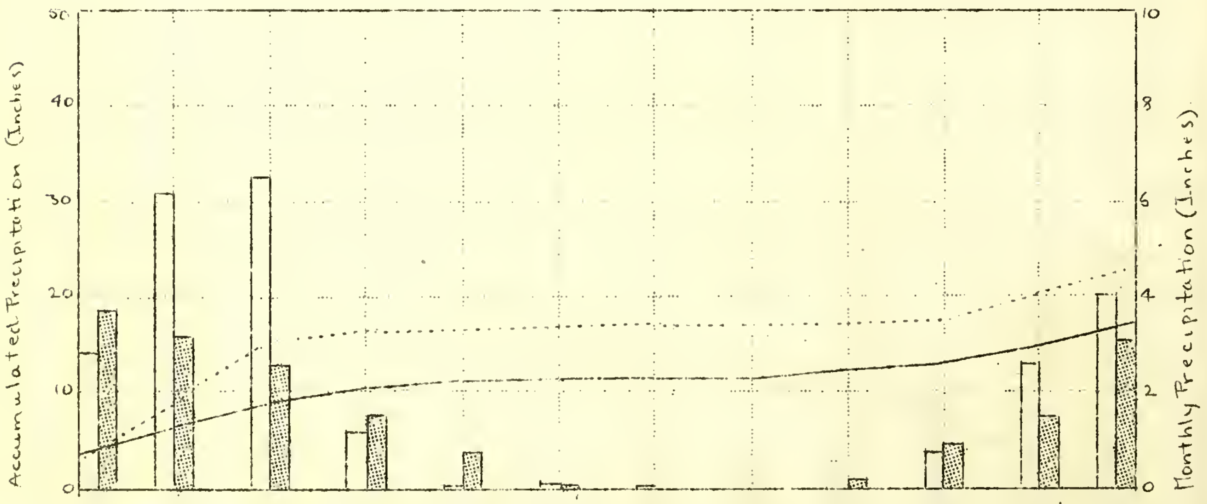

Fig. 20. Accumulated precipitation in inches at Sacramento, California for the year 1937 (dotted line) compared with normal (solid line), and monthly precipitation (plain bars) compared with normal (shaded bars).

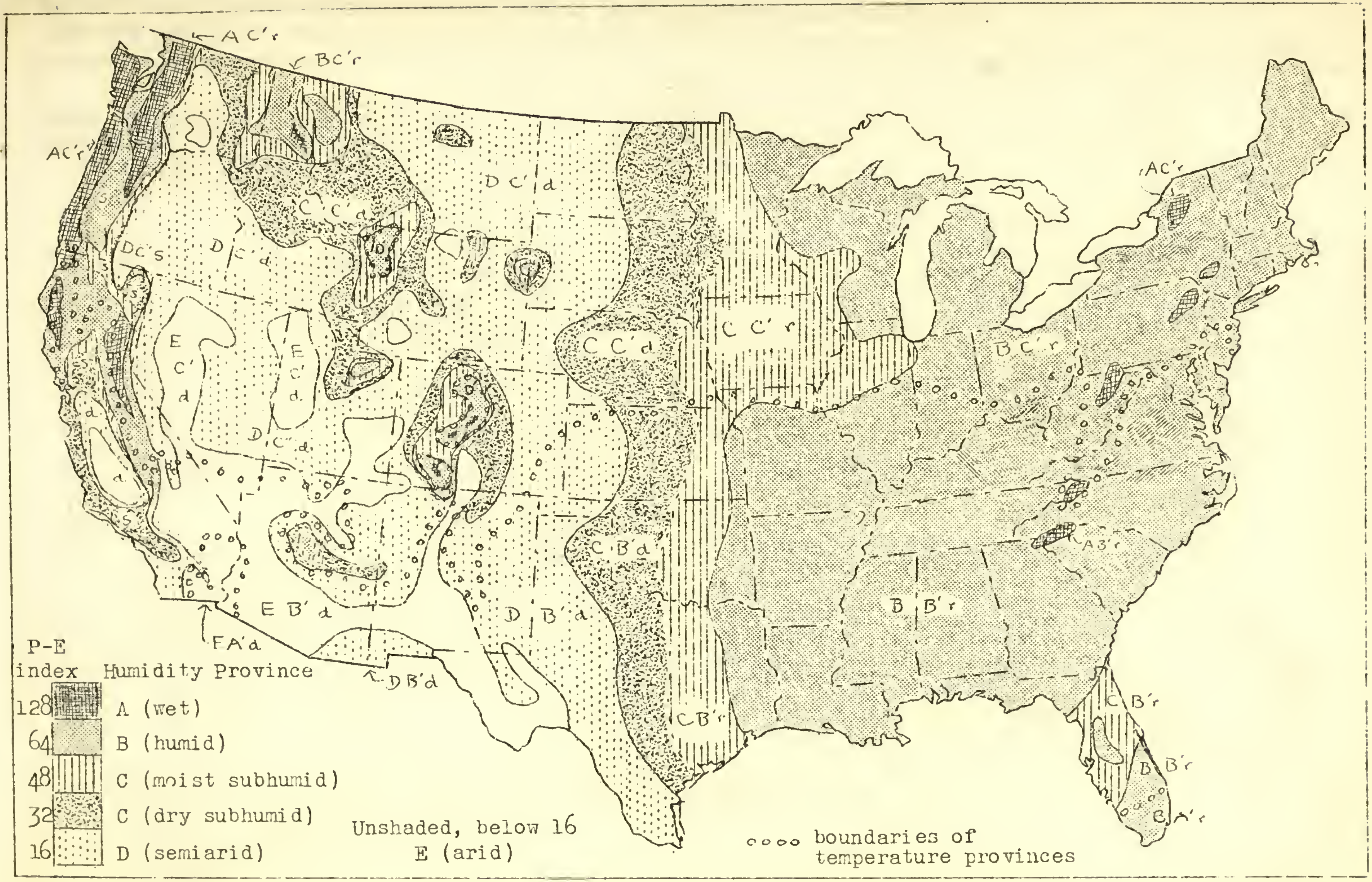

Fig. 21. Adaptation of Thornthwaite's map of climates of the United States (see text). The shading indicates humidity provinces, as shown. For meaning of letters see text (page 171). The map is much generalized in the western part of the country.

Fig. 22. Average percentage of deviation from mean annual precipitation in the United States (tentative). Adapted from National Resources Board Report Dec. 1934 (see text, page 173).

body of knowledge is inherently right or wrong; rather it is more or less useful", and ". . . such classifications are not an end in themselves, but rather convenient modes of synthesis . . ." with constant need for improvement as more satisfactory data become available.

The starting point of Thornthwaite's classification is the assumption that the most efficient possible climate for plant growth results in the tropical rain forest, and that to the extent that any combination of temperature and moisture varies from these conditions it becomes progressively less favorable and is expressed in a correspondingly different type of vegetation. Therefore, vegetation types--forest, grassland, desert, etc.--are taken as indicators of temperature and moisture efficiency, and the limits of natural distribution of each type establish the boundaries of the various climatic provinces[2].

Three climatic factors are employed as criteria in Thornthwaite's classification: precipitation effectiveness, temperature efficiency, and seasonal distribution of effective precipitation. The difficulty of combining more than three factors on one map prevented the use of a fourth important factor, the summer concentration of temperature efficiency, and other factors important for various special purposes were omitted for the same reason. Precipitation effectiveness (P-E) is expressed in an index which is a summation of the twelve monthly precipitation-evaporation ratios at stations with records of ten years or longer, multiplied by ten. Temperature efficiency (T-E) is similarly expressed by means of an index whose base is a summation of temperature units above freezing point, which is considered to be the zero point of temperature efficiency for plant growth. These indexes furnish a quantitative statement by means of which the ranges of temperature and moisture resulting in one vegetation type or another can be measured and the corresponding climatic provinces delimited[3].

The climatic provinces thus distinguished and their equivalent ranges of precipitation effectiveness and temperature efficiency are:

Humidity province	P-E index
A (wet)	128 and above
B (humid)	64
C (moist subhumid)	48
C (dry subhumid)	32
D (semiarid)	16
E (arid)	below 16

2/ See: Thornthwaite, C. W. The climates of North America according to a new classification. Geogr. Rev. 21: 633-655. Oct. 1931; and The climates of the earth. Geogr. Rev. 23: 433-440. July 1933.

3/ For data and methods used in obtaining these indexes, methods of interpolation for obtaining evaporation data, and basis of adjustment of temperature indexes, see Thornthwaite, first reference under footnote 2.

Temperature province	T-E index
A' (tropical)	128 and above
B' (mesothermal)	64
C' (microthermal)	32
D' (taiga)	16
E' (tundra)	1
F' (perpetual frost)	0

The designations for seasonal precipitation are:

r -- rainfall abundant at all seasons.
s -- scanty in summer (abundant in winter).
w -- scanty in winter (abundant in summer).
d -- deficient at all seasons.

These characterizations give a uniform, compact, and flexible method of describing climate in terms of the three factors, available moisture resulting from the combined effects of precipitation and evaporation, temperature efficient for plant growth, and seasonal distribution of effective precipitation.

The climatic provinces as shown on the map obviously can not be considered fixed from year to year; nor can they be thought of as areas of uniform and definite climate from one boundary to the other. On the contrary, for any province climate would be typical only in a comparatively restricted area in the center, shading outward through a more or less broad transition zone with constantly fluctuating climate to the extreme limits of extension of the province over a long period of years. A map for any individual year would present a greatly different picture[4].

The adapted map may serve as a basis for evaluating the significance of the departures shown in Figures 1 to 8. It is obvious that a less than normal precipitation is of greater consequence in a region which because of low normal rainfall and high normal evaporation rate is classified as semiarid than in one where rainfall is normally heavy and is therefore classified as humid or wet. It is also clear that, in general, with an increase in temperature there must be an increase in precipitation to maintain classification within a given humidity province.

The great variability that exists in the climate of a single station is illustrated by Thornthwaite et al.[5], in a discussion of ". . . climatic tension zones, such as the Great Plains, where the climate varies greatly from year to year. At Grant, Nebraska, for example, the annual precipitation during the period of record ranged between a minimum of 9.47 inches in 1910 and a maximum of 35.84 inches in 1915. For the 17 scattered years, in which records are complete, the climatic types (following Thornthwaite's classification) were as follows:

4/ See: Thornthwaite et al. footnote 1. Figs. 2 and 3.

5/ L. c., footnote 1.

"Humid 1, Moist subhumid 4, Dry subhumid 6, Semiarid 5, Arid 1 . . ."

Their discussion of climate and variability has special reference to soil erosion, but is equally applicable in the field of plant pathology or any other affected by weather. A most important factor in this climatic variability is of course the variation in amount of rainfall. The extent to which precipitation varies from one year to another throughout the country is the subject of Figure 22, which is adapted from the Report of the National Resources Board[6], and shows the average percentage of variation from mean annual precipitation.

The yearly variation in the weather is of course a chief factor in the incidence of plant diseases as reported annually in these summaries. Plant diseases, however, are no more exempt than the plants that they affect from the long continued action of climate, and their distribution over a period of years is equally limited by the range of temperature and moisture conditions within which their development is possible. It is at least probable that a broader and at the same time more definite knowledge of the geography of plant diseases would throw some light on many now obscure problems of occurrence and severity and help to explain what seem at times to be contradictory observations and experimental results. Such a plant disease geography is dependent upon a more complete knowledge of distribution than we now possess.

6/ National Resources Board Report on national planning and public works . . . Dec. 1, 1934. From map facing page 294.

DISEASES OF CEREAL CROPS

AVENA SATIVA. OATS:

Powdery mildew (Erysiphe graminis) caused slight losses in Virginia and Oregon. In North Carolina R. F. Poole reported it as very abundant and causing heavy damage to the lower leaves, with a resultant loss of 3 percent. None was observed in 80 oat fields visited in New York, according to M. F. Barrus and K. D. Butler.

Scab (Gibberella saubinetii) was reported as follows: several reports in New Jersey; usual slight importance in Maryland; more prevalent than usual in Illinois, where it occurred in the northern half, but with a loss of only 0.1 percent; not seen or reported in Wisconsin.

Crown rust (Puccinia coronata avenae). Estimated losses from crown rust ranged from nothing to 25 percent, averaging higher in States reporting from the southern and Atlantic Coast regions, and less in the Middle West and Northwest. The highest estimate reported, 25 percent in New York, was said by M. F. Barrus and K. D. Butler to be based on control experiments with dusting sulfur. They reported that crown rust was more prevalent than usual, infection apparently having been favored by abundant moisture in the form of dew and rain, and by cool nights at the period of inoculation. Up to the middle of July only traces were seen but later many fields became badly affected. Infection occurred in every one of the 80 fields visited but was more severe in certain areas. Besides New York, States in which crown rust was said to be more prevalent than usual are Pennsylvania, Georgia, Illinois, and Minnesota. In Iowa less was reported; elsewhere, when a comparison was made, the usual amount. Other loss estimares of 1 percent or more are 20 percent in Georgia, 10 in Louisiana, 5 in Connecticut and North Carolina, 3 in Ohio, 2 in Maryland and Wisconsin, and 1 in Iowa and Texas. Many reports concerning the development of crown rust in 1937 have been given in volume 21 of the Reporter.

Stem rust (Puccinia graminis avenae). Except in Pennsylvania, where the Barberry Eradication Division of the Bureau of Entomology and Plant Quarantine estimated 8 percent loss, stem rust was again unimportant on oats. Late appearance with damage confined to late fields was said by some reporters to explain the slight loss in their States. In New York stem rust was observed in only about a third of the 80 fields visited, and only a relatively few plants showed infection in most of these, although there was considerable in a few. Loss estimates, besides that for Pennsylvania, are 2 percent in New York, 1 in Tennessee and Texas, 0.5 in Iowa, and traces or no loss in other States reporting.

Smut (Ustilago avenae and U. levis). In Kansas and Oklahoma losses of 3.5 percent and 6 percent, respectively, were estimated in 1937 as compared with 20 percent and 10 percent in 1936, indicating a considerable reduction in the amount of smut in the area where it was so severe last year.

Elsewhere there was no significant change, judging from reports. Loss estimates, besides those mentioned, are 14 percent in Pennsylvania; 6 in Maryland, Tennessee, and Wisconsin; 6.5, Virginia; 5, Iowa, Montana; 4, Connecticut; 2.7, Illinois; 2, Ohio, Indiana, South Dakota; 1.5, New York, Georgia; 1.2, Michigan; 1, New Hampshire, North Carolina, Louisiana, North Dakota, Wyoming, Oregon; and a trace in Idaho.

Anthracnose (*Colletotrichum graminicola*) was reported only from Illinois, where it was found in one field in Pulaski County. It was said to be rare on this host in Illinois. Footrot, rootrot, seedling blight (*Fusarium* spp.): A loss of 1 percent was estimated in Oregon, 0.5 percent in Iowa, and traces in Virginia, Illinois, Minnesota, and North Dakota. *Fusarium poae* occurs on panicles of spring oats in Hood River and Clatsop Counties in Oregon. Infected spikelets are sterile, according to Roderick Sprague (PDR 21: 87-88). Leaf spot (*Helminthosporium avenae*), as usual, caused negligible damage in the States reporting it. The greatest estimate of loss was 0.5 percent in Illinois, where the disease was said to be general and more prevalent than usual. Red leather leaf (*Pseudodiscosia avenae*) caused slight loss in Oregon.

Halo blight (*Bacterium coronafaciens*) was reported from New York, Illinois, Iowa, southeastern North Dakota, and Kansas. More than usual occurred in Iowa and North Dakota, while in Illinois there was less. Blade blight said to be caused by *Pseudomonas avenae* and *Bacillus avenae* was prevalent in experimental plots at Manhattan, Kansas, according to C. O. Johnston.

Blast (non-parasitic). Estimates of the importance of blast varied widely. In Illinois the trouble was said to be of the usual importance and a reduction in yield of 15.5 percent was estimated. In New York, according to M. F. Barrus and K. D. Butler, there was more than usual. They found the disease in all of the 80 fields examined, and remarked that it undoubtedly occurred in every field in the State. Their loss estimate of 15 percent takes into consideration the possibility that half of the blasted spikelets could not have produced kernels anyway. In other States reporting it blast was of about the usual importance or less, loss estimates including 2 percent in Montana, 1 in Pennsylvania, North Carolina, and Wisconsin, 0.5 in Virginia and Iowa, and 0.3 in Oregon. The disease was also reported from Minnesota. "Blasted grains" were reported from Washington as due to frost injury.

Red leaf (undetermined, probably non-parasitic) occurred in nearly every field inspected in New York, according to M. F. Barrus and K. D. Butler, who estimated a loss of 10 percent. This estimate does not include the loss from blast, which was more abundant on red leaf plants (PDR 21: 359-361).

BARLEY. See HORDEUM VULGARE.
CORN. See ZEA MAYS.
FLAX. See LINUM USITATISSIMUM.

HORDEUM VULGARE. BARLEY:

Powdery mildew (Erysiphe graminis) was prevalent on spring barley in New York, being present in each of the 37 fields visited by M. F. Barrus and K. D. Butler, besides 41 fields reported by seed inspectors. The estimate of 10 percent loss in spring barley was based on the average loss observed in the fields surveyed. Frequent rains and cool weather probably favored the disease. In other States reporting it powdery mildew was not so generally important although in some cases it was said to cause severe damage in some fields. In Wisconsin it was reported as more prevalent than usual. Losses of 1 percent or more are 2 percent in Virginia and Kentucky and 1 percent in Iowa and North Carolina.

Scab (Gibberella saubinetii) was of little importance in 1937, less than the usual amount occurring in most of the States reporting it, and the highest loss estimated being 1.5 percent.

Stripe (Helminthosporium gramineum) was widely reported, mostly as less prevalent than usual and with losses ranging from 1.5 percent downward, except in North Carolina where R. F. Poole estimated 3 percent and stated that the disease was prominent and caused considerable damage in the Piedmont area. In Wisconsin, according to R. E. Vaughan, the reduced amount of stripe is due to a combination of factors, including the increased planting of the stripe-resistant variety Wisconsin No. 38, the extensive use of seed treatment for the varieties Velvet and Oderbrucker, and the dry summer of the preceding year.

Spot blotch (Helminthosporium sativum) also caused little damage judging from reports. In eastern North Dakota it was said that heavy stands favored the development of head blight. More than the usual amount occurred in this State, as well as in Iowa and Kansas; elsewhere the normal slight amount or even less.

Head blight (Helminthosporium sp.) was more abundant than usual in the Red River Valley of North Dakota, where heavy stands and late rains favored its development.

Footrot and seedling blight caused by Helminthosporium spp. including H. sativum and Fusarium spp., were reported as causing 6 percent loss in Iowa, 1 percent in Minnesota and North Dakota, and a trace in South Dakota. Fusarium footrot caused slight losses in Virginia, North Carolina, and Oregon, and Helminthosporium in Montana and Oregon. The cercosporella footrot caused by C. herpotrichoides was reported from Idaho and Oregon.

Leaf rusts. Puccinia anomala was, as usual, said to be of slight or negligible importance in States reporting it. In New York, M. F. Barrus and K. D. Butler reported that on spring barley "There was apparently very little of this rust this year. Seed inspectors reported it as considerable in 6 fields, and some in 5 fields out of 41. We found it in slight amounts in 6 out of 24 fields." A heavy infection was observed in one field of winter barley in Monroe County, West Virginia, according to C. R. Orton. J. H. Miller reported about 1 percent loss to certain varieties at Athens, Georgia, where, he stated, this rust occurs very rarely. In Kansas a considerable amount was observed on some varieties in experimental plots at Manhattan, according to C. O. Johnston. A loss of 1 percent was reported from Illinois, 0.5 percent in Pennsylvania, traces in New York, Ohio, Indiana, Iowa, and Oregon, and the disease was reported from Minnesota as occurring generally but causing no loss. P. rubigo-vera tritici was reported as causing 2 percent loss in Kentucky, 0.5 percent in Virginia, and traces in North Carolina, Michigan, and South Dakota.

Stem rust (Puccinia graminis tritici) caused losses amounting to more than 10 percent of the crop in Wisconsin, Iowa, and Illinois, as indicated on the map (Fig. 23), the area where damage was heaviest including northern Illinois, southern Wisconsin, and eastern Iowa. R. E. Vaughan reported that

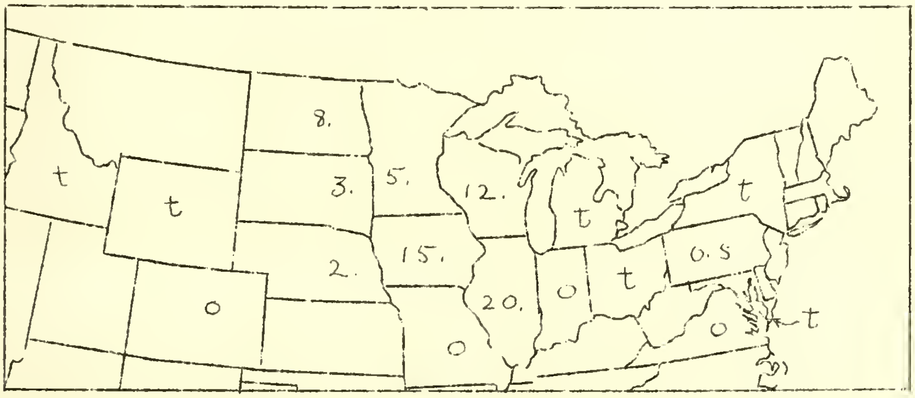

Fig. 23. Estimated percentage loss from stem rust of barley in 1937.

stem rust caused a 25 percent reduction in kernel weight in experimental plots at Madison. Smaller but significant losses occurred in North and South Dakota, especially the eastern parts, and in Minnesota and Nebraska. In Kansas infection was said to be especially severe on winter barley in the south central part, and on spring barley in the north central part of the State.

Scald (Rhynchosporium secalis) was reported for the first time from Missouri, where a considerable infection was found on barley hybrids at the Experiment Station, Columbia, according to A. G. Johnson. In Minnesota J. J. Christensen reported very heavy infection occurring locally on certain varieties not grown commercially in that State. A loss of 2 percent was estimated in Oregon, and occurrence was reported from Wisconsin and California.

Covered smut (Ustilago hordei) seemed to be of about average importance. More than last year was reported from Pennsylvania, Iowa, and South Dakota, and less from Minnesota and Kansas. In New York there was more in winter barley and less in spring barley. According to M. F. Barrus winter barley is a recent crop for New York State, where it is grown in Wayne County and nearby. Some covered smut, ranging up to 25 percent, was found in every field observed, and the average loss was estimated at 10.3 percent. Most of the fields were from the same seed source. In spring barley, which is much more widely grown, the low average percentage of loss, 0.3, is due to seed treatment. Other loss estimates reported are 10 percent in Tennessee, 9.4 in Pennsylvania, 7 to 8 in West Virginia, 4 in Kentucky, South Dakota, and Kansas, 3 in Maryland and Virginia, 2.5 in Iowa, 1.5 in Wyoming, 1 in North Carolina, Ohio, Illinois, and Montana, 0.8 in Wisconsin, 0.5 in Minnesota and North Dakota, 0.2 in Michigan and Oregon, and traces in Indiana and Idaho. In Oklahoma covered smut and loose smut together caused 5 percent loss.

Loose smut (Ustilago spp., including U. nuda, U. nigra, and others). Less than usual was reported from Illinois, Iowa, Wisconsin, and Minnesota. Reports from Wisconsin and Minnesota stated that dry weather at flowering time in 1936 was unfavorable to infection. On spring barley in New York there was also less than usual. In most other States reporting on relative prevalence there was about the usual amount. Percentage losses reported for loose smut, except in Illinois and Wisconsin, were less than for covered smut. They are, 5 percent in West Virginia and Tennessee, 3.5 in Pennsylvania, 2.7 in Illinois, 2.5 in Virginia, 2 in South Dakota and Maryland, 1.6 in Wisconsin, 1 in North Carolina, 0.5 in Ohio and Iowa, and traces in Indiana, Minnesota, North Dakota, Kentucky, Montana, Idaho, Wyoming, and Oregon. In New York there was considerably more in winter barley than in the more widely grown spring barley, estimates of reduction in yield being 1 percent and 0.1 percent respectively.

Leaf spot (Ascochyta graminicola) was found in Illinois for the first time, in Randolph and Macoupin Counties, as reported by the State Natural History Survey. This is the first report to the Survey on barley. Ergot (Claviceps purpurea) was reported as occurring locally in northern States, including New York, Michigan, Wisconsin, Minnesota, North Dakota, and Wyoming. G. H. Starr remarked that this was the first time he had found ergot in barley in Wyoming. Net blotch (Pyrenophora teres) was noted in most fields examined in New York, with considerable infection in some, but with a total reduction in yield of only a trace. It was said to be prevalent on some varieties in experimental plots at Manhattan, Kansas, and was reported from Michigan and Wisconsin. Leaf spot (Septoria passerinii): This infrequently reported disease was found in one field in Pulaski County and one in White County, according to the Illinois State Natural History Survey.

Basal glume rot (Bacterium atrofaciens). Barley has been recorded as a host for this organism, but had not been reported as such to the

Survey prior to 1937, when traces of infection were found in one field in Scott County, Illinois, as reported by the State Natural History Survey. Bacterial blight (Bacterium translucens) is an important disease in Iowa. C. S. Reddy estimated 8 percent loss in 1937.

Albinism (genetic) was observed to be unusually abundant in barley that germinated during January, in California.

LINUM USITATISSIMUM. FLAX:

Wilt (Fusarium lini) was of the usual prevalence in Minnesota and North Dakota, and caused losses estimated at 1 percent in both States. In Wisconsin more than usual was reported. Rust (Melampsora lini): The usual infection but moderate importance was reported from Minnesota, the loss there being estimated at 0.5 percent. In Wisconsin and North Dakota there was said to be less than usual. Damping-off (Pythium debaryanum) was less important than usual in Iowa, but caused a loss of 10 percent according to C. S. Reddy. Root rot (Rhizoctonia sp. and other fungi) occurred generally and caused a loss of 0.5 percent in Minnesota. Pasmo (Sphaerella linorum Wollenweber [Septoria linicola (Speg.) Garassini [Phlyctaena linicola Speg.]]): Scattered infection was reported from Wisconsin and Minnesota, with less than usual in Wisconsin and the usual amount in Minnesota. Heat canker (non-parasitic) was reported from Minnesota and North Dakota, with the usual prevalence in both States, and with a loss of 0.5 percent in North Dakota.

OATS. See AVENA SATIVA.

ORYZA SATIVA. RICE:

Leaf spot (Cercospora oryzae) was said to be about as abundant as usual in both Arkansas and Louisiana. It is an important disease in the latter State, according to T. C. Ryker, who estimated a reduction in yield of 2 to 5 percent. Black kernel: Chaetomium sp., Curvularia lunata, Fusarium sp., Nigrospora oryzae, and Phoma sp. were reported associated with this condition in Texas. Black leaf smut (Entyloma sp.) was less prevalent than last year in Louisiana, according to T. C. Ryker. Stem rot (Leptosphaeria salvinii [Sclerotium oryzae]) was reported by E. C. Tullis as more severe in Arkansas than it had been for the past two or three years. In Louisiana there was less than usual. Leaf and glume spot (Ophiobolus miyabeanus [Helminthosporium oryzae]) was reported from Arkansas as about average and from Louisiana as less prevalent than usual. Blast (Piricularia oryzae) was reported from Arkansas. Sheath spot (Rhizoctonia sp.) was of the usual slight importance in Louisiana. Smut (Tilletia horrida): T. C. Ryker reported this as occurring in the usual slight amounts in Louisiana, and stated that Rexoro is the only variety upon which it has been found to be prevalent in that State.

Straighthead (non-parasitic) was reported as occurring locally in Arkansas. White tip (non-parasitic) was reported from Louisiana as of moderate importance although general in rice sections.

RICE. See ORYZA SATIVA.
RYE. See SECALE CEREALE.

SECALE CEREALE. RYE:

Ergot (Claviceps purpurea). Judging from the number of States in which its presence was reported, and from the comments of some of the reporters, ergot was somewhat more prevalent than for the past several years. It was reported from Connecticut, New York, Pennsylvania, Maryland, Virginia, Kentucky, Tennessee, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, the Dakotas, Montana, Oregon, and Washington. In New York, Minnesota, Iowa, and North Dakota there was said to be more than usual; in Maryland, Michigan, Wisconsin, and South Dakota the usual amount was reported; for other States no comparison was made. M. F. Barrus and K. D. Butler reported that they found ergot in 8 rye fields out of the 12 visited in New York, and, "In the plots of rye used in the potato rotation experiment at North Cohocton, Steuben County, every head was badly affected." Severe infection observed in one field in Washington was reported by A. G. Johnson as follows: "In a twelve-acre field of rye near Colville, Washington, there was 30 to 50 percent ergot. The threshed grain contained 29.5 percent ergot sclerotia by weight, 32 percent by volume." In Illinois, according to the State Natural History Survey, volunteer rye in wheat was heavily infected, while rye fields were very lightly infected. W. E. Brentzel reported that early rains and cool weather favored infection in North Dakota. Loss estimates are 3 percent in South Dakota, 1 in Wisconsin, 0.7 in Iowa, 0.5 in Minnesota, North Dakota, and Maryland, traces elsewhere.

Anthracnose (Colletotrichum graminicola) was also more widely reported than for some years past. Losses were estimated at 5 percent in Pennsylvania and North Carolina, 0.5 percent in Wisconsin and Illinois, traces in Indiana, Michigan, and Iowa. In Wisconsin the disease was said to be widespread in May, causing losses up to 10 to 15 percent in affected fields.

Stem rust (Puccinia graminis) was unimportant on rye in 1937, losses reported being a trace or none.

Leaf rust (Puccinia rubigo-vera secalis). Estimates of loss from leaf rust ranged from 5 percent in Pennsylvania, 2 percent in Ohio and Illinois, to 0.5 percent in Virginia and Wisconsin, a trace in North Carolina, Tennessee, Indiana, Iowa, and Oregon, and no loss in Minnesota, North Dakota, and Montana. In Georgia, according to J. H. Miller, infection was heavier than usual, and the loss observed in certain varieties at

Athens was about 10 percent. In Wisconsin R. E. Vaughan reported that although infection was severe on spring-sown rye to be used for pasture, the grain crop escaped damage through its earlier maturity.

Leaf spot (Ascochyta graminicola) was found in Illinois, in Bond County. According to the State Natural History Survey, this disease has been found twice previously, in 1930 in Clinton County, and in 1931 in Edwards County. This is the first report of its occurrence on rye in the Survey files. Powdery mildew (Erysiphe graminis) was reported from Michigan and New Jersey. Scab (Gibberella saubinetii) was found in one field in Illinois, occurred locally in Wisconsin, and was reported from Ohio. In each case a trace of loss was estimated. Footrot and seedling blight (Helminthosporium spp. and Fusarium spp.) were reported from nine States, mostly in the north central region, the only loss of more than 1 percent estimated being 2 percent in Iowa. Mushroom death (Marasmius tritici) was reported by the Illinois State Natural History Survey from an additional county, Bond. Scald (Rhynchosporium secalis) was reported only from Illinois where a loss of 1 percent was estimated. Stem smut (Urocystis occulta) was widely reported as of negligible importance, the only loss higher than a trace being 0.5 percent in Illinois.

SORGHUM VULGARE. SORGHUM:

Leaf blight caused by a fungus tentatively referred to Ascochyta sorghina Sacc. was reported for the first time in 1937, from Alabama and Georgia (PDR 21: 309; 378). In Georgia it was first brought to the attention of pathologists in 1936, but its general distribution and severe attack on grain sorghums, sorgo, Sudan grass, and Johnson grass, indicated occurrence for a considerable period, as did also reports of growers that they had observed what seemed to be the same disease for about forty years. If the fungus is the same as the European species, the severe infection reported here suggests that conditions in these southern States are particularly favorable for its development, or that the hosts are especially susceptible, or both.

Rust (Puccinia purpurea) was said to be more prevalent than usual in Kansas, where C. O. Johnston reported "A sprinkling was noted on forage sorghums (Atlas and Kansas Orange), near Manhattan. It was also noted in the Botany Department experimental plots, and was seen on Atlas-Johnson grass natural hybrids." Rust was reported from Texas also, on sweet and grain sorghums.

Head smut (Sorosporium reilianum) was reported from Wisconsin, where it was said to be of the usual slight importance and scattered occurrence. Covered kernel smut (Sphacelotheca sorghi) was reported as occurring in the usual amounts in Wisconsin, Texas, Oklahoma, Kansas, and Wyoming. According to G. H. Starr the disease is very important in southeastern Wyoming. In 1937 it caused a 15 percent reduction in yield of seed, although loss to forage was slight. In a number of fields inspected from 25 to 35 percent of the heads were infected. Other losses reported are 1 percent in Oklahoma and 2 percent in Kansas.

Anthracnose: Colletotrichum falcatum was found on all plants in a twenty-acre field of broom corn in Cumberland County, Illinois, as reported by the State Natural History Survey. A specimen of C. graminicola, on sorghum, was received from Virginia. Red spot (Fusarium sp., Rhizoctonia sp.) was reported from Reeves County, Texas. Root rot, with which Helminthosporium sp., Phoma sp., Aspergillus nigricans, and nematodes are associated, is generally distributed and an important problem in Oklahoma. In 1937 it caused a reduction in yield estimated at 10 percent. Root and crown rot of milo with the cause listed as Pythium sp., was reported to the Survey only from Texas in 1937.

A root rot with which a Bacterium sp. was associated was reported from Reeves County, Texas. Bacterial stripe (Bacterium andropogoni) was reported from Kansas by C. O. Johnston, as follows "A little was observed on sorghums in creek valleys in the vicinity of Manhattan during September. There was a considerable infection on feterita and some feterita hybrids in the Botany Department experimental plots late in the season." Bacterial spot (Bacterium holci): A considerable amount was observed on Sudan grass, and traces on a few other sorghums in experimental plots at Manhattan, Kansas, according to C. O. Johnston. It was also reported as occurring locally in Arizona. Bacterial streak (Bacterium holcicola): C. O. Johnston reported from Kansas that "Traces were observed on a few varieties and hybrids in experimental plots late in the season. It was especially prevalent on Sudan grass."

Chlorosis due to iron deficiency was reported as causing 5 percent loss in Oklahoma. Weak neck (cause unknown): According to C. O. Johnston, "A. F. Swanson reported considerable injury caused by this trouble in experimental plots at Hays, Kansas."

TRITICUM AESTIVUM, T. DURUM, etc. WHEAT:

Ergot (Claviceps purpurea), as usual, was of slight importance in the five States reporting it, although there was said to be more than usual in New York, Minnesota (on durum), and North Dakota (more common on durum). In New York, where ergot seldom occurs on wheat, it was found in three fields.

Anthracnose (Colletotrichum graminicola) was found in two fields in New York, the only State from which it was reported.

Powdery mildew (Erysiphe graminis) was reported as causing slight to moderate damage in many fields in New York, with the total loss for the State doubtfully estimated at 2 to 3 percent. It was found to some extent in practically every field visited, according to M. F. Barrus and K. D. Butler. In Illinois the disease was observed only in thick spots along a ravine in one field. In Kansas, C. O. Johnston reported infection as prevalent in the Manhattan rust nursery, moderate in some fields in the Kaw Valley and more or less heavy in some lowland fields in the extreme northeastern part. Powdery mildew was also said to be generally distributed in New Jersey and Virginia, more prevalent than usual in West Virginia, much less so in Indiana, about as usual in Michigan, and was reported from Texas. (See PDR 21: 201-211 for report on varietal reactions in Kansas).

Footrots and rootrots, and seedling blight caused by various organisms: Cercosporella footrot (C. herpotrichoides) caused traces of loss in Idaho, Washington, and Oregon. Fusarium spp. and Helminthosporium spp., including H. sativum, were reported from a wide range, mostly together. Comments indicated that this type of footrot was more to much more prevalent than usual in most of the States reporting from the central part of the country, where losses were estimated at 5 percent in Iowa and Kansas, and 2 percent in Minnesota and the Dakotas. In Kansas, according to Hurley Fellows, the increased prevalence was associated with the dry hot season. Damage in other States, when reported, was negligible. In Pennsylvania, according to R. S. Kirby, H. sativum was found in only 4 of the 109 wheat fields surveyed. Seedling blight (Fusarium spp. and Helminthosporium sp.) was of the usual moderate importance in Minnesota. Take-all (Ophiobolus graminis) was seen in only 5 fields of the 169 visited in New York, according to M. F. Barrus and K. D. Butler, and none was reported in the 50 fields inspected by seed inspectors. In Kansas, Hurley Fellows reported that this disease was prevented from developing by the dry hot season and there was less than usual. Take-all was reported also from Tennessee and Oregon. Rootrot (Pythium sp.) was reported from Texas where it caused a loss of 0.5 percent.

Scab (cause reported as Fusarium culmorum) occurred in Adams County, Washington.

Scab (Gibberella saubinetii) was reported generally, with slight or negligible losses, from New York to North Carolina east to the Mississippi, from Iowa, Minnesota, and the Dakotas, and from Georgia and Texas. The only loss estimates of 1 percent or more were 1.5 percent in Maryland and Virginia, and 1 percent in Pennsylvania and North Carolina. However, rather severe local infections were reported in some cases.

Blotch (Helminthosporium sativum) was reported from Michigan.

Mushroom death (Marasmius tritici) was found in one small area in one field in Effingham County, Illinois, according to the State Natural History Survey.

Stem rust (Puccinia graminis tritici) distinguished itself by the second major outbreak within three years, with a total loss exceeded only in 1935 during the twenty years that loss estimates have been compiled by the Survey. The 1937 epidemic extended further to the east than did that of 1935, was much less severe in the spring wheat region and the Great Plains States, and did not involve regions to the west or south. This difference in area covered and losses caused during the two years is shown in Figures 24 and 25, while in Figure 26 is given an approximate representation of the regions most severely affected in 1937, based on all available information.

Much concerning the development of the epidemic has been given in Volume 21 of the Reporter, and a detailed account for Kansas is the subject of Supplement 107. Apparently there was very little overwintering in Texas in 1936-1937. The rust was first noticed in southern Texas April 6 and in northern Texas at the end of April. Most of the wheat in Texas and Oklahoma, except in scattered areas and late fields, matured early enough to escape damage, but rust development was sufficient to furnish abundant inoculum for regions to the north. By the end of the first week in June infection was general as far north as central Iowa, although only in traces northward, and in some restricted areas, notably in southwestern Missouri, northeastern Oklahoma, and southeastern Kansas, in northeastern Kansas and in east central Illinois, it was already very heavy. An unusually heavy infection was observed on the leaves in Kansas at this time, in some fields leaf infection being as high as 25 percent, with only a trace to 5 percent on the stems (Suppl. 107). Subsequently the development of the rust was favored by heavy stands of wheat, much of which was late, by weather, and by the preponderance again of race 56 to which most of the spring wheat varieties grown in North and South Dakota were susceptible. The smaller loss in Minnesota as compared with the Dakotas is probably attributable to the fact that a large part of the spring wheat planted there was Thatcher, which is resistant to race 56. In the winter wheat region heaviest losses were concentrated in the area from northeastern Oklahoma, eastern Kansas, and southeastern Nebraska, through Iowa, Missouri, central Illinois, and Indiana, to southwestern Ohio (Figure 26). Losses in Iowa, Missouri, Illinois, and Indiana were the heaviest reported for at least twenty years.

Westward the amount of infection decreased rapidly, owing to drought and heat, which in themselves caused great deterioration in the condition of the crop. Johnston, Melchers, and Miller (Suppl. 107) reported that the loss from stem rust in the eastern quarter of Kansas was 27 percent, whereas in the section immediately adjoining on the west it was only 3.5 percent and farther west it was even less, amounting to only a trace in the western half of the State.

Attention is called to the correction in the Crop Loss Estimates (PDR 23: 17-18).

Leaf rust (Puccinia rubigo-vera tritici). Opinion as to the importance of leaf rust varies widely, as shown by reports and estimates from neighboring States (Fig. 27); in fact, this disease is probably one

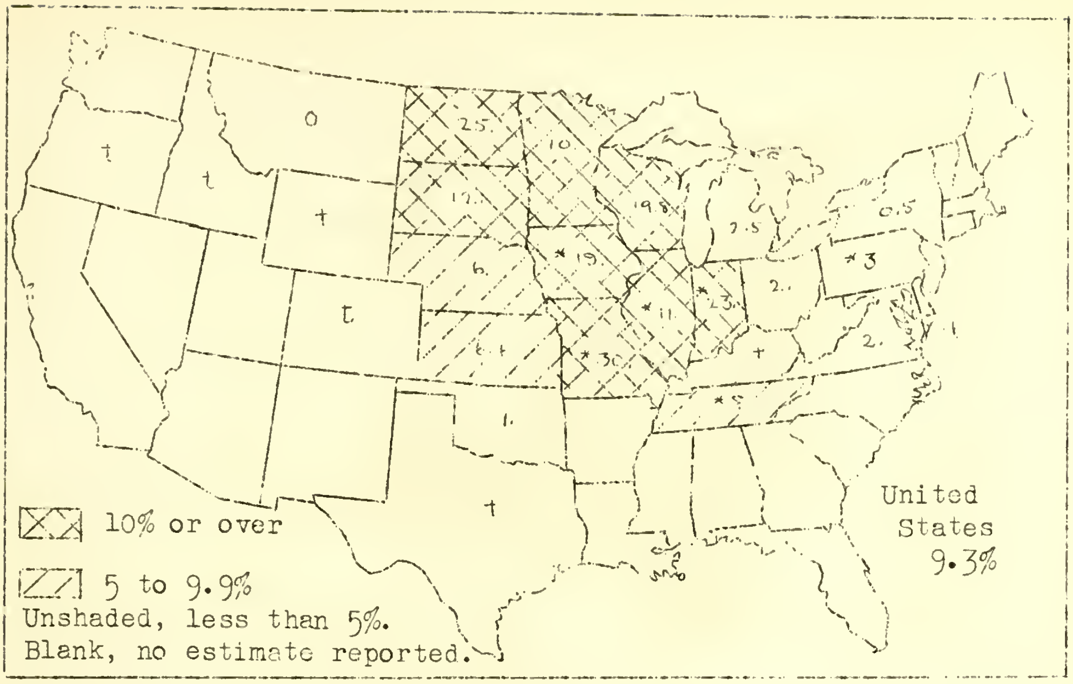

Fig. 24. Estimated percentage losses caused by stem rust of wheat in 1937. (*= heaviest loss reported to the Survey from State).

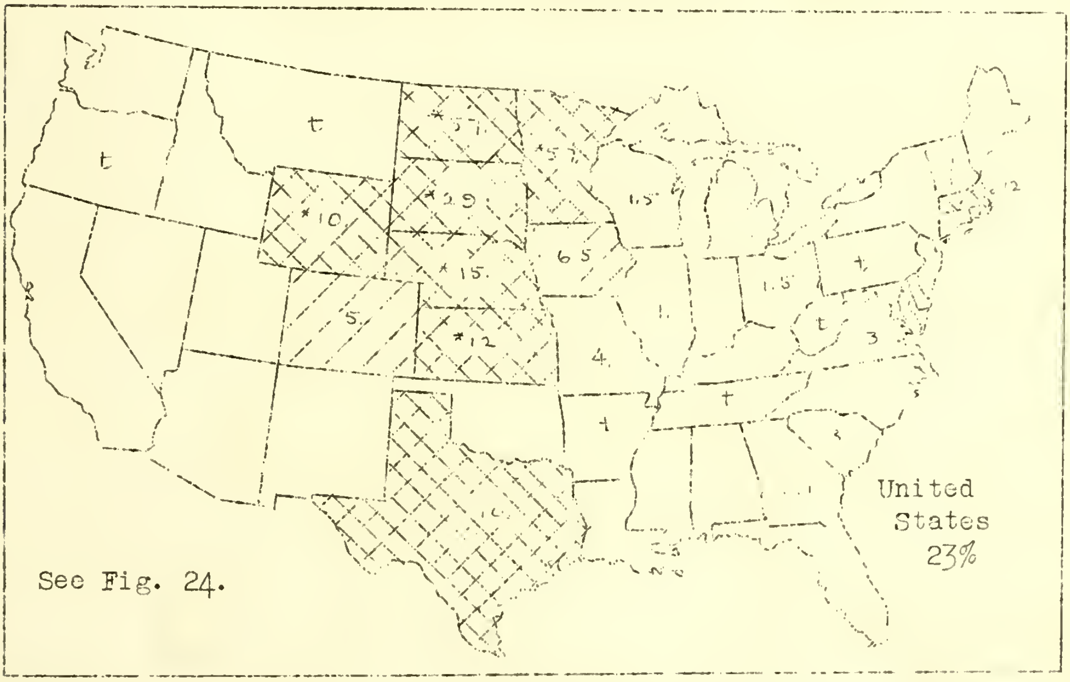

Fig. 25. Estimated percentage losses from stem rust of wheat in 1935. (*= heaviest loss reported to the Survey from the State).

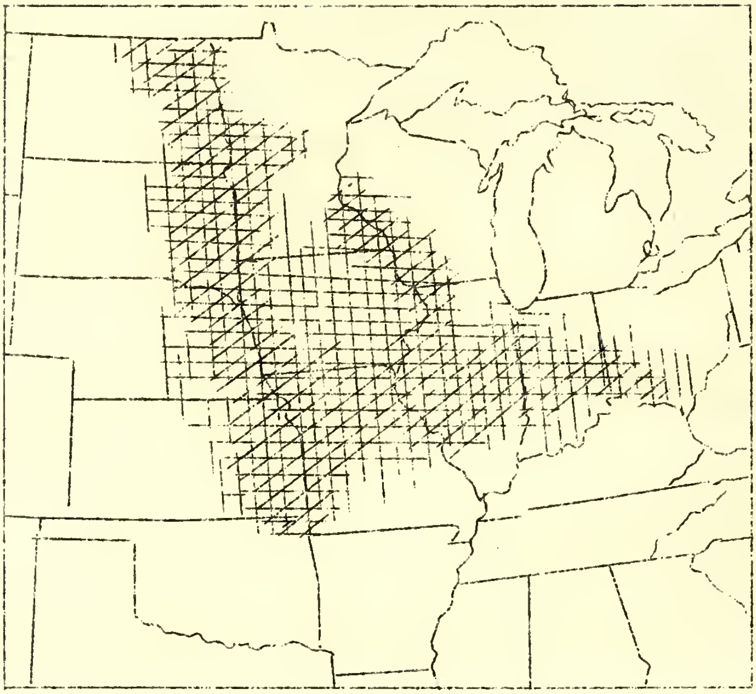

Fig. 26. Approximate extent of areas in which stem rust caused heaviest losses to wheat in 1937.

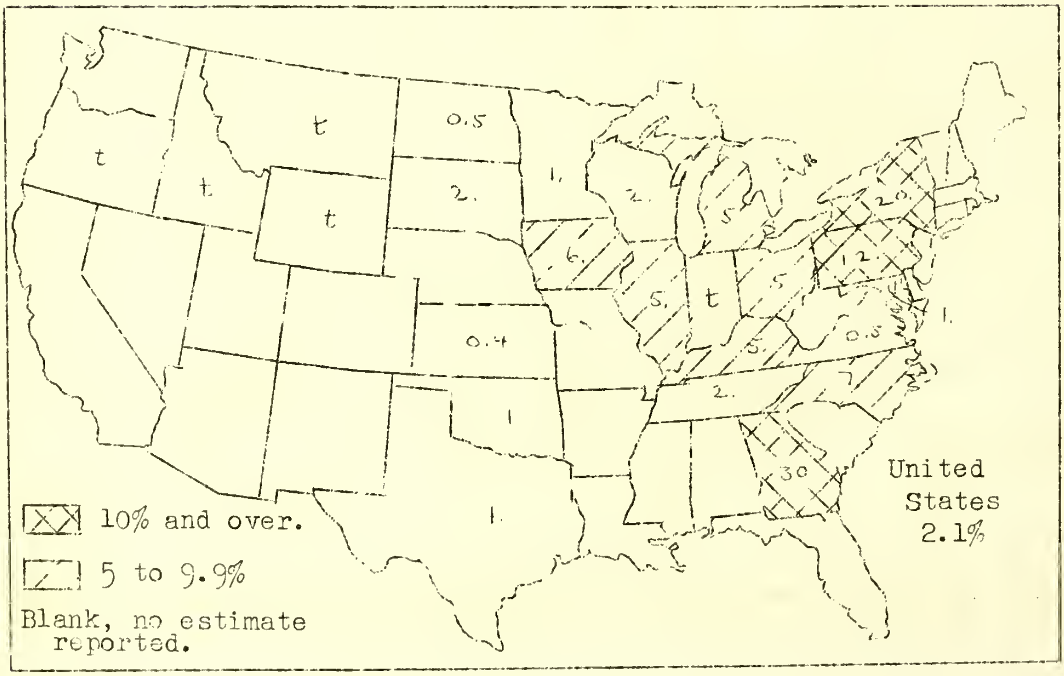

Fig. 27. Estimated percentage losses from leaf rust of wheat in 1937.

of the least uniformly estimated as far as comparative records are concerned. Pathologists who have worked with it indicate several possible reasons for this lack of uniformity: in areas where leaf rust is most important it occurs practically every year to a greater or less extent with the result that its effect on yield is apt to be overlooked except in epidemic outbreaks, and even then, for lack of a disease-free standard, the loss may largely be underestimated: because it occurs to some extent every year, it does not focus the attention by a spectacular outbreak as does stem rust: in contrast to the apparent suddenness with which stem rust often attacks, leaf rust is apt to appear early and to develop steadily throughout the season: since it does not cause shriveling of the grain as stem rust does, its effects are much less conspicuous. Possibly this contrast with stem rust is a chief factor responsible for minimizing leaf rust as a cause of loss. Even in epidemic years, damage is likely to be overshadowed by or confused with that due to stem rust, since, in general, conditions favorable for one rust are also favorable for the other.

It is probable that if the loss from stem rust were spread over a period of years instead of being concentrated in destructive outbreaks, that disease would attract much less attention than it does. Suppose, for example, that loss in Minnesota instead of varying from a trace to 57 percent had been 11 percent annually, which is the present average and the highest for any State, would it not be considered a routine loss subject to the "familiarity that breeds contempt", rather than a calamity to be feared?

It is of interest to note that the twenty-year period from 1918 to 1937 includes four years, 1919, 1920, 1935, and 1937, in which the total loss to the country from stem rust was more than 6 percent, and only one, 1935, in which leaf rust caused as much as 5 percent loss, according to the estimates. Nevertheless, the average estimated loss from leaf rust for the period was 1.6 percent, practically half as much as the 3.3 percent average for stem rust; and this in spite of the fact that, in the opinion of those who have worked with it, damage from leaf rust has been rather consistently underestimated.

This is not to say that leaf rust does not vary in importance from year to year and from region to region. On the contrary, it probably does vary much more widely than our reports would indicate.

In 1937, reports and estimates indicated less leaf rust than usual in the winter wheat region of the central part of the country, because of non-overwintering and consequent late appearance. According to I. M. Atkins, leaf rust was not observed at Denton, Texas, until March 31, which is much later than usual, the disease ordinarily reaching epidemic proportions by that time, and on April 15 infection although general was still very light. C. O. Johnston reported that in Kansas "Leaf rust developed unusually late in the season and was heavy only in the eastern half of the

State. The most damage was noted on late wheat in the northeastern quarter. Leaf rust undoubtedly was more serious than in 1936 but was overshadowed by the stem rust epidemic." R. M. Caldwell reported that leaf rust in Indiana did not develop until late in the season. In Michigan and Wisconsin there was less leaf rust than usual, its effects being obscured by those of stem rust in Wisconsin, according to R. E. Vaughan. On the other hand, in Illinois, Minnesota, and South Dakota, there was said to be more or much more than usual, while in North Dakota the normal amount was reported.

In the Southeast a mild winter permitted extensive overwintering and unusually early and severe development resulting in heavy loss judging from a report from Georgia by J. H. Miller. Leaf rust began to appear during February, and about 10 percent of the leaves were infected in northern Georgia by the middle of March, a month earlier than usual. No comments were made in reports from other States in this section. Farther north, there was said to be less than usual in Maryland, and the usual amount in Pennsylvania. "Leaf rust was found in every one of the 169 fields of winter wheat visited in New York", according to Barrus and Butler, and "The loss estimate of 21.7 percent in winter wheat was based on the increases in yield obtained by dusting 10 fields where leaf rust was the only important disease present affected by the dust." Estimates of loss are shown in Figure 27.

Glume blotch (Septoria nodorum) was reported as occurring in the usual amounts or somewhat more, and as causing losses estimated at 2 percent in Pennsylvania, 1.5 in New York, 1 in North Carolina, and smaller amounts in other States. Head blight and glume blotch reported as due to Septoria and Alternaria caused a loss of 0.5 percent in Michigan, and a head blight associated with Alternaria, Diplodia, Fusarium, and in some cases with S. nodorum was reported from New Jersey.

Speckled leaf blotch (Septoria tritici). In Illinois, according to the State Natural History Survey, this is a rather important disease. Prevalence in 1937 was about as usual and the loss was estimated at 6 percent. In fields examined the average percentage of plants affected was 95.7, with 16.5 percent of the leaf area destroyed. In one field all plants were attacked and more than 40 percent of the leaf area was involved. In other States reporting it, speckled leaf blotch is not considered important. The loss in New York and Virginia was said to be 1 percent; elsewhere it was less.

Bunt (Tilletia levis and T. tritici). Unusually large amounts occurred in some parts of Texas and Oklahoma, according to reports. K. Starr Chester reported that "Five hundred carloads of 1937 Oklahoma wheat were docked for smut. Much of the wheat was smutty but just under dockage concentration. This is our most serious wheat problem." More than usual was reported from New York, Pennsylvania, and Illinois. In New York the loss to winter wheat from *T. levis* was estimated at 1.5 percent. Regarding their estimate, Barrus and Butler commented, "1.5 percent is the average of all fields visited but we think that the actual percentage was somewhat higher. Thirty-four carlots of wheat received at Buffalo during the first 30 days of the 1937 crop movement were graded smutty." In New York the disease is present mainly in the western part. In Pennsylvania, according to R. S. Kirby, "Bunt was found in 71, or 72.6 percent, out of 122 untreated fields surveyed. A trace was found in 2 of the 19 fields treated with copper carbonate and in 6 of the 25 treated with ceresan."

Elsewhere, when indicated, there was the usual amount or less. In Wyoming, in a survey made late in the summer, reported by G. H. Starr, 80 percent of the fields examined were free from bunt although a few showed high percentages, and no bunt was found in the northern portion or the western valleys. Evidence from terminal inspection of car receipts in the Pacific Northwest indicates a decrease in loss from smutty wheat in that region during the period from 1930 to 1937, according to Bert W. Whitlock (PDR 21: 407-409).

Losses of 1 percent or more estimated in 1937 include 5 percent in Idaho, 3 in Pennsylvania and Tennessee, 2.5 in Maryland and Virginia, 2 in Michigan, 1.5 in New York and Wyoming, and 1 in Kentucky, North Carolina, Wisconsin, South Dakota, Kansas, and Oregon.

Loose smut (*Ustilago tritici*) was generally reported as occurring in the usual amounts or less, with losses ranging from 3 percent downward. Unusually heavy infection in winter wheat in Kansas, Oklahoma, and north central Texas was reported by C. O. Johnston (PDR 21: 199-200), it being especially serious in northern Texas and in Oklahoma. He stated that "This situation has been developing for the past four or five years, and I think there is no doubt that that we may experience heavier infections in the hard red winter wheat area of Kansas within the next few years. As a matter of fact, there is more loose smut in Kansas this year than I have ever observed before." A trace of loose smut was found in several varieties in plots at the Moro branch experiment station in Oregon, in heads of wheat grown from local seed raised in the plots the year previous. According to Roderick Sprague, "While it is not uncommon to find a trace of loose smut at Moro in the first generation progeny of seed grown east of the Rockies, it is rather rare to find it in the progeny of seed that has been grown on the station." (PDR 21: 225).

Basal glume rot (*Bacterium atrofaciens*) was reported from Illinois. Black chaff (*Bacterium translucens undulosum*): Local or scattered infections were reported from Virginia, Ohio, Illinois, Wisconsin, Minnesota, Iowa, and the Dakotas.

Wheat nematode (*Anguina tritici*) was reported from West Virginia, in Monroe County. In Georgia it was found in old locations in Hart, Franklin, and Pickens Counties, and in a new location in Stephens County.

Mosaic (virus). R. M. Caldwell reported much more than last year in winter wheat in Indiana. The varieties Trumbull, Gladden, Fulhio, and Michigan Amber are very resistant, while Purkoff and Purdue No. 1 are very susceptible, according to his report. In Illinois mosaic occurs in the Illinois River Valley where in 30 fields observed in 1937, 6.6 percent of the plants were diseased, according to the State Natural History Survey. Hurley Fellows reported less than the average and much less than last year in Kansas. The loss in all three States was said to be a trace.

Albinism (genetic). Unusual amounts were observed in California in wheat and barley that emerged during January, according to C. A. Suneson.

WHEAT. See TRITICUM AESTIVUM.

ZEA MAYS. FIELD CORN:

Black bundle (Cephalosporium acremonium), although less prevalent than usual in Illinois, caused a considerable loss, estimated at 6.8 percent. The State Natural History Survey reported that among 12,500 stalks examined from the middle of October to the middle of November, 15.5 percent were infected by this organism, of which 6.8 percent were barren and 8.6 percent bore ears. One percent loss was estimated in Pennsylvania and a trace in Iowa. In New Jersey only a few infected stalks were observed. The disease was reported from Texas also.

Ear and stalk rot (Diplodia spp.). D. zeae as a cause of both diseases was said to be less to much less prevalent as compared with both the preceding and the average year in Ohio, Indiana, Illinois, and Iowa. John F. Trost reported that in Indiana "General reports verify counts of one or two ears per wagon load at husking. Less than 0.1 percent of Diplodia infection was found in seed germinations of the 1937 crop." In Illinois, according to the State Natural History Survey, "The average percentage of ears infected in positive fields was 0.75. Occurrence was too rare for the standard 200-ear count. Koehler reports 0.18 percent on the University South Farm." In all of these States, where the fungus is ordinarily a very important factor, as well as in Michigan where it is usually of little consequence, it was practically negligible in 1937, according to reports and estimates. This agrees with Hoppe's findings (PDR 22: 234-241) from the 1937 survey on relative prevalence and geographic distribution of corn ear rot fungi as shown by samples from carload lots of known origin, "The 1937 crop throughout the Corn Belt proper was characterized by the lowest incidence of Diplodia zeae for the five years this survey has been in progress." He reported further that D. zeae was the principal fungus, as in previous surveys, in samples from the Atlantic Seaboard States including Pennsylvania, Maryland, and Delaware, and that high percentages occurred in samples from the southern States (Fig. 29). Collaborators' reports from Pennsylvania, Maryland, Wisconsin, and Minnesota indicated the usual slight

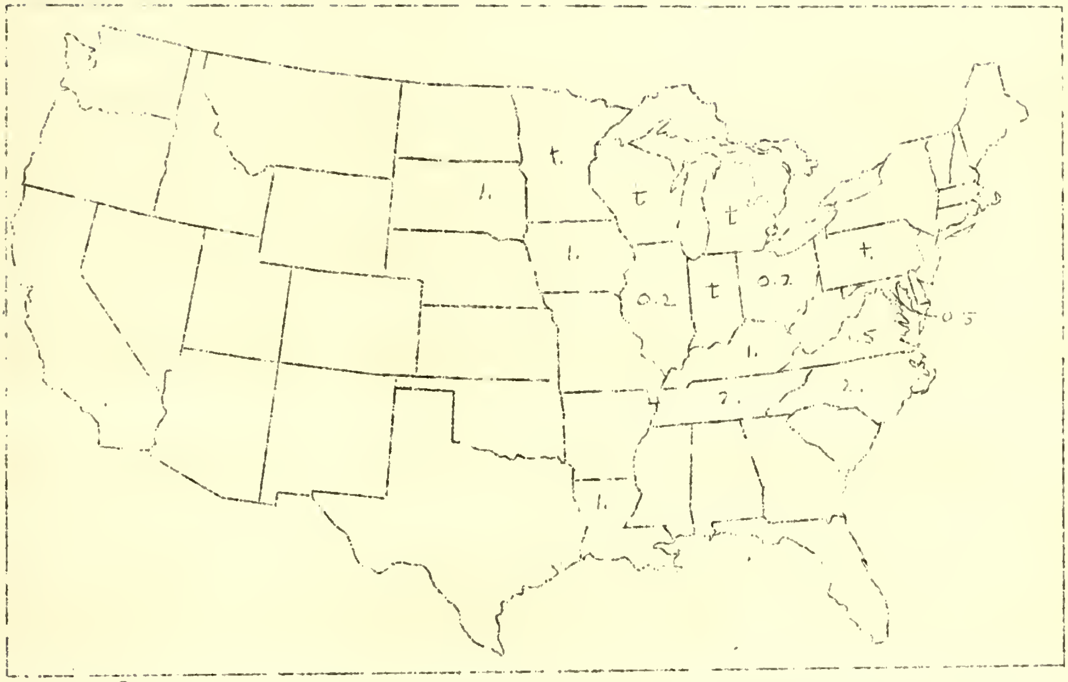

Fig. 28. Percentage losses due to ear and stalk rots caused by <u>Diplodia zeae</u>, as estimated by collaborators, 1937.

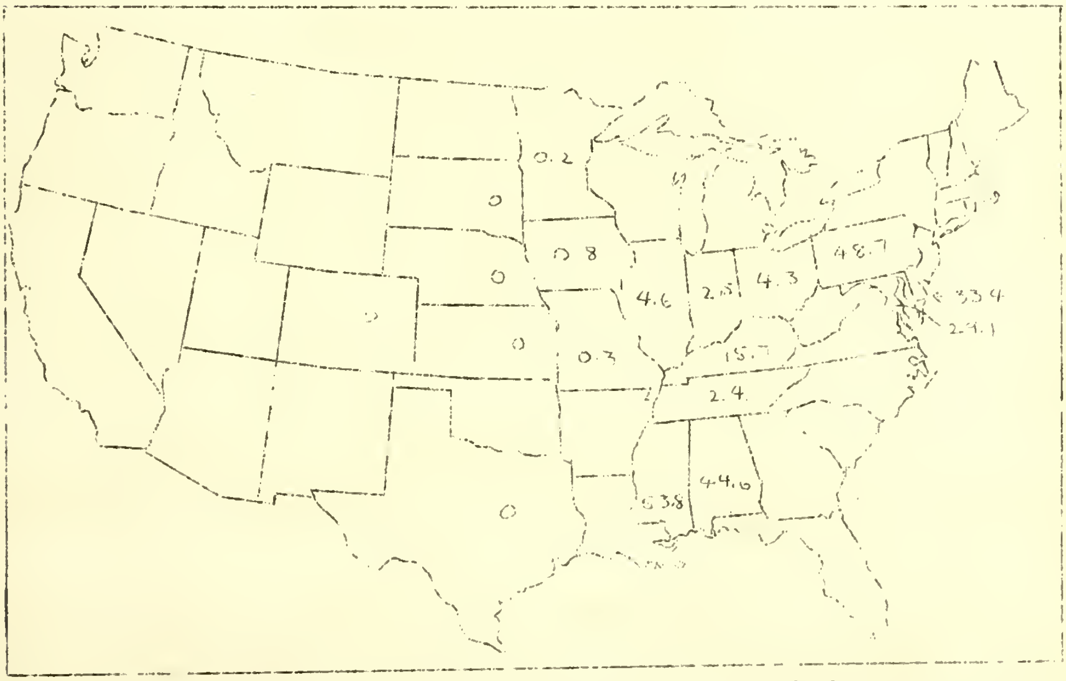

Fig. 29. Average percentages, by States, of <u>Diplodia zeae</u> recovered in plating damaged kernels from samples obtained from carload lots of corn (1937 crop) arriving at terminal markets. (Hoppe, PDR 22: 236).

or moderate amounts of ear and stalk rot. In Wisconsin, according to R. E. Vaughan, "There was very little except a small amount in the southern tier of townships and on river bottom lands." Occurrence in Alabama, Florida, Georgia, South Carolina, and Tennessee during 1937 is reported by Larsh from the examination of diseased cornstalks collected by N. E. Stevens early in 1938 (PDR 22: 159-162). In Figures 28 and 29 are indicated, respectively, the losses estimated by collaborators as due to ear and stalk rot caused by D. zeae, and the average percentage of D. zeae recovered in plating damaged kernels from samples obtained from carload lots arriving at terminal markets, as reported by Hoppe.

Diplodia macrospora is much less abundant than D. zeae in regions where both species occur, according to both Larsh and Hoppe, the ratio being about 1 to 25 or 30. This fungus was recovered by Hoppe from samples of damaged corn from Mississippi, Alabama, and Tennessee. Larsh reported its occurrence on diseased cornstalks collected in Alabama, Florida, and Tennessee. These reports from Mississippi and Tennessee are apparently the first for those States.

Physalospora rhodina (Diplodia frumenti) was also reported by Larsh, in diseased cornstalks from Alabama, Florida, Georgia, South Carolina, and Tennessee. This species is also much less abundant than D. zeae.

Ear rots caused by various organisms. The low estimate of total loss to the country from ear rots in 1937, amounting to 2.6 percent, or not more than 3 percent when loss from diplodia ear rot is included (PDR Suppl. 108), is supported by the data reported by Stevens (PDR 22: 375-377; 129-133) on the incidence of corn ear rots in the 1937 crop and on the fluctuation of ear rots in the Corn Belt from 1935 to 1937, and by Hoppe (PDR 22: 234-241) on the relative prevalence of the various fungi concerned. Hoppe wrote that "Market inspectors, corn breeders and others interested in corn production are generally agreed that the 1937 crop was one of the cleanest on record, with respect to ear and kernel rot diseases." As explanation for this situation he suggested, "Although the exceptionally favorable weather that prevailed during and following the maturation period probably accounted in a large measure for the low incidence of ear rots in 1937, the possible influence of hybrid corn is not to be overlooked." As an aid in visualizing the distribution and relative prevalence of the three fungi chiefly concerned, i.e., Diplodia zeae, Fusarium moniliforme, and Gibberella saubinetii, maps compiled from Hoppe's data are included (Figs. 29, 30, 31).

Ear rot caused by Aspergillus spp. A. niger was reported by collaborators from Illinois, Kansas, and Oklahoma, and A. ochraceus from Illinois. According to the State Natural History Survey, there was less than usual in Illinois, so little being present that the standard count of 200 ears per field was not sufficient to indicate prevalence. The average percentages of infected ears found in field counts were 0.46 for

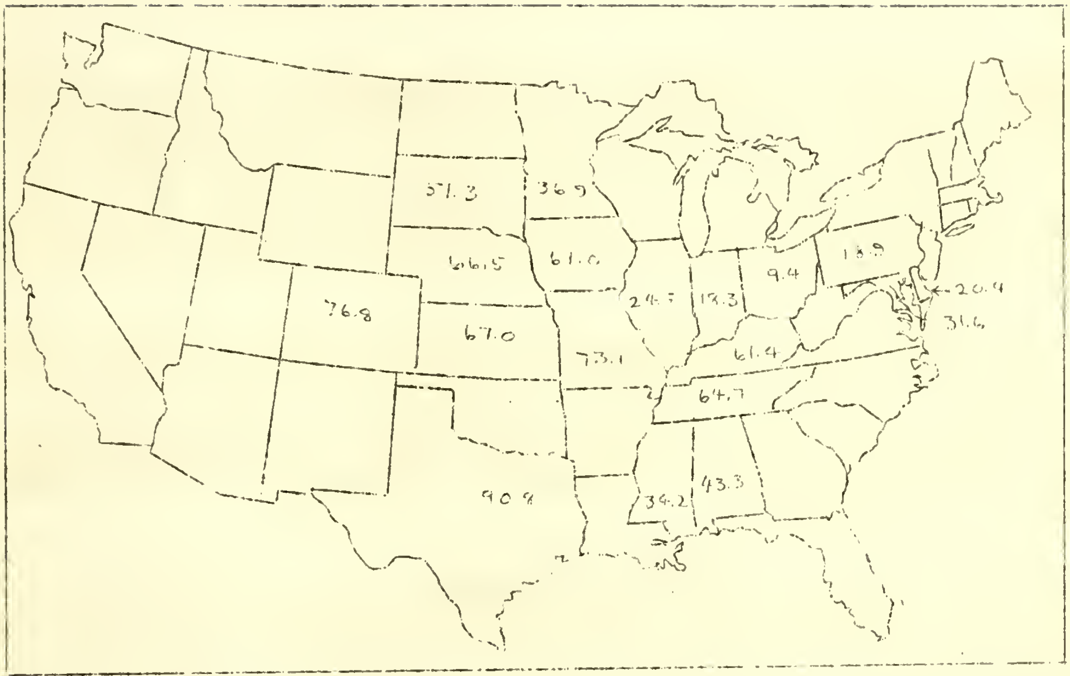

Fig. 30. Average percentages, by States, of Fusarium moniliforme recovered in plating damaged kernels from samples obtained from carload lots of corn (1937 crop) arriving at terminal markets. (Hoppe, PDR 22: 236).

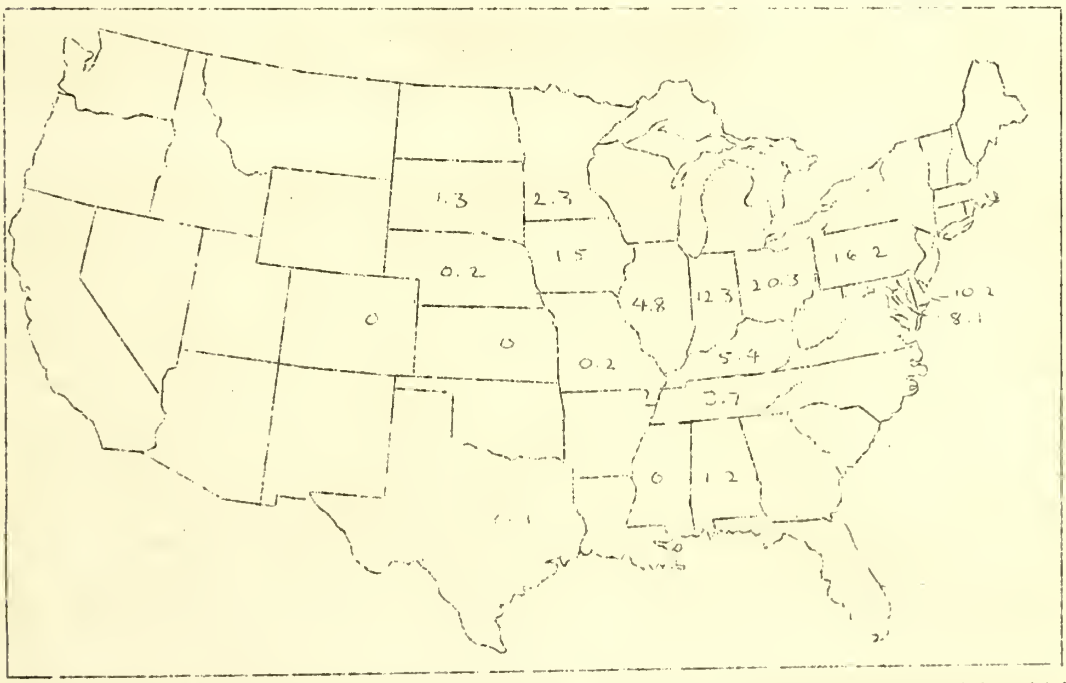

Fig. 31. Average percentages, by States, of Gibberella saubinetii recovered in plating damaged kernels from samples obtained from carload lots of corn (1937 crop) arriving at terminal markets. (Hoppe, PDR 22: 236).

A. niger, and 1 for A. ochraceus. While Aspergillus occurred throughout the State it was rare in northern parts. Hoppe found Aspergillus to be much more prevalent west of the Mississippi. He obtained it from samples from all States west of the River, the highest percentages being 9 in Kansas, and 3.5 in Nebraska. Eastward, less than 1 percent appeared in cultures from samples from Tennessee, Indiana, and Illinois, and none from other sources.

Ear rots caused by Fusarium spp. were reported with percentage losses as follows: Louisiana, 5; Illinois, 3.7; North Carolina and Wisconsin, 1; North Dakota, 0.5; Indiana, Michigan, and Minnesota, traces; Kansas. Hoppe's data showed "other fusaria", i.e., fusaria other than F. moniliforme and the Fusarium stage of Gibberella saubinetii, to be widespread but occurring in small amounts.

Ear rot caused by Fusarium moniliforme. This species was probably included under Fusarium spp. in most reports, Michigan and Oklahoma being the only States from which it was reported separately. It was said to be of average prevalence in Michigan and to cause a trace of loss. According to Hoppe, F. moniliforme was the most important fungus in samples from all States west of the Mississippi as well as in Illinois, Indiana, Maryland, Kentucky, and Tennessee. Percentages reported by him are shown in Figure 30.

Ear rot caused by Gibberella saubinetii. Losses estimated for this ear rot, when reported separately, were small, the highest being 2 percent in Iowa. The map (Fig. 31) gives the percentages obtained in Hoppe's cultures from samples from the various States.

Ear rot caused by Nigrospora sphaerica (formerly reported as Basisporium gallarum). Prevalence was reported as greater than average in Wisconsin and Illinois, average in Minnesota, and less than average in Indiana and Iowa. Losses reported were small, 1 percent reduction in yield being estimated in Iowa, a total loss of 1 percent, of which 0.9 percent was reduction in yield, in Illinois, 0.5 percent in Wisconsin, and traces in Indiana and Minnesota. Late planting and killing by frost favored infection in northeastern Indiana, but not elsewhere in the State, according to John F. Trost. Hoppe (PDR 22: 234-241) attributed the low incidence found by him in the 1937 crop to the very favorable weather during the maturation period. Besides the States already mentioned, he reported the fungus in cultures from Maryland, Delaware, Kentucky, Ohio, South Dakota, and Nebraska. N. sphaerica was isolated from popcorn from Erie County, New York, according to Charles Chupp. This seems to be the first report from that State.

Nigrospora oryzae was obtained from a damaged kernel from Iowa (Hoppe, PDR 22: 239).

Ear rot caused by Penicillium spp. was more important than usual as a storage rot in Indiana, according to John F. Trost, factors explaining its increase being abundant moisture favoring development of larger ears and slow drying, and heavy freezing followed by warm humid winter weather. The consequent loss in stored corn was estimated at 1 percent. In Illinois, the State Natural History Survey reported less than usual on corn in the field, the average percentage of infected ears being 3.4, and the reduction in yield 1.5. Hoppe obtained highest percentages of Penicillium in cultures from the east central and west central States and in those from Nebraska and Kansas, although it appeared in cultures from all States except Tennessee, Alabama, and Mississippi.

Miscellaneous fungi associated with ear rots. Rhizopus sp. was said to be less prevalent than usual in Illinois. Hoppe reported species of Alternaria, Chaetomium, Epicoccum, and various Mucors, and an unidentified fungus which is prevalent enough each year in samples from the Atlantic Seaboard States to be considered of major local importance.

Stalk rots (various fungi other than Diplodia). In Illinois, according to the State Natural History Survey, stalk rot caused by various organisms, mostly not identified, was of about average prevalence and much more prevalent than in 1936. Field counts of 200 stalks per field, made between October 14 and November 13 in 35 Illinois counties, weighted by field acreage, gave average percentages ranging from 24 in Champaign County to 80.1 in Madison County, and a State average of 59.5. Losses from stalk rots in general have been reported in Supplement 108. Stalk rot caused by Fusarium sp. was said to be more prevalent than usual in Wisconsin, where the loss was estimated at 6 percent. In North Dakota there was the usual amount with a loss of 0.5 percent. Small amounts of stalk rot caused by Gibberella saubinetii were reported from Illinois. Stalk rot (Phaeocytosporella zeae) was reported from Illinois, where small percentages were found in four counties. Stalk rot, reported by the Illinois State Natural History Survey as due to Sclerotium sp. (rolfsii ?), was found for the first time in Perry and Madison Counties, where percentages of infection were said to be 15 and 28.5, respectively. (S. rolfsii has been reported on corn, but not frequently.)1/

Footrot and rootrot caused by various fungi. A rootrot of undetermined cause was reported from Colorado (PDR 21: 425). Losses estimated as due to foot and root rots caused by various organisms have been reported in Supplement 108. The Illinois State Natural History Survey reported that counts made in 63 fields throughout the State, from October 14 to November 13, showed an average of 7.1 percent of the stalks affected by rootrot, the greatest infection noted being 30 percent and the total loss being estimated at 4.5 percent. Footrots caused by Gibberella, Fusarium, and Penicillium were responsible for a trace of loss in the high water area of southern Michigan. In Minnesota Fusarium and Penicillium were associated in causing foot and root rot and seedling blight. G. saubinetii and

1/ L. R. Tehon writes that the fungus is now identified as Sclerotium (Rhizoctonia) bataticola.

Fusarium were reported separately as the cause of footrot, with losses of 1 and 2 percent, respectively, in North Carolina. Footrot due to Fusarium was also reported from Tennessee as the cause of 5 percent loss, and from Oregon where the loss was 0.2 percent. Rootrot due to Pythium sp. caused a trace of loss in Wisconsin.

Seedling blight caused by various fungi. Gibberella saubinetii was less prevalent than usual in Wisconsin, there being more in early planted than in late planted corn. The usual moderate amount of seedling blight due to Penicillium spp. occurred in Indiana, a loss of 0.5 percent being reported. In Minnesota Fusarium and Penicillium together caused a loss of 0.5 percent from foot and root rot and seedling blight.

Brown spot (Physoderma zeae-maydis). A loss of 1 percent was estimated in North Carolina, and traces were reported from Louisiana and Iowa.

Rust (Puccinia sorghi) was widely reported as causing negligible loss or none, except in North Carolina and Virginia where the loss was said to be 1 percent and 0.5 percent respectively. On the plant-breeding grounds at Mount Carmel, Connecticut, the rust was found on teosinte growing near infected corn, according to A. A. Dunlap (PDR 21: 426).

Smut (Sorosporium reilianum) caused slight losses in Idaho and Oregon.

Smut (Ustilago zeae). Prevalence of corn smut was apparently about average and somewhat greater than in 1936. In Maryland, Louisiana, Illinois, Iowa, and Montana there was said to be more as compared with both standards; in Vermont, Wisconsin, North Dakota, and Kansas prevalence was average but greater than in 1936; in Michigan, Minnesota, and Wyoming the usual amounts occurred both in 1936 and 1937; in South Dakota prevalence was average, which meant a considerable decrease from 1936; and in Indiana less was reported as compared with both 1936 and the average. Although the disease was said to be more prevalent in Illinois than in 1936, the estimate of loss was considerably less, which is explained by the State Natural History Survey as follows: "Although the general prevalence was greater, the damage to ears was less than in 1936. In 63 fields, counts showed 3.9 percent of the stalks and only 1.6 percent of the ears with infection." H. E. Morris reported that smut was much more prevalent in Montana than for the past several years; however, the damage was only a trace. Loss estimates of 1 percent or more are: 8 percent in Iowa, 7 in Minnesota, 5 in South Dakota, 4.5 in Michigan, 4 in Pennsylvania, 3 in Virginia, North Carolina, and Oklahoma, 2 in Wisconsin, North Dakota, and Wyoming, 1.5 in Kansas, and 1 in Connecticut, Maryland, Kentucky, and Tennessee.

Bacterial wilt (Aplanobacter stewarti) was not important on field corn in 1937.

Mosaic (virus) was reported from Louisiana.

ZEA MAYS. SWEET CORN:

Ear and stalk rot (Diplodia zeae): Less than usual was reported from Iowa and much less from Indiana, while in Pennsylvania there was the usual amount. Losses estimated were 3 percent in Maryland, 2 in Pennsylvania and Iowa, 0.1 in Ohio, and a trace in Indiana. Stalk and ear rots caused by Diplodia, Fusarium, and Penicillium together caused 1 percent loss in Minnesota. Ear rot (Fusarium spp.): A trace was reported by G. M. Smith from Indiana, where the disease was less prevalent than usual. (See also under Diplodia zeae). Ear rot caused by various undesignated organisms was less prevalent than usual in Maryland.

Kernel rot (Penicillium sp.). According to R. E. Vaughan, in Wisconsin, there was more on corn tested for germination than for many years. It was especially prevalent on late planted sweet corn. (See also under Diplodia zeae).

Footrot caused by Fusarium spp. and Penicillium spp. was responsible for a loss of 1 percent in Minnesota. Rootrots due to various undesignated organisms were less prevalent than usual in Maryland, according to E. A. Walker, who estimated a loss of 2 percent.

Smut (Ustilago zeae) was of the usual moderate to considerable importance in most States in 1937. In Iowa and Maryland it was said to be more prevalent than usual while in Indiana there was less, and in New York, according to Charles Chupp, "There was less smut than in some years, although it was present as always. There was less on Long Island this year than last." In Massachusetts O. C. Boyd reported that "In no previous year was there such early and extensive ear infection observed as this season", but the percentage and severity of infection varied greatly on different farms. Losses estimated were rather high in some cases, 10 percent being reported in Iowa and South Dakota, 6 in Pennsylvania, Wisconsin, and Minnesota, 5 in Michigan, 4 in Wyoming, where the disease affected sweet corn grown under irrigation in the northern part of the State, 3 in North Dakota, 2 in Maryland, 1 in Connecticut and Tennessee, 0.8 in Ohio, 0.5 in Texas, and 0.1 in Indiana.

Leaf blight (Helminthosporium turcicum): A loss of 2 percent was reported from Tennessee by L. S. Mayer. Rust (Puccinia sorghi) was widely reported but unimportant, as usual.

Bacterial wilt (Aplanobacter stewarti). Incidence of wilt in 1937 was rather fully reported in the Reporter (PDR 21: 298-305). There was some increase in the area from Virginia to southern Connecticut, elsewhere there was no more than the usual amount or less. None was observed in Michigan, and only traces in Wisconsin. Losses reported were 5 percent in Connecticut, 1.5 in Pennsylvania, 0.7 in Maryland, traces in Ohio, Indiana, Wisconsin, Iowa, and Texas.

DISEASES OF FORAGE AND COVER CROPS

LEGUMES

MEDICAGO ARABICA. BUR CLOVER:

Cercospora medicaginis, leaf spot: Unusually common at Experiment, Georgia, at certain times of the year (PDR 21: 169). Stagonospora meliloti, leaf spot: This disease was abundant on bur clover at the Georgia Experiment Station grounds. So far as observed, the damage was never severe enough to cause the death of the plant. The disease disappeared later in the season as the weather became drier. J. L. Weimer, who reported this disease to the Survey says that he has found no published record of its occurrence on this host in the United States (PDR 21: 169).

MEDICAGO SATIVA. ALFALFA:

Colletotrichum destructivum, anthracnose, was found in Georgia on alfalfa growing on the experimental farm. This disease did not cause much damage and seemed to disappear with the advent of drier weather (PDR 21: 170). This is the first report of the disease on this host to the Survey from Georgia. Colletotrichum trifolii, anthracnose: Illinois, "One infected plant found in the field", first report to Survey on this host from State.

Pseudopeziza medicaginis, leaf spot, was present in Massachusetts; more prevalent than usual in Pennsylvania; also present in New Jersey. In Illinois data was taken from one field only. This field showed 80 percent of plants diseased, on these 18.8 percent of leaves were infected, each with an average of 14.6 spots; less prevalent than usual in Michigan "Crop was cut before defoliation to any appreciable extent"; less than usual in Wisconsin; more prevalent than last year in Iowa and North Dakota; heaviest infection in Wyoming observed at Torrington Experiment Farm in Goshen County. General in fields under irrigation; reported from King and Clarke Counties, Washington, general on the coast.

Pyrenopeziza medicaginis, leaf spot. Illinois, in St. Clair County, 43 percent of plants showed 14.8 percent of leaves diseased; in Bureau County, 87 percent of plants showed 32.2 percent of leaves diseased; Kansas "Observed only on agronomy farm and at rifle range plot".

Sclerotinia trifoliorum, crown rot, was noted in several plantings of alfalfa in New Jersey, in one case it caused heavy losses. S. A. Wingard reports the disease as generally prevalent this spring in Virginia (PDR 21: 174); reported from Monongalia and Preston Counties, West Virginia; Valleau reporting from Kentucky says, "Alfalfa sowed last fall is reported to be completely destroyed by Sclerotinia trifoliorum in several parts of the State". (PDR 21: 187).

Uromyces striatus, rust. Widely distributed in Illinois, "Attack, as observed through September, very light; 2 to 4 percent of plants diseased, with 4 to 5 percent of leaves with small numbers of sori." In Kansas the disease was observed only on agronomy farm and at rifle range experimental plot..

Cercospora medicaginis, leaf spot, was present in Iowa. Erysiphe polygoni, powdery mildew. Reported by O. C. Boyd from Massachusetts. First report of disease from this State on alfalfa; Wyoming, the disease was general in irrigated fields of Grimm and common alfalfa. Fusarium sp., crown rot: Arizona, "This trouble often follows pasturage of fields still very soft after irrigation; in north central Arizona, it may follow winter freezing." Peronospora trifoliorum, downy mildew, was reported from Massachusetts, New Jersey, Tennessee, and Wisconsin; much less in Wisconsin owing to the dry and hot weather. Phoma medicaginis, black stem, has caused extensive injury this year in Kentucky (PDR 21: 187). Phyllosticta medicaginis, leaf spot and black stem, was reported for the first time to the Survey on alfalfa from Oklahoma. Phymatotrichum omnivorum, root rot, is always present in alfalfa and other crops in southern Arizona, according to J. G. Brown. Physarum cinereum, slime mold, reported from Lancaster, California.

Aplanobacter insidiosum, bacterial wilt. According to O. C. Boyd, this disease was no more destructive in Massachusetts than in the average season (PDR 21: 383); Pennsylvania, more prevalent than last year; Oklahoma, "A contributing factor to a major problem in the early dying out of alfalfa stands"; Wisconsin; Iowa, less than usual; Kansas, found in the experimental plots at Kansas Experiment Station. Turkestan selections showed 0 to 5 percent loss, Grimm 62 percent loss; Wyoming, the disease was general in irrigated fields of common and Grimm alfalfa; Nevada and Washington, first report to Survey from these States; Oregon, "Apparently well established and gradually increasing."

Cuscuta sp., dodder, was present in Oklahoma and Washington.

Heart rot, various fungi associated. General in Oklahoma.

Mosaic (virus). Oklahoma in Washita County.

Winter killing caused by ice sheets in January and February in Wisconsin, "Very bad in southeastern section. Many fields entirely killed." Winter injury also present in North Dakota and Washington.

SOJA MAX. SOYBEAN:

Alternaria sp.: Illinois. Cercospora cruenta, frog-eye, was observed in Cumberland County, Illinois. "Found in one field, 26 percent of plants with 13 percent of leaves infected." First report from State on soybean. Colletotrichum glycines, anthracnose: Illinois, found in a "40-acre field of Illini beans, near Seatonville, Bureau County, 3 stems among 400 counted were infected. Formerly found in Illinois in 1935 in Champaign County." This is the first report to the Survey on soybean from Illinois. Peronospora manshurica, downy mildew: Scattered reports from New Jersey; reported as general in Illinois, "By the end of the season nearly 100 percent of plants were diseased, an average of 33 percent of leaves were infected in all fields examined." Phomopsis sojae, blight: In Illinois an "unusually large amount, attacking stems, branches, and pods." General and more prevalent than last year. Phyllosticta phaseolina, leaf spot, was general in Illinois, "2.5 percent of plants with infected leaves." Phymatotrichum omnivorum, root rot, was present in Texas. Sclerotium rolfsii, root and stem rot, was reported as general in Illinois. The Haberlandt variety was more susceptible than others observed.

Bacterium glycineum, bacterial leaf spot. New York, "Always present on lower leaves and sometimes may cause defoliation part way up the stem"; general in Illinois, "By the end of the season 100 percent of the plants were infected, an average of 49 spots per leaf in all fields examined, most severe infection observed was 146 spots per leaf."

Mosaic (virus) was reported as scattered in Illinois, "Haberlandt variety showed only a few diseased plants along edge of field."

TRIFOLIUM spp. CLOVER:

Sclerotinia trifoliorum, stem and root rot. New Jersey. According to S. A. Wingard, this disease was especially prevalent on young plantings of clover in Virginia (PDR 21: 174). West Virginia in Harrison County; Kentucky, according to W. D. Valleau, about the usual amount of red clover was killed by this disease during the winter; in North Carolina, "This disease was reported causing heavy loss on many varieties of clover and in fields where oats were planted with clover there seemed to be a toxic effect on the clover"; observed in King and Clarke Counties, Washington.

Erysiphe polygoni, powdery mildew, was observed in Massachusetts, New Jersey, Virginia, Illinois, Wisconsin, Iowa, and Washington. Gloeosporium caulivorum, anthracnose, was reported from Massachusetts; more prevalent than last year in Wisconsin, "Considerable outbreak reported from Coon Valley, Vernon County" (PDR 21: 234, correction 253). Phyllachora trifolii, sooty spot, was observed in Massachusetts and New Jersey. Pseudopeziza trifolii, leaf spot, was observed in Massachusetts. Uromyces minor, rust, Texas, in Brazos County. U. trifolii fallens, rust, New Jersey; also reported from Indiana on T. pratense. "No rust could be found on T. repens or T. hybridum which were growing intermixed with T. pratense on which it occurred."

Cuscuta sp., dodder, was observed from King County, Washington. This is the first report from Washington to the Survey. Mosaic (undet.). New Jersey "Scattered reports"; Illinois, "Recorded only in Livingston County."

VICIA SATIVA. VETCH:

Cladosporium sp., leaf spot. Washington.

VIGNA SINENSIS. COWPEA:

Alternaria atrans, leaf spot, was observed once in Jefferson County, Illinois, "11 percent of plants in a 5-acre field of a purple-flowered variety had 23 percent of leaves attacked". *Amerosporium oeconomicum*, leaf spot, was observed once in White County, Illinois, "an 8-acre field had 33 percent of plants with 20 percent of leaves diseased". *Cercospora cruenta*, leaf spot, was reported from Cherokee County, Texas; in White County, Illinois, "11 percent of plants in a 9-acre field had 20 percent of leaves infected". *C. dolichi*, leaf spot, was reported as severe on one farm in Cabell County, West Virginia. *Colletotrichum lindemuthianum*, anthracnose, was seen once in White County, Illinois. This is the first report to the Survey from Illinois. *Erysiphe polygoni*, powdery mildew, was found on all of the plants in one-fourth acre of cowpeas in Atascosa County, Texas (PDR 22: 11), also reported from Bell County. *Fusarium bulbigenum tracheiphilum*, wilt, was reported as general from Fayette and Wayne Counties, Illinois. *Macrophoma subconica*, stem canker, was more prevalent than last year in Illinois. *Macrophomina phaseoli*, ashy-stem blight, was reported as a serious disease in Cherokee County, Texas (PDR 21: 279). *Pythium* sp., root rot: Arizona. *Rhizoctonia* sp., soreshin, was reported as trace to 100 percent in Hidalgo County, Texas, and trace in State. *Sclerotium rolfsii*, blight, root and stem rot: Blight was observed in Texas; root and stem rot was reported from Texas in White County. *Uromyces vignae*, rust, damaged 60 percent of the leaves in one-fourth acre of cowpeas in Atascosa County, Texas (PDR 22: 11). *Bacterium phaseoli*, leaf spot, was observed in Fayette County, Illinois, "36 percent of plants had 15 percent of leaves infected". *Heterodera marioni*, root knot: Trace in Texas; reported from Oklahoma in Oklahoma County. Mosaic (virus) was observed in Payne County, Oklahoma. Chlorosis (physiological) was recorded as trace in Texas.

GRASSES

Additions to the check list of the parasitic fungi on grasses in Oregon (1935-37) are listed in the Reporter 21: 412-422.

AGROPYRON SMITHII. WESTERN WHEATGRASS

Claviceps purpurea, ergot, was reported from Kansas as causing damage to cattle.

AGROSTIS PALUSTRIS. RED TOP

Fusarium sp., root rot, Oklahoma in Comanche County.
Helminthosporium leaf spots were observed in Massachusetts.

BUCHLOE DACTYLOIDES. BUFFALO GRASS
Cercospora leaf spot. Oklahoma.
Anguina sp. (nematode). Oklahoma.

CYNODON DACTYLON. BERMUDA GRASS
Physarum sp., crown rot. Texas.
Ustilago cynodontis, smut. Texas and Oklahoma.

DACTYLIS GLOMERATA. ORCHARD GRASS
Helminthosporium leaf spots. Massachusetts (PDR 21: 383).
Puccinia graminis, stem rust, was observed on orchard grass in Wythe County, Virginia (PDR 21: 199).

DANTHONIA SPICATA. POVERTY OATGRASS
Puccinia graminis, stem rust, was reported from West Virginia. The oatgrass was growing beside rusted barberry *Berberis canadensis*.

DIGITARIA SANGUINALIS. CRABGRASS
Piricularia grisea. New Jersey, "Very prevalent on crabgrass."
P. oryzae, blast. Indiana.
Ustilago rabenhorstiana, smut. Indiana and Illinois.

EUCHLAENA MEXICANA. TEOSINTE
Puccinia sorghi, corn rust, was found on teosinte growing near *Zea mays* upon which the rust was also found. The disease was reported from the plant-breeding grounds at Mount Carmel, Connecticut (PDR 21: 426).

ELYMUS CANADENSIS. WILD RYE
Claviceps purpurea, ergot. Wyoming, "Native grass infected heavily this year, the heaviest observed in Wyoming."

HOLCUS HALEPENSIS. JOHNSON GRASS
Ascochyta sorghina. Georgia (PDR 21: 378).
Sphacelotheca sorghi, smut. Texas.

LOLIUM MULTIFLORUM. ITALIAN RYEGRASS
Puccinia coronata, rust, was reported as widespread in Texas.

MUHLENBERGIA SCHREBERI. NIMBLEWILL
Puccinia schedonnardi, rust. District of Columbia.

PANICUM DICHOTOMIFLORUM. FALL PANICUM
Sorosporium syntherismae, smut. Illinois.

PHLEUM PRATENSE. TIMOTHY
Heterosporium phlei, leaf spot. Massachusetts (PDR 21: 383).
Puccinia graminis, stem rust. Massachusetts (PDR 21: 383); West Virginia; Illinois, in Madison County, less prevalent than last year.

Scolecotrichum graminis, leaf spot. Illinois, "All culms carrying diseased leaves; 67 percent of leaves infected."
Ustilago striaeformis, stripe rust, was observed in Massachusetts (PDR 21: 383).

SORGHUM VULGARE SUDANENSE. SUDAN GRASS
Ascochyta sorghina. Georgia (PDR 21: 378).
Bacterium andropogoni, bacterial stripe. First report to Survey from Arizona.

TRIPSACUM DACTYLOIDES. EASTERN GAMAGRASS
Puccinia polysora, rust. Texas.

UNDETERMINED GRAMINEAE
Colletotrichum graminicola, anthracnose, was observed in Monroe County, New York.
Fusarium sp., New Jersey.
Helminthosporium sp., New Jersey.
Physarum cinereum, slime mold. New Jersey, disease of no economic importance; Washington.
Sorosporium syntherismae, smut. New Jersey.
Ustilago sp., smut. Texas, in Angel County.

DISEASES OF SPECIAL CROPS

ALEURITES FORDI. TUNG OIL TREE:

Dothiorella (*Botryosphaeria*) sp., nut rot. Louisiana, "No nuts this year, consequently no nut rot."

Crown girdle (undet.) was present in Louisiana in St. Helena, Washington, and St. Tammany Parishes. "*Dothiorella* (*Botryosphaeria*) sp. and *Clitocybe* sp. were found associated with the disease."

Bacterium aleuritides, bacterial spot. Practically all tung-oil growers in Louisiana are located in two parishes. The disease had its earliest appearance in Saint James Parish. According to A. G. Plakidas, practically every plant in one large nursery was found affected, but the damage was very slight.

Interveinal browning (undet.). Louisiana, not found this year. "Observational evidence suggests that there may be a connection between fruitfulness and this trouble. This year the blossoms were killed by an early spring freeze, so there was practically no crop of nuts, at the same time no interveinal browning."

Translucent spot (undet.) was present in Louisiana in Washington, St. Tammany, and East Baton Rouge Parishes.

White tree (undet.) was found only in one locality in Washington Parish, Louisiana. "Limited experimental evidence at hand indicates that this trouble is a genetic abnormality."

ARACHIS HYPOGAEA. PEANUT:

Cercospora sp., leaf spot, caused trace to 5 percent injury in Texas; C. personata was reported as severe in North Carolina over areas where peanuts are grown. Defoliation apparently caused heavy reductions in yield.

Root rots. North Carolina, "Several organisms including Corticium vagum, Sclerotium bataticola, Pythium ultimum, and several species of Fusaria have been found associated with root rots of peanuts."

CANNABIS SATIVA. HEMP:

Phymatotrichum omnivorum, root rot: Texas, 5 percent injury in Bell County. Heterodera marioni, root knot, was reported as common in Hidalgo County, Texas.

GOSSYPIUM HIRSUTUM. COTTON:

Alternaria sp., leaf spot and blue stain. In North Carolina the weather was warm and wet during the early part of the picking season. Blue stain was much more prevalent than usual and seemed to be due to many fungi but primarily to Alternaria sp.; "no loss" was reported from Texas from leaf spot. P. A. Young reports target board spot from an experimental plot of cotton in Cherokee County, Texas, "The ring-marked spots caused by Alternaria were common only in the rows of cotton planted without potash fertilizer; such injured leaves first showed symptoms of interveinal chlorosis due to potassium deficiency"; Arizona, "Alternaria leaf spot always present in our fields; less this year probably due to lighter summer precipitation"; A. tenuis, leaf blight, was reported to the Survey for the first time on cotton in Illinois. "Two fields averaged 51 percent of plants diseased and 9.5 percent of leaves infected."

Aspergillus niger, boll rot. Oklahoma, reported from Pittsburg, Haskell, LeFlore, and Jefferson Counties, "worst in black, waxy soils along Red River"; Texas.

Brachysporium sp., seedling disease, was present in Brazos County, Texas. Cercospora sp., leaf spot: Louisiana, "Prevalent in many areas about the middle of the season". Corticium vagum, damping off: In Louisiana Ceresan seed treatment resulted in improved stands, 1 percent reduction in yield was reported; Texas, 1 percent loss for the State. Diplodia gossypina, boll rot: Louisiana reported traces of loss from this disease in Concordia and East Baton Rouge Parishes. Diplodia natalensis, seedling disease, was present in Texas in Brazos County.

Fusarium sp., boll rot: North Carolina (PDR 22: 4-6); reported as general in Oklahoma, but of moderate importance. F. bullatum, F. moniliforme, F. oxysporum, and F. semitectum, seedling diseases, were reported from Brazos County, Texas. F. vasinfectum, wilt: Virginia reported 1.5 percent reduction in yield; in Tennessee the estimated reduction in yield was 3 percent; the disease was prevalent in North Carolina in sandy areas of the piedmont and especially in the coastal areas, and caused severe losses which were estimated at 6 percent. In Louisiana the reduction in yield was estimated at 2 percent. Improved strains of Dixie Triumph are recommended for the wilt infested districts of the State. The loss in Texas was from a trace to nearly 5 percent. Oklahoma reports infection in four counties, with a loss of 3 percent in yield.

Glomerella gossypii, anthracnose. In Virginia the estimated loss was 2.5 percent; in Tennessee 1 percent loss; North Carolina reported 1 percent loss in yield (PDR 22: 4-6); Louisiana, less prevalent than last year, estimated reduction in yield was set at 1 percent for the State; Texas, trace; Oklahoma (PDR 21: 385-386, Report of cotton anthracnose survey in Oklahoma by Thomas B. Gordon).

Phymatotrichum omnivorum, root rot. Texas reported 5 percent loss (PDR 21: 369); in Oklahoma there was an estimated reduction in yield of 3 percent.

Puccinia schedonnardi, rust. Texas (PDR 21: 279); Arizona, "Bad in some fields in southern Santa Cruz Valley. More or less rust every year in this Valley" (PDR 21: 369).

Bacterium malvacearum, angular leaf spot and boll rot. Virginia, 4.5 percent was estimated as loss in yield; Tennessee, 0.5 percent loss; the disease was prevalent throughout North Carolina and caused moderate damage to the lower leaves, estimated reduction in yield was 3 percent; Louisiana, "Disease prevalent in almost every field about the middle of the season", estimated loss was a trace; Texas reported 3 to 5 percent loss from this disease; Oklahoma, 3 percent reduction in yield, "Little difference seen in all cultivated upland varieties, a major research project here"; Illinois, "In 3 fields 100 percent of plants were diseased, 31 percent of leaves infected, and 0.5 percent of pods with lesions"; Arizona, "Infection varied from a trace to approximately 90 percent in one field in Pinal County. This badly infected field showed the bollrot phase of the disease on almost every boll. Disease found in both Pinal and Pima Counties, but none in fields from sulphuric-acid delinted seed. (See also PDR 21: 369). B. tumefaciens, crown gall, was present in Texas in Tarrant County.

Gloeosporium sp., seedling disease, was present in Brazos County, Texas. Helminthosporium sp., seedling disease, was reported from Brazos County, Texas. Macrosporium sp., boll spot: Texas reported traces of loss from this disease. Melanospora sp., seedling disease, Texas, in Brazos County. Mycosphaerella gossypina, leaf spot: Texas, trace; Illinois, general in southern part of State, "Two fields average 70 percent of plants diseased and 14.6 percent of leaves infected". Nigrospora sp. (Basisporium gallarum) and Brachysporium sp., seedling diseases, were present in Brazos County, Texas. Phoma sp., seedling disease: Texas in Brazos County. Rhizopus sp., boll rot, was present in Jefferson County, Oklahoma. Verticillium albo-atrum, wilt, was present in all cotton districts in Arizona (PDR 21: 368).

Heterodera marioni, root knot. In North Carolina 2 percent loss in yield was estimated; it was observed in Cherokee County, Texas. In Oklahoma it appeared scatteringly causing a trace of loss.

Miscellaneous troubles. Crinkle leaf is a disease associated with a low pH and is corrected by liming. It is found in Lintonia, Olivier, and Denham silt loam soils in East Baton Rouge Parish, Louisiana. It was also reported from Washington Parish. Estimated loss was set at a trace. Cotton stands were poor in parts of eastern Arkansas (PDR 21: 188). In North Carolina, "There was less potash hunger than in 1936, but the magnesium hunger was more severe. These two diseases cause serious damage especially in the light sands." In Louisiana "rust" caused by potash deficiency was "very prevalent in areas where good fertilizer and cultural practices had not been followed"; in Oklahoma it caused a 10 percent reduction in yield. Seedling losses, caused by damping-off, were prominent throughout North Carolina. Seed treatment with Ceresan was used on 200,000 acres with good results. Strangulation, a non-parasitic disorder, was observed in Wood, Floyd, and Jackson Counties, Texas, estimated reduction for these counties was 1 to 5 percent.

HUMULUS LUPULUS. HOPS:

A report on hop diseases in New York in 1937 is given in the Plant Disease Reporter Vol. 22, pp. 100-101, April 1, 1938.

Fumago vagans, sooty mold: Washington, in Pierce and Yakima Counties Oregon in Josephine, Lane, Linn, Marion, Polk, and Yamhill Counties.

Pseudoperonospora humuli, downy mildew, was much more prevalent than last year in New York. It was observed in Ontario, Lewis, Oneida, Otsego, Franklin, and Schoharie Counties; Washington, in Lewis, Pierce, and Yakima Counties; Oregon, in Benton, Clackamas, Douglas, Josephine, Lane, Linn, Marion, Polk, Washington, and Yamhill Counties; California, Mendocino, Sacramento, and Sonoma Counties; British Columbia.

Sphaerotheca humuli, powdery mildew. According to R. O. Magie, 1937 was an average powdery mildew year. Where sulfur was dusted consistently, losses were not serious (PDR 22: 101), in New York.

Bacterium tumefaciens, crown gall. Linn County, Oregon.

Chlorosis (virus) was reported from New York on English Clusters. Mosaic (virus) was observed in Pierce and Yakima Counties, Washington; one report from Marion County, Oregon.

Other virus diseases in New York: Ring spot was reported as being more prevalent this year. Slip down, about the same amount as usual. According to G. R. Hoerner, 3 reports were received on split-leaf, 1 on English Clusters, 1 on Fuggles, and 1 variety unknown. Yellow-flecking was reported on English Clusters.

MENTHA spp. MINT:

Sphaceloma menthae, anthracnose, on peppermint in Michigan, "Gradually spreading and becoming established in commercial producing sections. Seems likely to become a factor in production in seasons of normal or excessive rainfall. No control methods known." The disease was more prevalent than last year, causing a trace of reduction in yield.

Verticillium sp., wilt: According to Ray Nelson wilt caused less damage to the peppermint crop in Michigan than usual owing to abundant rainfall. The disease causes greatest damage in dry and hot seasons. Wilt is increasing in commercial areas. Stem canker (probably Alternaria) was observed on spearmint in Van Buren County, Michigan, cankers on stem extending from soil level to 10 to 12 inches upward. Gummosis was an accompanying symptom. Puccinia menthae, rust: Michigan, "Was important on spearmint in Van Buren County plantings for first time in many years. Last observed about 1924."

NICOTIANA TABACUM. TOBACCO:

Summaries of tobacco diseases in The Reporter are given as follows: Kentucky (PDR 21: 246, 423-424); Tennessee (PDR 21: 245-246); Florida (PDR 21: 345); Virginia (PDR 21: 245, 22: 45-49); Wisconsin (PDR 21: 335-336); Indiana (PDR 21: 246); Canada (PDR 22: 246-249).

Alternaria longipes, brown spot. Virginia, excessive precipitation during the latter portion of the growing season resulted in an outbreak of leaf spots and brown spot (PDR 22: 48). In North Carolina the disease caused severe injury in a few fields in the Old Belt in late August and in September. In Florida the disease was very severe in one shade, in which root knot was also severe (PDR 21: 345).

Cercospora nicotianae, frogeye in Maryland caused 4 percent loss; Virginia; Kentucky (PDR 21: 424); Florida (PDR 21: 345).

Fusarium oxysporum nicotianae, wilt, was reported as a trace in Maryland; Kentucky, "More reports this year than in all other years combined, see Figure 32" (PDR 21: 424); Tennessee estimates loss 0.5 percent; Ohio, generally distributed through the dark tobacco area.

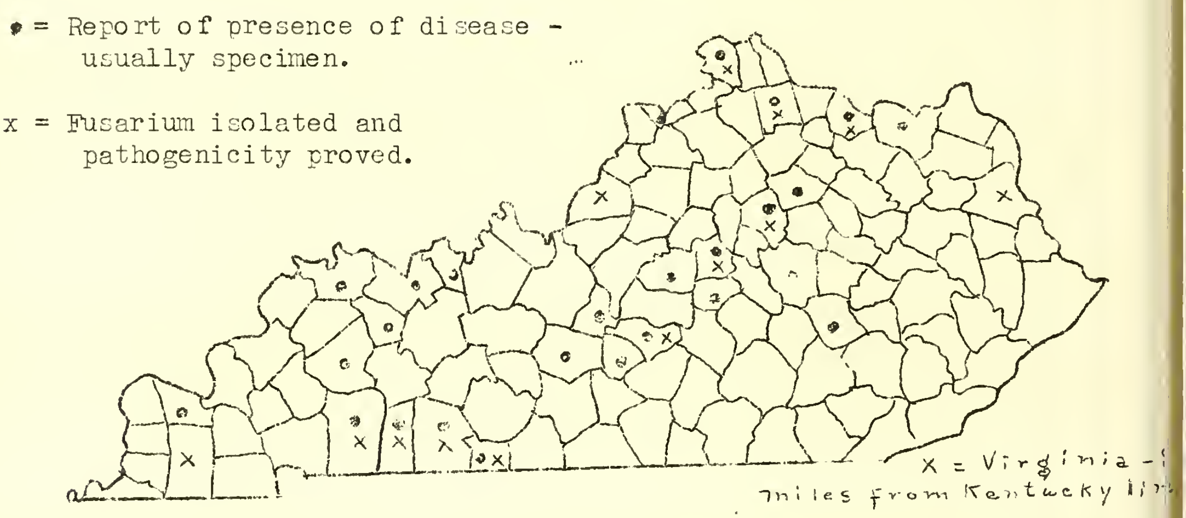

Figure 32. Distribution of fusarium wilt of tobacco in Kentucky. (After map by Valleau, Johnson and Diachun.)

Peronospora tabacina, downy mildew. In Massachusetts downy mildew was the outstanding tobacco disease. This year it made its first appearance in the Connecticut Valley tobacco of both Connecticut and Massachusetts (PDR 21: 235, 286-287, 384); in Connecticut the disease made its appearance for the first time in the seed beds (PDR 21: 218); Pennsylvania, trace; much more prevalent than last year in Maryland owing to the cool period and the abundance of moisture in the plant beds. Estimated reduction in yield 15 percent (PDR 21: 331-332); except in Mecklenburg County, Virginia, downy mildew on tobacco did not do a great deal of damage (PDR 21: 245; 22: 45-47); in Kentucky the disease was widespread throughout the State having been observed in 28 counties (PDR 21: 174, 182-184, 246); the disease was the most widespread Tennessee ever experienced, but the actual damage was not great, as in most cases the plants were large when infected. Estimated reduction in yield was 3 percent (PDR 21: 174, 245); North Carolina experienced heavy damage throughout the State, but despite this fact there were sufficient plants to plant a very large acreage. Growers were inconvenienced and resorted to considerable expense in securing plants to meet planting needs. Estimated loss 5 percent (PDR 21: 108, 133); South Carolina (PDR 21: 108, 133); downy mildew recurred very early in Georgia this year. By March 15 the disease had killed about 50 percent of the plants. The remainder were defoliated but recovered (PDR 21: 42, 107); in Florida downy mildew caused considerable reduction in field stands, averaging as high as 35 percent in some counties and perhaps 10 percent for the State (PDR 21: 226-227, 345); for the first time downy mildew was found in southern Indiana (Spencer and Warrick Counties on June 13). Most of the plants had been set in this vicinity at that time, consequently the damage was negligible (PDR 21: 235, 246). (See also PDR 21: 260-266).

Phytophthora parasitica nicotianae, black-shank. Report of Committee of the Tobacco Research Council on the black-shank disease of tobacco is given in The Reporter (21: 246-248). According to J. A. Pinckard blackshank has not yet been found in Virginia (PDR 22: 49); losses in North Carolina not as great as in the past because a high percentage of farmers are controlling the disease by crop rotation; in Florida the disease is believed to have been less serious in the cigar-wrapper area than usual (PDR 21: 345).

Pythium (damping-off). Wisconsin (PDR 21: 229).

Rhizoctonia etc., soreshin. Virginia (PDR 22: 49).

Sclerotium rolfsii, stem rot. W. B. Tisdale reports the occurrence of this disease in a field of cigarette tobacco near Hawthorn in Alachua County, Florida. The loss was estimated by the grower at perhaps 15 to 20 percent (PDR 21: 345). This is the first report of this disease on tobacco to the Survey from Florida.

Thielaviopsis basicola, black rootrot, in Massachusetts caused the usual amount of damage on soils with too high pH readings (PDR 21: 383); in Maryland the disease was much more prevalent than last year, 1 percent loss was estimated for the State; Virginia, trace (PDR 22: 49); Kentucky, 2 percent estimated reduction in yield (PDR 21: 424); Tennessee; North Carolina, trace, "More than 3,000 growers have obtained and used seed of resistant variety developed at the Tobacco Test Farm at Oxford. This variety also shows advantages of maturity over other varieties used in the Piedmont"; in Wisconsin the use of black rootrot resistant varieties has greatly reduced the amount of this disease. A reduction of 2 percent loss in yield was reported (PDR 21: 335).

Bacterium angulatum, angular leaf spot, blackfire. Massachusetts, blackfire started in the plant bed and was not so conspicuous in the field as in certain past seasons (PDR 21: 383); the usual trace of loss was reported from Maryland; losses in Virginia were minor (PDR 22: 49); Kentucky, prevalent in the Burley area (PDR 21: 183); North Carolina, 1 percent loss, "In North Carolina approximately 5 percent of the acreage in the northeastern part of the State showed angular leaf spot infections. In about one percent of the acreage in this area the injury was severe"; Tennessee, 0.5 percent loss; Ohio, trace; Wisconsin, as usual blackfire was the most common disease noted in the general survey (PDR 21: 229, 336).

B. solanacearum. Granville wilt was a very serious disease in Virginia in Halifax, Lunenburg, and Mecklenburg Counties (PDR 22: 49). In North Carolina the loss in yield was estimated at 3 percent.

B. tabacum, wildfire, was observed in Massachusetts during July as traces or very light infections in several fields of Havana seed (PDR 21: 287, 383); Pennsylvania, much more than usual, owing to the high temperatures during rainy periods. The estimated loss in yield was 40 percent; Maryland, more prevalent than last year, 7 percent loss for the State. For distribution see PDR 21: 331-334; in Kentucky this disease has caused much damage (PDR 21: 183, 423-424); Tennessee, sunshine was needed for tobacco, rains caused wildfire and dropping of leaves, estimated reduction in yield was set at a trace; Ohio, 1 percent estimated loss (PDR 21: 275); Wisconsin, the disease did not spread to the extent of causing any damage (PDR 21: 336).

Heterodera marioni, root knot, was observed in Virginia. A 1 to 2 percent loss in North Carolina was slightly above normal. Although no estimate of the actual loss incurred by root knot can be made in Florida, it was perhaps greater in 1937 than usual (PDR 21: 345).

Drought and heat injury in Wisconsin was estimated at 20 percent.

Brown rootrot (undetermined) was observed in Massachusetts (PDR 21: 287, 383); the disease was reported to the Survey from Virginia this year for the first time (PDR 22: 49); in Kentucky the disease was unusually prevalent over the entire State (PDR 21: 297, 424).

Frenching (non-parasitic) caused an estimated loss of 1 percent in Pennsylvania; the disease was more prevalent in Maryland than usual; Kentucky (PDR 21: 424); Tennessee, estimated reduction in yield 15 percent; Florida (PDR 21: 345).

Potash deficiency. Estimated loss in yield was 6 percent in Maryland in North Carolina "High fertilization with potash indicated a potential means of reducing various parasitic and physiological leaf diseases, 3 percent loss; in Virginia the disease was found rather generally although not particularly severe (PDR 22:47); Kentucky, 2 percent loss in yield; Tennessee in Wisconsin it caused an estimated reduction in yield of 1 percent.

Mosaic (virus). (PDR 22: 74-84). Losses were about normal this year in Massachusetts (PDR 21: 287, 303); New Jersey; Pennsylvania, less than last year, a reduction in yield of 2 percent; Maryland, more prevalent than last year, loss in yield and grade, 7 percent (PDR 21: 331); in Virginia the losses from the disease were about the same as last year (PDR 22: 48); Kentucky, distributed about as usual, 2 percent loss in yield (PDR 21: 298); North Carolina, 2 percent reduction in yield; Florida; Texas; in Wisconsin mosaic was much less common than in normal years and was present in about the same amount as 1936. Estimated loss 1 percent (PDR 21: 335).

Other virus diseases; Ringspot in Maryland was more prevalent than usual, causing a loss of 1 percent; in Virginia it was observed on 9 of the 90 farms visited (PDR 22: 48). Ring spot was observed in scattered fields in North Carolina but injury of consequence was not noted. Streak has been unusually prevalent this year in Kentucky according to W. D. Valleau. It has been found in nearly every field which has been carefully examined in the Burley and dark areas of the State (PDR 21: 297-298); also reported from Wisconsin (PDR 21: 335).

Miscellaneous troubles. See PDR 21: 296, 336, 345; 22: 47, 49, 248.

DISEASES OF FRUIT CROPS

AMYGDALUS PERSICA. PEACH:

Scab (Cladosporium carpophilum) was reported as follows: In Massachusetts, according to O. C. Boyd, the disease was somewhat more damaging generally than in most years (PDR 21: 380); Connecticut, more prevalent than last year, reduction in yield estimated at 5 percent; New York, trace, as usual more prevalent in southern Hudson Valley; New Jersey, scattered reports. "Severe in some fields"; Pennsylvania, more than last year or in an average year, losses were estimated at 3 percent; Maryland, about the same amount as in 1936, with an estimated loss of 2 percent; Virginia, trace (PDR 21: 232); Tennessee, general, estimated loss a trace; Texas, reported from Cherokee County; Indiana, more prevalent than last year, frequent rains during spring and early summer months, estimated loss 0.1 percent; Illinois, much more prevalent in southern part of State than last year. "Average in 69 plantings examined: 58 percent of trees and 10.9 percent of fruit infected." Loss estimated, trace; Iowa, more prevalent than last year, estimated reduction in yield 5 percent.

Blight (Coryneum beijerinckii). From Ohio, A. L. Pierstorff sent in a report (PDR 21: 275), very abundant in northern portion of State, loss 0.5 percent; Idaho, much less than last year or in an average year, "Winter injury killed practically all peach buds". Estimated loss 2 percent (PDR 21: 215); Washington, in Yakima and Whitman Counties.

Brown rot (Sclerotinia fructicola) was reported from the following States with the estimated percentage losses indicated: New York, 1.5, somewhat more prevalent than last year, occurred mostly in the southern Hudson Valley and northwest section; New Jersey; Maryland, 8, more prevalent than last year or in an average year. "Early drought followed by four days of rain caused fruit to swell and crack." (PDR 21: 322); Pennsylvania, 10, more prevalent than last year or in an average year, occurred mostly in the southeastern section of the State; Virginia, 2, same amount as reported in 1936, "Heavy rains at end of picking season caused some losses"; Tennessee, 10, as prevalent as last year, but more prevalent than in an average year, "Very light set of fruit and growers gave special attention to production of clean crop"; Arkansas, in the northwest the disease did not cause any serious loss but in the eastern part of the State a number of growers reported that the blossom blight phase of the disease was very serious on the Early Wheeler variety (PDR 21: 188; 22: 37); Ohio, 5, more prevalent than in 1935 (PDR 21: 274); Indiana, 0.5, "In spite of severe blossom blight in one particular orchard, sufficient healthy blossoms remained to make a normal crop of fruit. During the harvest season the weather was dry and little fruit rot developed"; Illinois, 3, more than last year, "Average in orchards examined: 34 percent of trees, 0.67 percent of fruit, 0.05 percent of twigs." Brown rot has caused considerable blossom and twig cankers on peach in scattered localities of the various peach growing sections of this State (PDR 21: 186); Michigan, 10, much more than usual. "Rainfall well distributed. Blossom infection was general--much fruit rot reported, probably aggravated by oriental moth." Iowa, practically none; Missouri, 0.5, much more than last year, "Brown rot was present in the form of blossom blight and was found in midsummer on peaches as late as October." According to M. A. Smith, brown rot was generally more prevalent on peaches this season than for the past six years (PDR 22: 13); Sclerotinia sp. was reported from Washington in Kitsap, Pierce, and Clarke Counties.

Leaf curl (Taphrina deformans) was reported from twenty-three States. In Massachusetts the disease was somewhat more damaging generally than in most years (PDR 21: 229, 380); Connecticut, more prevalent than last year or in an average year; New York, much more prevalent than last year, estimated loss 1 percent (PDR 21: 214); New Jersey, "Very severe in south Jersey, prevalent in Bergen, Essex, Middlesex, Morris, and Warren Counties"; Pennsylvania, more than last year, 2 percent loss was estimated; Maryland, more prevalent than last year or in an average year; Virginia, 1 percent loss, abundant in neglected orchards, but not unusually so (PDR 21: 174, 232); Tennessee and North Carolina (PDR 21: 174); in Kentucky peach leaf curl was severe in the southwestern counties; Louisiana, "Ordinarily the disease is of no importance in Louisiana, but occasionally severe outbreaks occur. Such an outbreak occurred this year, causing considerable damage"; Texas, trace; Oklahoma; Arkansas, very general on peaches this year but seldom in serious amounts (PDR 21: 187); Indiana, less than last year or in an average year, loss a trace; Illinois, very scattered and generally light, less than last year and much less than in average year, "Average in 59 plantings: 25.4 percent of trees, 1.1 percent of leaves, 0.02 percent of fruit" (PDR 21: 215); Michigan, more prevalent than usual, estimated reduction in yield 5 percent. "Sprayed orchards had good control. Fall spraying with Bordeaux 8-8-100 was as effective as spring spraying"; Iowa, estimated loss 2 percent, more than usual; in Missouri the disease was prevalent in many of the unsprayed orchards, much more prevalent than last year, its severity varied considerably, loss, a trace (PDR 21: 186; 22: 13); Idaho, more prevalent than last year, estimated loss 0.5 percent (PDR 21: 215). Washington, reported as general on the coast and in King and Spokane Counties; Oregon, more prevalent than last year, "especially abundant in home orchards and smaller plantings"; California, more than last year, "Cool weather seemed to aggravate the disease while a 4-4-10 (K-P-N) fertilizer seemed to increase the vegetative growth and thus overcome the disease to some extent. The crop was good when harvested during July."

Root rot (*Armillaria mellea*): Texas. Canker (*Cytospora* sp.): New Jersey, "Cankers on twigs, light brown areas with dark fruiting bodies". Stem canker (*Phoma persicae*) was reported from New York on stems of seedling peaches. Powdery mildew (*Podosphaera oxyacanthae*): New Jersey. Powdery mildew, *Sphaerotheca pannosa*, was observed locally in New York, in Niagara County the fruits were snow white with mildew; Colorado; Washington, in Pierce and Yakima Counties. Silver leaf (*Stereum purpureum*) was observed in Oklahoma County, Oklahoma. Rust (*Tranzschelia pruni-spinosae*) was common and destructive in Florida, also present in Texas (PDR 22: 11). Canker (*Valsa* spp.) seems to be increasing in southwestern Michigan according to Donald Cation; *V. leucostoma* reported from Illinois (PDR 21: 186). Wilt (*Verticillium albo-atrum*) "appeared in New York after several years absence".

Bacterial spot (*Bacterium pruni*) in Massachusetts was somewhat more damaging generally than in most years (PDR 21: 380); Connecticut, much more prevalent than last year (PDR 21: 308); "Especially severe in sandy soils of south Jersey"; traces were observed in New York, Pennsylvania, Ohio, and Tennessee; more prevalent in Virginia than last year, estimated loss 0.5 percent; more important in North Carolina than last year, 3 percent loss, which was the highest for any State reporting; not as prevalent in Texas as last year; reports were received from Oklahoma and Arkansas (PDR 22: 37); much more prevalent in Illinois than last year, "Average in orchards examined: 46.7 percent of trees, 4.1 percent of fruit, 0.25 percent of leaf area". Estimated reduction in yield 1 percent.

Crown gall (*Bacterium tumefaciens*). Texas.

Root knot (*Heterodera marioni*). Texas.

Virus diseases: Little peach was reported from New York and Iowa. Mosaic was reported in Woods County, Oklahoma by K. Starr Chester, "First record for Oklahoma. Viewed with much concern"; infections in Arizona, New Mexico, Utah, and Texas were confined to areas not so important commercially

(PDR 22: 269). So far as known, California and Colorado are the only States where the disease exists in extensive commercial peach areas (PDR 21: 269, 425, 427). The disease is also present in Mexico (PDR 21: 427). Rosetted mosaic was found in Michigan on several young plantings with 90 percent of trees infected, according to D. Cation.

Phony peach eradication, according to the Bureau of Entomology and Plant Quarantine, was conducted during the winter in Alabama, Arkansas, Georgia, Illinois, Missouri, North Carolina, South Carolina, Tennessee, and Texas, comprising the removal of about 2,000,000 peach trees a month. (See also PDR 21:427). Illinois, "No positive cases found. Suspected trees found in two counties."

O. C. Boyd reports from Massachusetts, "Peach growers are complaining more than usual this summer about peach yellows. It seems that an unusual amount of both first-year symptoms (mostly the premature ripening of fruit) and second and third year effects are prevalent. County Agent Fred E. Cole and I visited a farm in Sterling yesterday (Aug. 26) where we found the corner of a 30-year old orchard bordering the woods heavily affected. Just across the wall stood healthy young chokecherries and diseased older trees. The symptoms were similar in the foliage to those on peach trees. About a quarter of a mile away, a four-year orchard showed what I considered a heavy infection of yellows, both first and second year stages. Infected trees were most numerous along the stone wall, where we found a number of badly diseased wild cherries." In New York yellows was reported as prevalent as last year. New Jersey: "In Essex County 100 trees had to be replaced; reported from several orchards in Middlesex County." Pennsylvania: Observed in Blair, Adams and Philadelphia Counties. Maryland: Estimated reduction in yield 0.5 percent. Virginia: (PDR 21: 232). Iowa: No loss.

Diseases of non-parasitic and undetermined origin: Chlorosis (non-parasitic), Texas; Gummosis (undetermined) was reported from New York and New Jersey, one report from Washington due to mechanical injury. Spray injury of peaches in Massachusetts was common and perhaps more noticeable than usual (PDR 21: 380); in New York arsenical injury was much more prevalent than last year (PDR 21: 249); in Arkansas, as the result of frequent rains, conditions were exceptionally favorable for the development of arsenical spray injury (PDR 22: 37).

AMYGDALUS PERSICA NECTARINA: NECTARINE:

Bacterial blight (Bacterium pruni) was reported as "general" in Oklahoma. Powdery mildew (Sphaerotheca pannosa persicae) was observed in one orchard in Niagara County, New York.

APPLE. See MALUS SYLVESTRIS.
APRICOT. See PRUNUS AMERICANA.
AVOCADO. See PERSEA AMERICANA.

CARICA PAPAYA. PAPAYA:

Fruit rots (Colletotrichum sp., Diplodia sp., etc.) were common and destructive on unsprayed papayas in Florida (PDR 22: 18).

Leaf spot (Pucciniopsis caricae) was also common on unsprayed papayas in Florida (PDR 22: 18).

BLACKBERRY. See RUBUS spp.
CHERRY. See PRUNUS spp. CHERRY.

CITRUS spp. CITRUS:

Stem blotch (Colletotrichum gloeosporioides) on twigs and little specks on leaves reported from Puerto Rico. Melanose and stem end rot (Diaporthe citri): Texas, trace. Stem end rot (Diplodia natalensis) caused 1 to 2 percent loss in Hidalgo and Cameron Counties, Texas. Sooty blotch (Gloeodes pomigena): Texas, trace. Blue and green molds (Penicillium spp.) Texas, 1 percent loss. Scab (Sphaceloma fawcettii) in Florida was more abundant than in average years but was somewhat less severe than in 1936 (PDR 22: 17).

Canker (Bacterium citri) was found in Louisiana in April on one tree in Saint Charles Parish. Only three infected properties were found in this State in 1936; in Texas the disease has recently recurred on several properties in Galveston and Brazoria Counties and to a less extent in Harris County (PDR 21: 268).

Chlorosis (excess alkalinity), Texas. Gummosis (undetermined), Texas, widespread. Scorching (weather conditions), Florida (PDR 22: 18).

For diseases of lime, grapefruit, lemon, tangelo and tangerine in Florida see PDR 22: 17, 18, observations on diseases of fruit crops in Dade County, Florida, in 1937, by George D. Ruehle.

CYDONIA OBLONGA. QUINCE:

Leaf blight (Fabraea maculata). New York, reported from Wayne, Orleans and Niagara Counties, more prevalent than last year; New Jersey; Pennsylvania, caused a loss estimted at 4 percent.

Rust (Gymnosporangium clavipes) more prevalent than last year or in an average year in New York, estimated loss a trace (PDR 21: 250); New Jersey, "Medium to severe in some orchards in Northern Jersey."

Blight (Bacillus amylovorus) was reported as follows: Connecticut in New Haven County; New York, less prevalent than usual; New Jersey; Pennsylvania, general, about the same as usual, 5 percent reduction in yield.

Crown gall (Bacterium tumefaciens). New Jersey.

DEWBERRY. See RUBUS spp.

ERIOBOTRYA JAPONICA. LOQUAT:

Ashy-gray spot (Pestalotia sp.). Florida.

FICUS CARICA. FIG:

The following diseases were reported from Louisiana as causing the usual amount of damage: thread blight (Corticium stevensii); twig blight (Stilbum cinnabarinum) and rust (Physopella fici).

FIG. See FICUS CARICA.

FRAGARIA sp. STRAWBERRY:

Gray mold rot (Botrytis cinerea) was the outstanding disease in Massachusetts this summer, causing decidedly more damage than any other single disease (PDR 21: 380); New York, in Dutchess County, "Several growers suffered great loss from rot to green as well as ripe berries as a result of wet weather," more prevalent than last year (PDR 21: 392-394); New Jersey, "Common in many fields"; North Carolina (PDR 21: 267, 268); in Louisiana the disease was more prevalent than last year or in an average year owing to the prolonged rains during picking season, estimated loss 5 percent; much more prevalent in Idaho than in previous years, estimated loss 10 percent.

Leaf scorch (Diplocarpon earliana) was reported as follows: Pennsylvania and Maryland, less prevalent than for several years, estimated reduction in yield 0.3 amd 1 percent respectively; North Carolina, "High temperature during winter months favored development of the parasite. Spraying with 4-4-50 Bordeaux mixture reduced damage from this disease. However, considerable damage occurred before spraying was started in early March." Reduction in yield was estimated at 10 percent, which is more than in an average year; Louisiana, estimated reduction 3 percent, same as in 1935 and 1936; Oklahoma and Wisconsin, loss a trace, less prevalent than in an average year in Wisconsin.

Leaf spot (Mycosphaerella fragariae) was reported from Vermont as "general" and more prevalent than last year or in an average year; Massachusetts, unusually prevalent on most varieties other than Howard-17 (PDR 21: 381); New York, much more prevalent than last year, also more than in an average year, estimated loss, trace (PDR 21: 392-394); New Jersey, reported as abundant but causing little injury; Pennsylvania, reduction in yield 1.5 percent, which is more than last year; Maryland, 2 percent reduction in yield, which is more than last year or in an average year; Virginia, 5 percent reduction in yield; North Carolina, "High temperature during winter favored rapid development of parasite. Spraying with 4-4-50 Bordeaux mixture gave practical control of the disease and gave an average increase in yield and value of approximately 35 percent." Reduction in yield was estimated at 20 percent, which is more than last year and much more than in an average year; Louisiana, same as last year, 10 percent loss; Indiana, more prevalent than usual, frequent rains during the early spring and summer months favored the disease, estimated reduction in yield 0.1 percent; Wisconsin, less prevalent than usual; Minnesota, "Nursery inspectors report that the disease is worst on Mastodon," estimated reduction in yield 2 percent; Iowa, same as last year, 3 percent loss; North Dakota, usual trace; Kansas, as prevalent as last year, and much less prevalent than in an average year; Idaho, much more, loss 1 percent; Washington, reported from Kitsap, Pierce, Thurston, and Clarke Counties.

Tan rot (Pezizella lythri) in Louisiana was much more prevalent than in previous years, estimated loss 15 percent. "Prolonged rains during peak of harvesting. Rained April 14-17, and again April 30 - May 1. Heavy losses occasioned by different rot-producing organisms, but chiefly by Pezizella lythri. The Federal inspector estimated that at least 200 carloads (average 750 crates per carload) were lost. The loss was not due so much to the actual rotting of the fruit as to the reduction in grade and price."

Red-stele (Phytophthora sp.) was reported from New York, New Jersey, Maryland, Virginia, Illinois and Michigan (PDR 21: 392-399).

"A strawberry disease, previously reported from Europe and a few localities in the United States, was observed for the first time in New Jersey. This trouble, known as the brown stele or red stele disease, results in a dwarfing and final death of the strawberry plant. It is reported to be severe in some plantings in Maryland. In the one planting where the disease was observed in New Jersey, the plants made a good growth after planting in 1936, but the field was so poor this year that all plants with the exception of one row were plowed under. These plants showed the typical symptoms of the brown stele disease. Strawberry growers are being advised to be careful when purchasing plants, to avoid introducing the fungus causing this disease, in their soils."

Slime mold: Fuligo septica, Washington; Mucilago spongiosa, Kansas, reported from Rice, McPherson, Washington and Riley Counties, "Numerous inquiries and specimens sent in." Leather rot (Phytophthora cactorum) in Louisiana was more prevalent than last year or in an average year. Root rot (Rhizoctonia sp.): One report from Texas shows 4 percent loss in Dimmit County. Fruit rot (Rhizopus nigricans): Maryland and Kansas. Black rot (Sphaeropsis sp.): Colorado. Powdery mildew (Sphaerotheca humuli) in New York was more prevalent than last year, estimated loss a trace; less prevalent than last year in Idaho.

Dwarf or crimps (Aphelenchoides fragariae) in Massachusetts was less damaging on Cape Cod than in other seasons, according to O. C. Boyd (PDR 21: 286, 381); Maryland, same as in 1936, with losses estimated at a trace (PDR 21: 392-394); Louisiana, usual amount, distribution general, negligible loss. Root knot (Heterodera marioni): Maryland, scattered distribution, loss, a trace; Texas, 2 percent loss in Hidalgo County.

Virus diseases: Crinkle was reported from New York and Washington. Scattered distribution of mosaic in Wisconsin, "Inspectors of nurseries in State Department of Agriculture report more mosaic than previously." Witches'broom, Minnesota, "No reports."

Chlorosis due to excess lime was reported as causing 5 percent loss in Dimmit County, Texas, and a trace for the State.

Black root and root rots (undetermined): Maine, estimated reduction in yield 2 percent; New York, more prevalent in Wyoming County than usual; New Jersey; Pennsylvania, scattered distribution, more prevalent than last year or in an average year, 12 percent estimated reduction in yield; Maryland, 6 percent; black root rot in Virginia seems to be associated with freezing injury according to S. A. Wingard, 5 percent loss; Tennessee 10 percent; Texas, 1.5 percent; Indiana, trace; Illinois, 5 percent; Michigan 20 percent; Wisconsin, less prevalent than last year; Minnesota, estimated reduction in yield 5 percent; Iowa, no loss; Montana, 5 percent; Idaho, 10 percent; Washington; Oregon, 3 percent.

Weather injury: Frost injury was reported from Washington; winter injury occurred in New York, New Jersey, Delaware, Maryland, Ohio, Illinois, Michigan and Idaho (PDR 21: 215, 392-394).

Leaf variegation (cause undetermined). J. B. Demaree and George M. Darrow write that this has recently become serious in certain strawberry varieties. Among important commercial varieties it is most serious in Blakemore and it is apparently increasing in Howard 17 (Premier). This trouble has been known for over 40 years on some varieties, but the yellow-foliage plants of Blakemore have been observed only since 1933.

The development of the condition in Blakemore has been rapid. In some cases 25 to 50 percent, and in extreme cases all of the plants are affected. The condition has also been termed June yellows, yellow leaf, gold leaf, suspected mosaic, etc. (PDR 21: 400-403). Reported as follows: In New York it was as prevalent as last year, total loss a trace; Delaware; Maryland, much more than last year or in an average year, 1 percent estimated loss, "Blakemore yellows resistant varieties are being tried"; Minnesota, "Still prevalent in fields of Blakemore"; North Carolina; Illinois; Kansas, more than in an average year. "A chlorosis of Blakemore and certain others. Etiology not known, whether a virus or a heritable character. The disease is definitely injurious to plants--causes slower, stunted growth." (PDR 21: 392-394).

GOOSEBERRY. See RIBES GROSSULARIA.

GRAPE. See VITIS sp.

GUAVA. See PSIDIUM GUAJAVA.

LOQUAT. See ERIOBOTRYA JAPONICA.

MALUS SYLVESTRIS. APPLE:

Sooty blotch (Gloeodes pomigena) was more prevalent in New York than last year or in an average year. Most prevalent in the Hudson Valley, loss, a trace; New Jersey; in Arkansas Grimes Golden apples almost completely covered by the sooty blotch fungus were noted in one orchard (PDR 22: 36); the disease in Indiana was much more prevalent than last year and more prevalent than in an average year. "Frequent rains during the early summer months" favored the disease, loss 0.1 percent; more prevalent in Illinois than last year. "In 5 orchards in 3 counties, and an average of 30.8 percent of fruit infected. Jonathan, Grimes and Winesap infected," estimated reduction in yield, trace.

Root rot (Armillaria mellea), Pennsylvania. Fruit rot (Botrytis sp.) was rare on green apples near Corvallis, Oregon, according to C. E. Owens. Kadow reported it on apples in storage in Delaware (PDR 22: 102, 117). Canker (Cytospora rubescens). Arizona, "kills occasional branches." Heart rot (Fomes sp.) in New Jersey has killed several trees.

Perennial canker (Gloeosporium perennans). Much more prevalent in Idaho than last year, "Only found in Northern Idaho. Local losses probably over 1 percent;" Washington.

Bitter rot (Glomerella cingulata) was reported from eighteen States: New Hampshire, trace, susceptible varieties were Wealthy, McIntosh and Baldwin; New York, same amount as usual; New Jersey; Pennsylvania, trace; Maryland, much more prevalent than last year, loss

3 percent, "Evidently due to lack of proper concentration of spray;" Virginia, "Most bitter rot since 1931," loss 0.5 percent; West Virginia, on Winter Banana variety, local distribution, loss 0.1 percent; Kentucky, estimated reduction in yield 5 percent; Tennessee, general distribution, loss 6 percent, "Sanitation and spraying reasonably effective in control;" North Carolina, "Disease continues to cause heavy loss because growers of home fruit do not spray properly, if at all." Estimated loss, 3 percent; Oklahoma, general; Arkansas, this disease has not been of commercial importance in Northwest Arkansas orchards for many years, yet isolated cases exist (PDR 22: 35); Ohio, loss 0.5 percent; Indiana, less prevalent than last year or in an average year, "Summer temperatures were below the optimum for the development of the disease," loss 0.1 percent; Illinois, trace, "Observed only in Massac County, where 1.6 percent of fruit on 500 Winesap trees were infected;" Wisconsin, in Rock County; Iowa, no loss; Missouri, no commercial loss (PDR 22: 13).

Rusts. Gymnosporangium spp. (probably mostly G. juniperi-virginianae) were reported from Massachusetts as about normal in behavior; Connecticut, same as usual; New York, estimated reduction in yield 0.5 percent (PDR 21: 214, 240, 250); Virginia, less than usual, 1.5 percent loss was estimated by A. B. Groves (PDR 21: 174, 231); Arkansas, V. H. Young (May 21) writes that only scattered spots on apple leaves have been seen as yet and no serious outbreak is expected; Ohio (PDR 21: 274); Iowa, 1 percent loss.

Quince rust (Gymnosporangium clavipes) was reported as being much more severe in New York than last year or in an average year, "Early reports largely McIntosh and Delicious. Most of affected fruits dropped. Affected Cortland fruits did not drop--caused much alarm later in season--followed by black rot in many cases" (PDR 21: 249-250); New Jersey, "A recent examination of several apple orchards in North Jersey revealed the presence of considerable quince rust. This rust causes much more serious damage than the common cedar rust. It does not attack the leaf but it renders the fruit unsalable.............The presence of quince rust in such large quantities in some North Jersey orchards may require additional applications of sulfur in the bloom stage if the fruit is to be protected from infection;" Pennsylvania, much more prevalent than last year, mostly in the southeastern part of State, 0.3 loss; Virginia, "less quince rust than usual" (PDR 21: 171, 231); Arkansas, appears to be increasingly prevalent on the Delicious varieties (PDR 22: 36); Indiana, "much more prevalent than last year or in an average year owing to the frequent rains during the early spring. Susceptible varieties were King David, Golden Delicious, Rome, Delicious, Stayman, and Winesap;" Illinois, local distribution, "Newly recorded at Carbondale, Jackson County. 100 percent of trees, 1.4 percent of fruit;" Missouri, very prevalent (PDR 22: 13).

Hawthorn rust (Gymnosporangium globosum) in New York was less prevalent than usual. "Field men are not distinguishing hawthorn from apple rust on apple foliage, present but not reported as such."

Apple rust (Gymnosporangium juniperi-virginianae. See also Gymnosporangium spp.) in Massachusetts, which ordinarily is so conspicuous on Wealthy and Winter Banana, appeared to be even less damaging than in many past seasons; New York, more prevalent than last year, susceptible varieties were Wealthy, Winter Banana and Golden Delicious; Pennsylvania, much more prevalent than last year on Rome and York varieties, estimated reduction in yield 1 percent; Maryland, same as last year, reduction in yield 0.2 percent; Virginia (PDR 21: 174); in North Carolina the "Disease was abundant throughout the State. Spores were discharged on 6 occasions throughout a period of 30 days. Fruit was exposed and in some orchards isolated trees had much infected fruit;" Arkansas, observed on various varieties during the season, but not enough to cause any serious loss (PDR 22: 36); Ohio, cedars (Juniperus virginiana) found in close proximity to apple orchards are the cause of this trouble and in some sections of the State the apple rust is quite bad and causes great damage; Indiana, much more prevalent than last year or in an average year owing to frequent rains during the early spring. The susceptible varieties were Jonathan, Golden Delicious, Wealthy, Ben Davis and Rome; Illinois, same amount as last year but less than in an average year, distribution general, "100 percent of trees, 25.4 percent of fruit, 0.4 percent of leaf area. Average in infected orchards: 57.8 percent of trees, 0.83 percent of fruit, 0.02 percent of leaf area"; Wisconsin, more prevalent than last year, "cedar galls very abundant, infection followed wind channels from cedars. First year considered of importance on fruit at Gays Mills." (PDR 21: 232); Minnesota, more prevalent than last year owing to rain in early part of season, estimated reduction in yield 2 percent; Missouri, much more prevalent than last year or for several previous years, "Conditions were very favorable for cedar rust infection this spring, in some localities fruit and foliage infection very severe. One grower reported most of his crop ruined by cedar rust. Investigation showed his orchard surrounded by red cedar hedge." The most susceptible varieties were Rome, Wealthy, Red Delicious and McIntosh. Estimated reduction in yield 0.5 percent (PDR 22: 13); Kansas, less than usual.

Black pox (Helminthosporium sp.). Pennsylvania, local distribution, loss, a trace, "93 percent of Grimes apples were infected in one orchard."

Fly speck (Leptothyrium pomi) was less prevalent in New York than last year and much less than in several previous years; Pennsylvania, distribution general, "Average of 41 percent of unsprayed apples infected"; Maryland, more than usual; Oklahoma; Illinois, "Observed on 6 percent of fruit in 400-tree Jonathan orchard"; Wisconsin, scattered distribution.

Canker (Nectria cinnabarina): Pennsylvania, found in one orchard. First report on this host to the Survey from this State. Anthracnose (Neofabraea malicorticis): Washington, in King and Cowlitz Counties. Blister canker (Nummularia discreta): New York, no loss; Kansas. Fruit spot (Mycosphaerella pomi /Phoma pomi/) was reported from New York, New Jersey, Pennsylvania and Maryland, where it was of little importance. Blue mold (Penicillium sp.): New York. P. expansum was reported from Pennsylvania as having a general distribution. Reduction in yield 0.5 percent.

Blotch (Phyllosticta solitaria) was reported from New York, Maryland, Virginia (PDR 21: 231), Tennessee, Wisconsin and Kansas in the usual amounts; less in Pennsylvania and Iowa. A trace of loss was reported from Virginia, Texas, Ohio, Illinois (PDR 21: 215), Wisconsin, Iowa and Missouri, the estimates of more than a trace being 5 percent in North Carolina, 3 in Oklahoma, 2 in Kentucky, 1 in Pennsylvania and Tennessee, 0.1 in New York, West Virginia and Indiana, and 0.5 in Maryland; frequent rains through June, July and August furnished conditions in Arkansas favorable to the disease (PDR 22: 35); in Missouri, "The disease was generally well controlled this season though it was occasionally seen on early apples."

Black rot (Physalospora obtusa). Massachusetts (PDR 21: 229, 378-379); in New Hampshire the susceptible varieties were Wealthy and McIntosh, loss a trace; New York, same amount as last year, loss 0.1 percent; New Jersey, "Observed in several counties, traced to dark twigs or cankered areas above the affected leaves; Pennsylvania, more prevalent than last year, 3.5 percent reduction in yield plus 1 percent storage loss, "Average of 4.1 percent in unsprayed orchards"; Maryland, general distribution, more prevalent than last year, 2 percent loss; Virginia, less than last year or for several previous years (PDR 21: 231); West Virginia, loss 0.1 percent; Kentucky, trace; Tennessee, general distribution, 1 percent reduction in yield; North Carolina and Ohio, traces; Indiana, general distribution, "Infection of foliage was rather general and more prevalent than rot of fruits," loss 0.1 percent; Illinois, less than in an average year, "Average in orchards examined: 100 percent trees, 0.58 percent fruit, 0.11 percent leaf area," reduction in yield 2 percent (PDR 21: 215); Wisconsin, trace; Minnesota, "Occurs only on twigs and bark killed by other agents"; Iowa, reduction in yield 1 percent; Kansas.

Powdery mildew (Podosphaera leucotricha) was observed as traces in New York, Pennsylvania and Maryland; New Jersey; Virginia (PDR 21:174); Washington in King and Pierce Counties.

Heart rot (Polyporus spumeus) was reported from New Haven County, Connecticut. Brown rot (Sclerotinia fructicola) was unusually prevalent in Arkansas this year (PDR 22: 36); scattered distribution in Maryland, loss, trace. Silver leaf (Stereum purpureum) in New York was less prevalent than last year or in an average year, trace loss. Die-back (Valsa leucostoma): Illinois.

Scab (Venturia inaequalis) was reported from thirty-one States. Of these, New Hampshire, Vermont, New York, Pennsylvania, Virginia, Kentucky, North Carolina, Ohio, Indiana, Illinois, Michigan, Missouri, and Idaho reported the disease much more prevalent than last year. Maine, Tennessee, Iowa and North Dakota recorded the usual amount: while Maryland, West Virginia, Oklahoma, Wisconsin and Kansas noted less prevalence than last year. Other States reporting were Massachusetts, Rhode Island, Connecticut, Texas, Arkansas, Minnesota, Montana, Washington, and Oregon. As explanation, a few characteristic remarks follow. Massachusetts: This has been a difficult year for apple growers to prevent scab infections. There occurred nine infection periods from the pre-pink bud stage to the middle of June, the duration of ascospore discharge. There were additional ones during the remainder of June (PDR 21: 285). Indiana: Frequent rains in the spring and early summer favored the disease. Illinois: Owing to continued frequent showers throughout the months of April and May, apple scab has finally become established in practically all orchards in the State which have not been properly sprayed. The late appearance of the disease seems to be due to the scarcity of ascospores for primary infection (PDR 21: 214-215). Michigan: Moderate temperatures were accompanied by frequent rains in spring and summer. Missouri: Scab was some later in making its appearance, but very favorable environmental conditions after May 1 resulted in rapid spread. In general, good control of scab was obtained in commercial orchards where thorough spraying was done. Unsprayed fruit suffered heavily. Rain during the pre-bloom period made some bloom sprays necessary. Oregon: Much rainy and cloudy weather during early May. Scab was showing June 7 in more general distribution in an orchard under observation than at any time in three years. (PDR 21: 88, 108, 138-140, 172-173, 185, 186, 187, 212, 214-215, 229, 230, 232, 249, 274, 285, 286, 308, 322, 331, 378-379; 22: 12, 34-35, 38). Those States reporting losses of over 1 percent were Pennsylvania and Ohio, 15; New Hampshire, Connecticut, Kentucky, Tennessee, North Carolina, 10; Virginia, 8.5; Indiana, 7; Vermont, New York, Maryland, Oklahoma, Illinois, Michigan, Iowa, 5; Wisconsin, 3; Maine and Missouri, 2; Minnesota 1.5.

Black root rot (Xylaria mali). Virginia, losses from black root rot, principally of old drought-injured, mouse-girdled, or otherwise weakened trees, and of young trees planted in old holes where trees had died of the disease, continue to be observed in increasing numbers (PDR 21: 231-232).

Blight (Bacillus amylovorus) was reported from twenty-eight States. Vermont, New York, Virginia, Tennessee, Indiana, Illinois, Wisconsin, and Idaho reported less or much less than last year, while Connecticut and Minnesota reported more. In Minnesota, "Sufficient rain and fairly high temperatures in the first part of the season" favored the disease. Kentucky and Ohio recorded the disease as general. (PDR 21: 187, 215, 231, 232, 274, 379). Those States reporting losses of over 1 percent were Pennsylvania, Maryland and North Dakota, 1.5; Minnesota and North Carolina, 2; Iowa and Montana, 3; Kentucky, Tennessee and Wyoming, 5. Other States reporting its presence are New Hampshire, Massachusetts, New Jersey, Virginia, West Virginia, Texas, Oklahoma, Michigan, Kansas and Colorado.

Crown gall (Bacterium tumefaciens) was reported from Maryland with a trace loss; Wisconsin, less than for several previous years, "Observed only on nursery trees"; Minnesota, "No report this year. Probably quite a bit in nurseries"; Kansas, less than in an average year, "especially in nursery stock"; Washington.

Bitter pit (Baldwin spot, stippen; non-parasitic). Vermont, scattered distribution, more prevalent than in an average year, estimated loss 10 percent; in Massachusetts the disease was irregular as usual in its distribution and damage (PDR 21: 379-380); New York, usual amount, most susceptible varieties were Northern Spy and Baldwin; New Jersey; Maryland, usual amount, general distribution, estimated loss 1 percent; more prevalent than last year in Wisconsin.

Cork (non-parasitic) was less prevalent in New York than last year or for several previous years; Maryland and Virginia, scattered distribution, estimated loss 0.5 percent, susceptible varieties were Ben Davis and Gano.

Drought spot (non-parasitic). Less than usual in New York, "Few cases in Champlain Valley"; Idaho, local distribution.

Jonathan spot (non-parasitic) was reported from Arkansas (PDR 22: 36).

Measles (cause unknown). New York "internal bark spot type, scattered principally in Delicious orchards," less prevalent than last year, "Exact identity of rough bark on several varieties of apple still unknown. This appears to be associated with a physiological condition--probably due to mineral deficiency (boron ?), since drought seems to intensify the condition"; Pennsylvania, most severe in southwestern part of State, estimated reduction in yield 0.3 percent; Oklahoma, in Delaware County.

Spray injury (various spray materials) is more or less general in apple orchards in Massachusetts this year where lime-sulfur or the combined lime-sulfur plus lead arsenate spray was used early in the season (PDR 21: 248-249); much more prevalent than usual in New York, "Yellowing and dropping of leaves severe this year, especially in Western New York" (PDR 21: 249); lime sulfur spray injury has appeared quite generally in Illinois, but is not severe enough to cause appreciable losses (PDR 21: 215); New Jersey, In some cases trees were injured from oil emulsion applied during dormant period"; Maryland, local distribution, 1 percent loss; Virginia, lime sulfur injury was unusually severe in many orchards following the petal fall spray (PDR 21: 232); Arkansas, fruit of the Golden Delicious variety in an orchard near Rogers developed the typical calyx-end type of arsenical injury (PDR 22: 36); Washington, in Mason County.

Weather injuries: Frost injury in New York was much less prevalent than last year, little damage was done. Also reported from Spokane County, Washington. More hail injury in New York than last year. Earliest recorded date of appearance was May 14. Sun scald: New York, "Mostly on lower limbs. One-half of 1 percent of fruit affected," caused by high temperature and exposure to the sun. In Minnesota, sun scald was caused by cold, general distribution. C. J. Eide reports, "Actual injury by sun scald was probably very scarce this year, but the injury caused last year became more apparent, and a great majority of the telephone calls and letters this year were concerning dead bark and Schizophyllum on trees. The injury in some of the orchards examined will amount to 25 to 30 percent of the trees which are dead or will die within the next couple of years because of the injury. Injury was less in well cared for orchards than in others and seemed to be worse on old trees than on young ones." Winter sun scald reported from Kitsap County, Washington. Winter injury: Wisconsin, scattered distribution, "Bad in Central and Northwestern sections. Cumulative effect from series of dry seasons"; also reported from three counties in Washington.

NECTARINE. See AMYGDALUS PERSICA NECTARINA.

PAPAYA. See CARICA PAPAYA.

PEACH. See AMYGDALUS PERSICA.

PERSEA AMERICANA. AVOCADO:

Cercospora spot or blotch (Cercospora sp.) and anthracnose (Colletotrichum sp.) were considered by some packing house men and growers to be slightly more abundant than during 1936 in Florida (PDR 22: 16).

Rot (Colletotrichum gloeosporioides). Puerto Rico.

Powdery mildew (Oidium sp.) was much less evident on avocado foliage in Florida this season than during 1936 and was of very minor importance (PDR 22: 16).

Scab (Sphaceloma perseae). In Florida scab occurred in a severe form as usual on the Lula variety. Fruit infections ranged from less than 10 percent in groves that were well sprayed to 100 percent in unsprayed trees, with an average of approximately 25 percent for the variety (PDR 22: 16).

Frenching or mottle leaf (chlorotic condition) was observed in a number of groves in Florida this past season, but was of minor importance (PDR 22: 16).

Tip burn (non-parasitic) of leaves was observed in several groves in Florida, following the use of calcium cyanamide as the source of nitrogen in the fertilizer (PDR 22: 16).

PEAR. See PYRUS COMMUNIS.

PLUM. See PRUNUS spp. PLUM.

POMEGRANATE. See PUNICA GRANATUM.

PRUNE. See PRUNUS DOMESTICA.

PRUNUS ARMENIACA. APRICOT:

Blight (Coryneum beijerinckii). Idaho, general distribution, more prevalent than last year or in an average year (PDR 21: 215); Washington, in Adams, King, Pierce and Clarke Counties.

Brown rot (Sclerotinia spp.): Washington, general on coast.
Mildew (Sphaerotheca pannosa persicae): New York, "Fruits snow white with mildew in Niagara County."

Crowngall (Bacterium tumefaciens). Arizona, "Crowngall is quite generally distributed throughout the State; on account of close balance between water intake and outgo in driest months, the disease is usually fatal."

Gummosis (undetermined). New Jersey.

Ring spot (virus?). Washington.

PRUNUS DOMESTICA. PRUNE:

Root rot (Armillaria mellea). Washington in Clarke County.

Black knot (Dibotryon morbosum). New York, in Monroe County, new black knots on prunes were numerous in orchards infected last year; in Niagara County no new black knots have been found of last year's infection but the 1935 knots showed new areas of growth.

Brown rot (Sclerotinia sp.). Washington, general on coast; slight infection of S. fructicola in New York, also reported from New Jersey.

Mosaic (Virus). More prevalent in New York than last year. "In one orchard containing 2 diseased trees two years ago, 11 diseased trees were observed in June 1937. Formerly thought that this disease was spread only in propagation."

Drouth spot was reported from New York as more prevalent than usual. Fruit drop and wilting (undetermined); Washington. Gum spot (undetermined): Idaho, much more prevalent than last year, 3 percent loss. Russetting (frost): Washington, in Chelan County.

PRUNUS spp. CHERRY:

Root rot (Armillaria mellea). Washington, in Pierce County.

Scab (Cladosporium carpophilum) was more prevalent than last year or for several previous years in Idaho. Estimated loss a trace.

Leaf spot (Coccomyces hiemalis). Connecticut; Massachusetts, the disease was about normal this year (PDR 21: 380); New York, much more prevalent this year or in an average year, trace to 1 percent loss, general distribution; New Jersey, "Developed earlier than usual, made its appearance in South Jersey orchards during week of June 14"; Pennsylvania, much more prevalent than last year or in an average year, estimated reduction in yield 20 percent. R. S. Kirby says, "The most severe and complete defoliation I have ever seen"; Maryland, general distribution, more prevalent than usual, estimated loss 5 percent; Virginia, more than usual, frequent early rains favored the disease, 2.5 percent loss; West Virginia, 0.5 percent loss; North Carolina, trace; Tennessee, 20 percent loss; Arkansas, in properly sprayed orchards the disease had little effect upon the 1937 crop (PDR 22: 36-37); Ohio, 5 percent loss; Indiana, less prevalent than last year or in an average year, scattered distribution, estimated reduction in yield 5 percent; Illinois, general distribution, 10 percent loss was estimated; Michigan, much more prevalent than for several years owing to the well distributed rain periods in early summer, "Loss will be reflected in next season's crop and damage to trees," much more prevalent than usual, estimated loss 10 percent; Wisconsin, less than usual owing to the dry and hot weather, 2 percent loss; Iowa, 2 percent reduction in yield, more prevalent than last year or for several previous years; Missouri, environmental conditions during May and June favored the spread of this disease (PDR 22: 13). Much more prevalent than last year, "caused complete defoliation by July in unsprayed orchards. In some poorly sprayed orchards the disease caused considerable defoliation"; Kansas; Montana, trace loss; Washington, general on coast.

Blight (Coryneum beijerinckii) was reported much more prevalent on sweet cherry in Idaho than last year or for several previous years; Washington, general on coast, also reported from Yakima County.

Powdery mildew (Podosphaera spp.) was less prevalent than usual in Idaho on sour cherry, estimated loss was set at 10 percent. P. oxyacanthae was more prevalent than last year in Western New York.

Brown rot (Sclerotinia fructicola) appeared in New Haven County, Connecticut on sweet cherry, about the usual prevalence was noted; New York, much more prevalent than last year, occurred on both sweet and sour cherries (PDR 21: 214, 250); New Jersey, general distribution; Pennsylvania, estimated an average 20 percent loss, "most severe in Erie section"; Maryland, general distribution on sour cherry, more than usual, reduction in yield was estimated at 3 percent plus 1 percent loss in grade. New Jersey, " In Morris County 20 percent of fruit dried, very severe on unsprayed fruit"; Virginia, 8.5 percent loss; West Virginia, trace; North Carolina, 15 percent; Tennessee, trace; Arkansas, the brown rot disease was not observed on the Montmorency variety but small plantings of Napoleon, Bing and an unknown variety of white cherry were affected by fruit rot as they matured during the period June 5 to June 19 (PDR 22: 37); Indiana, less prevalent than in an average year, but more prevalent than last year owing to the frequent rains during the ripening period. Average estimated loss 0.5 percent; Illinois, estimated loss was 2 percent, "Very little damage in late season"; Michigan, much more prevalent on sweet cherry than in previous years, owing to the warm rains in the early season, estimated reduction in yield 10 percent; in Wisconsin the disease was less prevalent than usual owing to the dry and hot weather; Iowa, more prevalent than last year or in an average year, 2 percent loss; Kansas, "Very little noted in 1937"; S. laxa was reported from Washington in Snohomish County; Sclerotinia spp. were more prevalent in Oregon than for several previous years.

Silver leaf (Stereum purpureum) in New York was less prevalent than usual, "Black Montmorencies with over 80 trees showing clear symptoms in 1935 seem to have recovered 100 percent."

Witches' broom (Taphrina cerasi). New York and Washington.

Plum pocket (Taphrina pruni) was reported on chokecherry in New York.

Bacterial spot (Bacterium pruni). Traces in western New York. Gummosis (Bacterial ?), Washington.

Virus diseases: Buckskin: Washington in King and Pierce Counties. Mottle leaf was reported from Idaho, scattered distribution, "May be on increase or more apparent."

Weather injuries: Wind and storms in Michigan were much more prevalent than last year or for several previous years. There was a "severe storm before fruit was half harvested (July 25). Loss of grade severe. Some authoritative reports consider loss over one million dollars to growers." Drought injury in Wisconsin was much more prevalent than last year. The hot winds "caused heavy damage to Montmorency just before harvest, the nature of the damage was bruised fruit"; Kansas, "Some fruit in '37. Few trees in the State as compared to 1927--owing to injury from dry hot seasons"; Washington in Lincoln County; no new cases of winter injury were reported from New York; much less winter injury in Wisconsin than last year, distribution local, also reported from Washington in Kittitas and Yakima Counties. Winter sunscald was present in King County, Washington. Frost injury in New York was much less than last year or in an average year, "almost none reported"; it caused "heavy loss to fruit buds in low sections of orchards in Door County."

PRUNUS spp., PLUM (See also P. domestica, prune):

Leaf spot (Cercospora circumscissa). Texas in Cherokee County.

Scab (Cladosporium carpophilum) was less prevalent than usual in Wisconsin, "mostly on Americana varieties and unsprayed trees."

Leaf spot (Coccomyces prunophorae) was generally distributed in New York, more prevalent than last year, loss 1.5 percent; more prevalent in Indiana owing to frequent rains during the early summer months, distribution scattered, estimated loss 0.1 percent; Minnesota, "No reports."

Black knot (Dibotryon morbosum) was reported from Hartford, Middlesex and Fairfield Counties, Connecticut; New York, trace; New Jersey, reported from Bergen, Hunterdon, Middlesex and Morris Counties; Pennsylvania, usual prevalence, 2 percent was the estimated reduction in yield; Maryland, more prevalent than for several years, estimated reduction in yield 4 percent; Wisconsin, scattered distribution, usual prevalence; Minnesota and Iowa, trace loss; North Dakota, "Not observed this year."

Hypertrophy (Exoascus mirabilis). Winn Parish, Louisiana, and North Carolina.

Root rot (Phymatotrichum omnivorum). Texas.

Brown rot (Sclerotinia fructicola) was much more prevalent in New York than last year, loss was estimated at 3 percent; New Jersey, "scattered reports"; Pennsylvania, general distribution, more prevalent than last year, estimated loss 9 percent; Maryland, scattered distribution, reduction in yield 5 percent; Ohio, according to A. L. Pierstorff plums rotted earlier this year than he ever saw them in Ohio (PDR 21: 274); Indiana, more prevalent than last year, 5 percent loss. Illinois, general distribution, "Only occasional trees examined, on these 7.1 percent of fruit was attacked"; Wisconsin, less prevalent than for several previous years, weather hot and dry; Minnesota, "Abundant apothecia seen at the Fruit Farm, but very little rot. Not many plums grown in Minnesota"; Iowa, more prevalent than usual, estimated reduction in yield 12 percent.

Plum pocket (Taphrina pruni) appeared in New York, West Virginia, Louisiana, Texas, North Dakota, Minnesota and Wisconsin, but was of comparatively little importance.

Rust (Tranzschelia pruni-spinosae) was reported as general from Oklahoma.

Bacterial spot (Bacterium pruni) appeared in traces in Pennsylvania and Maryland; in Arkansas, according to John C. Dunegan, typical cases of leaf spots on cultivated plums were observed in orchards near Fayetteville during 1937. The injury to the fruit was of minor importance, however, from a commercial standpoint (PDR 22: 37); Wisconsin, reported from Jefferson County.

Crowngall (Bacterium tumefaciens) was reported from New York on budded plum seedlings; Maryland, scattered infection, a trace was the estimated loss.

Spray injury (Arsenic and lime sulphur). New York, "Lime sulphur little used in commercial area. Arsenical injury more than 1936, but less than average. In Niagara County on August 14, prunes all over the county showed yellowing of leaves on terminals of weak trees"; Wisconsin, lime sulphur spray was more injurious than last year, "Reported bad in Rock County," the variety most susceptible was the Japanese plum.

Mummies (cause unknown) was reported from Washington in Yakima County.

PSIDIUM GUAJAVA. GUAVA:

See report of Geo. D. Ruehle, PDR 22: 18. Aside from fruit rots (Colletotrichum sp. and others) the guava was quite free from serious diseases during the past season in Florida.

PUNICA GRANATUM. POMEGRANATE:

Blotch (Mycosphaerella lythracearum) was very common and destructive on the pomegranate in Florida, causing partial defoliation and severe blemishing of the fruit (PDR 22: 19); reported as general in Hidalgo County, Texas.

PYRUS COMMUNIS. PEAR:

Root rot (Armillaria mellea). Texas, in Wise County. Leaf spot (Cercospora minima) appeared in East Baton Rouge Parish, Louisiana.

Leaf blight (Fabraea maculata). New York and Michigan reported 0.1 percent loss; Maryland, 1.5; North Carolina, 10; Pennsylvania, Virginia, Ohio, Wisconsin and Missouri, traces; in Missouri, "Conditions early in the season seemed to indicate that the disease might prove serious in 1937. Foliage infection was moderate to severe in unsprayed orchards, but fruit was apparently beyond stage for ready infection. In general the disease was of no commercial importance in 1937. The canker phase of the disease was again very prevalent." (PDR 21: 186; 22: 13); Idaho, none reported; in Louisiana the disease was seen only in the southeastern part of the State. The most resistant variety was the Kieffer, and the most susceptible varieties were Pineapple, Hood and Le Conte; Illinois reported more than last year and much more than for several previous years, generally distributed in the southern part of the State, "100 percent of trees with infection, 47.5 percent of leaves infected, average 2.7 spots per leaf for all leaves," estimated reduction in yield 4 percent.

Scab (Venturia pyrina) was reported from twelve States. New York and Michigan each reported 0.1 percent loss; Pennsylvania, 1; Maryland, 1.5; Wisconsin, 2; Virginia, North Carolina, Ohio and Oregon, each a trace; Iowa, 0; estimated losses for New Jersey and Washington not given.

Sooty blotch (Gloeodes pomigena) was reported from Macoupin and Jasper Counties, Illinois. Hawthorn rust (Gymnosporangium globosum) was very prevalent on pear foliage in Missouri in the experimental plots on the University campus (PDR 22: 13). Fly speck (Leptothyrium pomi) was as prevalent as usual in New York, total estimated loss was a trace. The Kieffer pear was susceptible. Leaf spot (Mycosphaerella sentina) in New York was less prevalent than last year or in an average year, trace loss; Illinois, more prevalent than last year or for several previous years, distribution general in the South, "76 percent of leaves infected, average 4.2 spots per leaf." Sporotrichum rot (Sporotrichum malorum) was reported from Oregon. Silver leaf (Stereum purpureum), New York, "none reported."

Blight (Bacillus amylovorus) was on the whole less prevalent than last year. New Hampshire and New Jersey reported its presence; Connecticut, Virginia, Oklahoma, Wisconsin and Iowa each reported 1 percent estimated loss; New York and Michigan 0.1 percent; Pennsylvania, 15, "Less severe in most of the State"; Maryland, Indiana and Illinois, each 10 percent (PDR 21: 215); Kentucky, very general over the State, and very destructive. This is the first outbreak for several years

(PDR 21: 187); Ohio, Mendenhall writes, "Fire blight is very bad this year, causing considerable damage to pears." General over the State, the estimated loss was reported as 0.1 percent; North Carolina estimated 4 percent loss; Tennessee, 50 percent; Texas, 0.5 percent; Idaho, 7 percent; traces from Washington and Oregon.

Bitter pit (non-parasitic): Washington, in Chelan and Okanogan Counties. Black end (non-parasitic) was observed as general and more prevalent than usual in Idaho, estimated loss 2 percent. Crown girdle (undetermined): Louisiana, Dothiorella [Botryosphaeria] sp. and Clitocybe sp. found associated with the trouble. Target canker (non-parasitic): Washington. Branch necrosis, canker, die back and rough bark (undetermined) were reported from Washington.

QUINCE. See CYDONIA OBLONGA.
RASPBERRY. See RUBUS spp.

RIBES GROSSULARIAE. GOOSEBERRY:

Leaf spot (Mycosphaerella grossulariae). Wisconsin.

Anthracnose (Pseudopeziza ribis). New Jersey, prevalent in several plantings; Wisconsin, scattered distribution, less prevalent than in an average year; Washington in Pierce County.

Rust (Puccinia grossulariae) was first observed in Ulster County, New York, May 24, on both leaves and fruit; more prevalent in Wisconsin than last year.

Powdery mildew (Sphaerotheca mors-uvae) was reported as severe on gooseberries in Ulster County, New York, more prevalent than last year; Wisconsin, less than usual owing to the dry weather; Idaho, usual prevalence, estimated loss 5 percent; Washington in Island and King Counties.

Winter injury was reported from Clallam County, Washington.

RUBUS spp. CANE FRUITS:

BLACKBERRY: Gray mold (Botrytis sp.) appeared in four counties in Washington.

Rosette (Cercosporella rubi) was reported from Louisiana by A. G. Plakidas, for a complete report he refers to Journ. Agr. Res. 54: 275-303, Feb. 15, 1937.

Anthracnose (Elsinoe veneta). New York, "none reported"; New Jersey; Kansas, less than usual; appeared in Snohomish, Pierce and Thurston Counties, Washington.

Double blossom (Fusisporium rubi): New Jersey, "Not so abundant as usual"; trace in Texas.

Sooty blotch (Gloeodes pomigena) was reported as abundant along the Susquehanna River at Herndon, Northumberland County, Pennsylvania in May by G. L. Zundel.

Orange rust (Gymnoconia peckiana) was found to be less prevalent than for an average year in New York; "Common throughout New Jersey, severe in some cases"; in Pennsylvania, "Most abundant in neglected or poorly cared for patches," estimated loss 2 percent; scattered distribution in Wisconsin, less prevalent than last year; Kansas, "Not seen in 1937."

Leaf spot (Mycosphaerella rubi): Kansas, much less than usual.

Crown gall (Bacterium tumefaciens) appeared in New York, Texas, Wisconsin and Washington.

Mild mosaic (virus): Wisconsin.

Witches' broom (virus) was reported again this year from Pennsylvania.

DEWBERRY: Rosette (Cercosporella rubi) was reported from Louisiana by A. G. Plakidas; for a complete report he refers to Journ. Agr. Res. 54: 275-303, Feb. 15, 1937.

Die-back (Coniothyrium sp.) was reported from Dallas County, Texas.

Anthracnose (Elsinoe veneta): New Jersey, was observed in Camden and Middlesex Counties.

Double blossom (Fusisporium rubi) was much less prevalent in New Jersey than in former years.

Orange rust (Gymnoconia peckiana) was observed in Saratoga County, New York.

Cane blight (Leptosphaeria coniothyrium) was reported as general in Louisiana.

Interveinal mild mosaic (virus): Trace in Texas.

RASPBERRY: Spur blight (Didymella applanata) was the outstanding disease on red raspberries this season in Massachusetts (PDR 21: 380); one report from Minnesota in St. Louis County; Washington, general on the coast. (See also Mycosphaerella rubina).

Anthracnose (Elsinoe veneta) was an outstanding disease on black raspberries this season in Massachusetts. It continued to develop later in the summer than usual owing to the continued wet weather up to July and to the succulent growth (PDR 21: 380); less prevalent in New York and Maryland than usual, losses set at trace and 3 percent respectively; abundant in New Jersey, but did not cause any serious damage; much more prevalent in Pennsylvania than last year, estimated loss 4 percent. "This disease was controlled by proper spraying"; Ohio, "Anthracnose quite bad on Latham red raspberries, on account of a very rainy season," in Fairfield County the crop was reduced and the berries unsalable; the disease in Indiana was more prevalent than last year owing to frequent rains during the spring and summer months, estimated loss 5 percent; generally present throughout Illinois as a leaf spot (PDR 21: 186); Wisconsin, less than last year; estimated reduction in yield in Minnesota was 2 percent. The disease was "fairly heavy on all blocks examined"; more prevalent in Iowa than usual, estimated loss 7 percent; Kansas, "Cane infections very severe, but no infections on fruit"; Washington, in Wahkiakum County, also general on the coast.

Double blossom (Fusisporium rubi): Maryland, scattered distribution, trace loss.

Orange rust (Gymnoconia peckiana) was reported from Connecticut in Middlesex County; more prevalent in New York than last year, trace loss; Pennsylvania, "Most abundant in neglected or poorly cared for patches, reduction in yield 2 percent; Maryland, 1 percent loss, scattered distribution; Minnesota, "No reports."

Cane blight (Leptosphaeria coniothyrium) was observed in Durham County, New Hampshire; New York, "Not reported"; Pennsylvania, scattered distribution, 2 percent estimated loss; Maryland, local distribution, more prevalent than last year, loss 3 percent; North Dakota, trace; Kansas, less prevalent than usual.

Leaf spot (Mycosphaerella rubi) in Massachusetts was more conspicuous than in most seasons, though not very injurious (PDR 21: 380); New York in Madison County; New Jersey, "Very severe in many plantings in Bergen County. Two sprays using concentrated lime sulphur 1-40, delayed dormant, and one of Bordeaux 4-4-50 at pre-blossom stage failed to reduce infection appreciably"; Pennsylvania, more prevalent than last year, 0.5 percent was the estimated reduction in yield; Iowa, trace; Kansas.

Spur blight (Mycosphaerella rubina) was observed in New York as being more prevalent than for several previous years. The susceptible varieties were June Red and Latham Red, loss a trace; New Jersey, "Very severe in a few plantings"; Pennsylvania, scattered distribution; Iowa, less than in an average year, trace loss; Colorado; Idaho, more prevalent than last year or in an average year. (See also Didymella applanata).

Western yellow rust (Phragmidium rubi-idaei): Washington, in Island and Cowlitz Counties, also general on the coast.

Yellow leaf rust (Pucciniastrum americanum), according to O. C. Boyd, was observed occasionally this fall, as usual, but was not widespread or destructive as in 1933 (PDR 21: 380).

Powdery mildew (Sphaerotheca humuli) was reported again this year in the Hudson Valley in New York, with a trace loss; Pennsylvania, more prevalent this year on Latham and Cumberland varieties; Minnesota, "No reports."

Wilt (Verticillium albo-atrum) was observed in New York as more prevalent than last year, and in New Jersey.

Crown gall (Bacterium tumefaciens) was much less prevalent than usual in New York, but was a major problem in Pennsylvania, causing a loss of 7 percent. The susceptible varieties were Plum Farmer and New Logan; Maryland, trace; North Carolina, "Large commercial plantings of 3 and 4 years ago have about disappeared, because of anthracnose and crown gall. Farmers have abandoned the developments in many fields"; Minnesota, one report from Swift County; Kansas; Washington in Puyallup Valley.

Leaf curl (virus): New York, "Not reported"; Pennsylvania, "During the last few years this disease has become much less prevalent"; Maryland, 1 percent reduction in yield, local distribution; Ohio, "Occurs locally in a number of districts, seems to be more common on the Cumberland variety of black cap raspberries"; Wisconsin, same as last year; Minnesota, "No reports."

Mosaic (virus) was less prevalent in Vermont than for several previous years, estimated loss 10 percent, distribution scattered; New York, more prevalent than in an average year, 15 percent was the estimated loss; New Jersey; Pennsylvania, 6 percent loss, less prevalent than usual. Newburg variety was immune, Latham resistant, and Cuthbert susceptible; Ohio, in Clark County, "It is more frequent on red raspberries"; Wisconsin, less prevalent than usual, "About 150 acres inspected as mosaic free. Over 100 acres that not even a plant found"; Minnesota, more prevalent than last year or for several previous years, estimated reduction in yield 12 percent, general distribution. According to C. J. Eide, "Nursery inspectors report slightly more mosaic than last year, owing probably to the fact that it was masked last year and was not easy to find. This would leave more to be found this year"; Iowa, usual amount, 7 percent loss; Kansas, "Very few plants left in State due to drouth"; Idaho, general distribution, estimated loss 50 percent; Washington, in King, Pierce, Thurston and Lewis Counties.

Streak (virus) in Pennsylvania was reported as causing 7 percent loss, the same as last year, but less than in an average year.

Winter injury: O. C. Boyd said the outstanding injury in raspberries in Massachusetts this year was winter injury (PDR 21: 229-230); New York, "Not noted"; Idaho (PDR 21: 215); Washington, general on coast.

YOUNGBERRY (HYBRID DEWBERRY): The following diseases have been reported from Washington. Anthracnose (Elsinoe veneta),cane blight (Leptosphaeria coniothyrium), and leaf spot (Mycosphaerella rubi) in Jefferson County; crown gall (Bacterium tumefaciens)in Clarke County.

STRAWBERRY. See FRAGARIA sp.

VITIS sp. GRAPE:

Dead arm (Cryptosporella viticola) occurred in New York causing a trace loss; in Michigan D. Cation reports, "No accurate survey made but have seen varying amounts of this disease in Van Buren County vineyards."

Anthracnose (Elsinoe ampelina) was reported from Maryland in about the usual prevalence, a trace was the estimated reduction in yield.

Black rot (Guignardia bidwellii) appeared in New Hampshire; in Massachusetts the disease was less damaging than in the average season, even in the back-yard arbors. Properly sprayed vineyards were troubled very little by this disease (PDR 21: 381); Connecticut, in Hartford, New Haven and Fairfield Counties, estimated loss for State 10 percent; more prevalent than for several years in New York, estimated loss 1 percent; very severe in several plantings in New Jersey; much more prevalent in Pennsylvania than for several previous years, total estimated loss 30 percent; in Maryland the disease was more prevalent than usual on unsprayed orchards, "not a problem in commercial orchards," reduction in yield 12 percent; Virginia, more prevalent than usual owing to frequent rains, 20 percent loss; in North Carolina, "European varieties rotted badly despite heavy spraying with Bordeaux mixture. American varieties continue to be much more resistant"; Florida, much less prevalent than last year, estimated loss 10 percent. The most susceptible varieties were Herbemont, Beacon, Niagara, Fredonia and Fern Munson; estimated reduction in yield for Texas was 10 percent; Oklahoma; Arkansas (PDR 21: 188); Ohio, 1 percent loss (PDR 21: 275); owing to the frequent rains during the early spring and summer the disease in Indiana was more prevalent than usual, causing a 4 percent loss; Michigan, much more prevalent than for several previous years owing to the "moderate temperature during the summer and the numerous well distributed rains. Reported plentiful in poorly sprayed or neglected vineyards in Van Buren and Berrien Counties. No surveys made," 5 percent loss; Wisconsin, less prevalent, trace loss; Minnesota, "No reports"; Iowa, more prevalent than in an average year, 2 percent loss was estimated; Kansas, "None noted."

Bitter rot (Melanconium fuligineum): New Jersey; Florida reported 12 percent as estimated reduction in yield.
Root rot (Phymatotrichum omnivorum) was present in Arizona and Texas, causing 1 percent loss in Texas.

Downy mildew (Plasmopara viticola): Losses from this disease were generally more than usual. Of the eighteen States reporting, New York, Pennsylvania, Indiana, Michigan and Iowa reported it more prevalent than last year or in an average year. Vermont and Maryland were the only States reporting less. According to O. C. Boyd, downy mildew generally was the most damaging disease of grapes this year, particularly on unsprayed vines (PDR 21: 381); a loss of 1 percent was estimated for New York; New Jersey, "Severe in some cases despite the fact that the regular spray schedule was applied. Infection limited to foliage that developed late in July and August. More severe in Bergen, Middlesex, Monmouth and Morris Counties than in other sections. Present in various localities"; Florida, "No downy mildew of commercial importance has been observed since the season of 1932"; Ohio, "On account of so much rain in early summer with cloudy weather there is a great deal of downy mildew" (PDR 21: 275); Indiana, "Abundant rainfall during the summer months"; Michigan, "Prevalent on wild grapes. Not a factor in the sprayed vineyards. No survey made"; Iowa, estimated loss 3 percent.

Powdery mildew (Uncinula necator): Losses from this disease were no more prevalent than usual. There were eleven States reporting and ten of these gave estimated reduction in yield as follows: New York, 0.5 percent; Pennsylvania, Tennessee, Ohio, Michigan, Iowa and Texas, each a trace; Maryland, 1; Virginia, 2, and North Carolina, 5.

Crown gall (Bacterium tumefaciens) was observed as a trace in New York and Maryland.

Winter injury was less than usual. New York reported "none"; Iowa, trace; one report from Washington in Benton County.

DISEASES OF NUT CROPS

For chestnut see Castanea under Trees and for peanut see Arachis hypogea under Special Crops.

CORYLUS sp. FILBERT, HAZELNUT:

For filbert diseases in the Pacific Northwest in 1937 by P. W. Miller, see Plant Disease Reporter 22: 21-22. Bacterial blight (caused by Phytomonas [Bacterium] sp.) was not as prevalent nor as severe, on the whole, as in 1936. It is estimated that this disease caused a death of from 5 to 35 percent of the trees in young orchards under 5 years of age, the average loss being approximately 10 percent. Leaf scald, a non-parasitic disorder of filbert leaves, was widely distributed in the Pacific Northwest in 1937. Shrivel (non-parasitic) was present in greater or less amounts in 1937 in practically all filbert orchards in the Pacific Northwest. For the Pacific Northwest as a whole, it is estimated that not more than 5 percent of the 1937 filbert crop were "blanks" due to shrivel.

HICORIA PECAN. PECAN:

Scab (*Cladosporium effusum*) was prevalent in North Carolina but did not cause important losses; Stuart variety was immune, while Schley was susceptible. Scab in Louisiana was more prevalent than last year or in an average year; Stuart variety was very resistant, Success susceptible, and Schley very susceptible. The estimated loss for Texas was 1 percent.

Brown leaf spot (*Cercospora fusca*) caused 2 percent loss in Bell County, Texas. Powdery mildew (*Microsphaera alni*) was reported as causing a trace loss in Bell County, Texas.

Rosette, attributed to zinc deficiency, was observed as "general" in Oklahoma.

JUGLANS REGIA. PERSIAN WALNUT:

Diseases of Persian walnut in the Pacific Northwest were also reported by P. W. Miller (PDR 22: 19-20). For reports on butternut, *J. cinerea*, and black walnut, *J. nigra*, see *Juglans* under Tree Diseases.

Leaf spot (*Phyllosticta juglandis*) occurred on leaves of Persian walnuts near Eugene, Oregon. This particular leaf spot has not been reported heretofore on *Juglans regia* in the Pacific Northwest (PDR 21: 345-346).

D I S E A S E S O F T R E E S

The following list of articles on tree diseases which appeared in the Reporter supplements this summary.

Boyd, O. C. Diseases of ornamentals and trees in Massachusetts. Reporter 21: 292-293.
Carter, J. C. Verticillium wilt of woody plants in Illinois. Reporter 22: 253-254.
Davis, William C. and Dennis H. Latham. Phomopsis blight in some forest tree nurseries. Reporter 22: 24-25.

Edson, H. A. *Crataegus* diseases collected in Virginia. Reporter 21: 279.

Fowler, Marvin E. *Cryptodiaporthe castanea* on Asiatic chestnuts. Reporter 22: 69.

Harrar, J. G. and S. A. Wingard. Diseases of Virginia ornamental trees. Reporter 21: 218.

Hilborn, M. T. Winter injury to ornamental woody plants in Maine. Reporter 21: 310-313.

Jackson, L. W. R. *Cylindrocladium* associated with diseases of tree seedlings. Reporter 22: 84-85.

Jenkins, Anna E. New records of *Dothidella castanicola* and *Gnomoniella coryli* from Oregon. Reporter 22: 68.

Latham, Dennis H., Kenneth F. Baker, Carl Hartley, and William C. Davis. Dodder in forest nurseries. Reporter 22: 23-24.

Steinmetz, F. H. and A. E. Prince. Additional *Gymnosporangium* rusts in Maine. Reporter 21: 234-235.

Tims, E. C. and P. J. Mills. Some new hosts for *Corticium stevensii* in Louisiana. Reporter 22: 50.

Waterman, Alma M. Diseases of shade and ornamental trees: Summary of specimens received in 1937 at the New Haven office, Division of Forest Pathology. Reporter 22: 58-60.

White, R. P. Diseases of trees observed this year. Reporter 21: 277-278.

Yarwood, Cecil E. Unreported powdery mildews. Reporter 21: 180-182.

PHYTOPHTHORA CINNAMOMI IN 1937:

During 1937 *Phytophthora cinnamomi*[1/] was isolated from seedling black walnut with root rot from two different localities. In an Arkansas nursery a loss of only 2 percent was experienced in contrast to an almost total loss the year before when the seedbeds were located on a poorly drained site. A rather severe loss was reported in the same species from a North Carolina nursery. In two additional North Carolina nurseries and one South Carolina nursery, losses from a disease with the same symptoms were observed, but the causal organism was not confirmed by culture.

1/ This is the fungus referred to in "Root disease of some conifers and hardwoods caused by Phytophthora cambivora (*P. cinnamomi*)". Plant Dis. Rep. 20: 202-204. July 15, 1936. Until more complete evidence is available on the synonomy of *P. cambivora* and *P. connamomi* the strains found in the United States will be called *P. cinnamomi* Rands.

On the two Arkansas National Forests, P. cinnamomi caused a disease similar to the "ink disease", killing many of the few remaining trees of Castanea ozarkensis. On the Holly Springs National Forest in Mississippi the fungus was isolated from Castanea dentata also suffering from a disease similar to the "ink disease". Additional cases of the same disease occurred in Georgia on C. dentata and in Alabama on C. alabamensis.

(Bowen S. Crandall, Division of Forest Pathology).

DISEASES IN FOREST TREE NURSERIES AND PLANTATIONS 1936 and 1937:

In general, losses in nurseries have decreased somewhat in recent years because of the wider spacing now commonly given seedlings.

Conifers: In the western nurseries damping-off was not markedly different from what is normally expected and no other serious parasitic troubles were reported. Losses from the 1936 drought were not so heavy as was anticipated. In the northern Lake States damping-off and parasitic diseases generally were relatively unimportant on the acid sands on which most of the nurseries in this territory are located. Spruce needle rusts which have leather leaf for their alternate host occurred in both 1936 and 1937, but the disease was less abundant than in 1927. Drought killing and heat injury to the bases of stems were frequent in 1936, and according to Forest Service sources heat injury of the bark of pines in plantations was rather general during the unprecedented heat wave of 1936. The needle droop disease epidemic of 1935 mainly on planted red pine, probably non-parasitic, was not repeated during the severe season of 1936 nor during 1937. However, this disease was reported in 1936 from isolated areas in the Lake States and in the East, while in 1937 it was reported in New England and in the Northwestern States.

In the Central States damping-off and chlorosis were general, aggravated in some places by the use for seedbed cover of sand which contained lime. Nurserymen have now been advised on this point and little further trouble from this source is expected, although certain of the soils have already received so much lime that they can no longer be used for conifer seed beds. Serious phosphate deficiency associated with predominance of pseudomycorrhizae over ectomycorrhizae was found at an Indiana nursery and these factors may explain less acute stunting elsewhere. A basal resinosis of planted white pine several years old in southern Indiana killed one-eighth of the trees in the plantations but did not occur on red pine and other pines and spruce which were interplanted with the white pine.

In the South longleaf pine, because of its rosette habit, suffered considerably from Rhizoctonia starting near the base of the cotyledon whorl. This trouble was most serious in beds over which sand and dirt had drifted or washed. Slash and shortleaf pines suffered some injury from chlorosis. In Mississippi, slash and loblolly pines, more susceptible to *Cronartium fusiforme* than is longleaf pine, were found to have an alarming number of stem infections with this rust during the first season in seed beds at nurseries where oaks of the black-oak group were near by. In slash and loblolly pine plantations in Mississippi and elsewhere on what had originally been longleaf sites, the rust developed at such speed as to cause alarm.

In the Allegheny and northeastern regions serious losses were not reported. *Rhizoctonia* and *Fusarium* top infection in red spruce at an Allegheny nursery, formerly troublesome, was reduced by spraying with Bordeaux.

Red cedar blight due to *Phomopsis*, while serious in the Southeastern States, in general was a less frequent source of complaint than formerly.

In 1937 a root trouble of unknown origin was prevalent on *Juniperus virginiana* at a nursery in Tennessee, and on *J. scopulorum* in Nebraska.

Broadleaves: Leaf diseases in cherry and ash and storage or transit losses of black locust and elm were the most prominent troubles. Part of the storage difficulty was due to preliminary freezing, of tops in the case of the locust and of roots in the case of elm; sharp fall freezes had caught the locust while it was still growing and the elm after the lifter had been run under it and the soil loosened. Seed rot and very early damping-off were also factors sporadically important; because of the extensive character of the plantings these can not be combated by seedbed treatments of the type that are employed for conifers. Shallow and early sowings did much to reduce losses from these sources below those of 1935. There was some loss from top infections by *Phytophthora* in black locust in Iowa, but the rather extensive damage due to the spread of *Rhizoctonia* through the leaves of dense beds reported in 1935 was less prominent.

(Division of Forest Pathology, Bureau of Plant Industry, in cooperation with Forest Service and Civilian Conservation Corps).

ABIES:

Cephalosporium sp., canker. Minnesota, about a dozen trees, 4 to 8 inches in diameter were found with cankers several years old; the trees were scattered throughout the park at Itasca.

Melampsora albertensis? rust. Washington, in King County.

Rehmiellopsis bohemica. New Hampshire on *Abies concolor* (PDR 22: 58). First report from State on this host.

Rhabdocline pseudotsugae? leaf cast. Washington, in Thurston County.

Leaf fall, cause unknown. Washington.

ACER:

Cristulariella depraedans, leaf spot, on Norway maple, *A. platanoides*, Calhoun County, West Virginia. "Very wet periods followed by high temperatures."

Eutypella sp., canker. Minnesota, on hard maple, *A. saccharum*. About 20 cankers found on trees from 3 to 12 inches in diameter in a 50-foot circle near Big Lake, which is on the west side of the University Forest Experiment Station at Cloquet. Several found at Itasca. One found at Waseca.

Fusarium solani var. *medium*, basal decay. Essex County, New Jersey, on Norway maple.

Phomopsis sp., canker. New Jersey, one report on Japanese maple, *A. palmatum*, in Morris County.

Rhytisma acerinum, tar spot. Wisconsin; Minnesota, one report on soft maple, *A. saccharinum*. "Young trees in a nursery at Lake City heavily infected, especially in one small area about 10 yards in diameter."

Steganosporium pyriforme, canker. New Jersey, one report on *A. rubrum*, first report for the State on this species.

Taphrina sp., leaf blister. Virginia; Arkansas, one report on *A. saccharum*, relatively rare this year (PDR 21: 187).

Verticillium sp. (also reported as *V. albo-atrum*, *V. dahliae*), wilt. Connecticut, apparently increasing. New York, reported from Monroe and Suffolk Counties on *A. platanoides*; New Jersey on *A. saccharum* in Morris County; Pennsylvania, on *A. platanoides*, mostly in the southeastern part of the State, about as prevalent as last year; Delaware, Wilmington, one report; Virginia; verticillium wilt of trees is becoming increasingly prevalent in the Pacific Northwest (PDR 22: 22-23).

Winter injury. Washington, on *A. palmatum* in Island, Clarke, and Spokane Counties.

Winter sunscald. Washington, one report from Benton County.

AESCULUS HIPPOCASTANUM:

Guignardia aesculi, leaf blotch. Massachusetts (PDR 21: 384); Connecticut, one report from New Haven County; New York, generally prevalent, but less than last year; New Jersey; Pennsylvania, more prevalent than last year, defoliated most trees by August; Maryland.

Frost and winter injury. Washington.

CASTANEA:

Endothia parasitica, blight. The present status in the Pacific Northwest was reported by J. L. Bedwell (PDR 22: 66-68). Recurrence of chestnut blight in two infected plantings in San Joaquin County, California, in 1937 was reported by D. G. Milbrath. Calif. Agr. Dept. Bull. 26: 538-539. 1937.

Septogloeum ochroleucum, leaf spot. Illinois, "Prevalent in commercial plantings but not destructive."

CATALPA:

Macrosporium catalpae, leaf spot. New York.

Phyllosticta catalpae, leaf spot. New Jersey.

Leaf necrosis caused by drought. Washington, in Toppenish, Yakima County.

Winter sunscald. Washington, one report from Langley, Island County.

CELTIS OCCIDENTALIS:

The following diseases were reported from Texas: Cylindrosporium sp., leaf blight, in Jackson County. Ganoderma (?) sp., crown rot, "Only two cases," in Hidalgo County. Septoria sp., leaf spot, in Robertson County. Phoradendron flavescens (mistletoe), "General over State."

CORNUS:

Myxosporium nitidum, twig blight. New York, in Tompkins County.

CRATAEGUS:

Bacillus amylovorus, blight. Connecticut, in Litchfield County; New Jersey, general.

Cytospora sp., canker. New Jersey, one report.

Entomosporium thuemenii, leaf spot. New Jersey.

Fabraea maculata, leaf spot. In Massachusetts this leaf spot was uncommonly injurious in all parts of the State (PDR 21: 384).

Gymnosporangium sp., rust. Connecticut, in New London County; Louisiana; Arkansas, very prevalent (PDR 21: 188); Washington.

G. clavipes, quince rust. Virginia (PDR 21: 279), Shenandoah National Park. Washington, in Thurston County on scarlet hawthorn.

G. exiguum, rust. Texas, "General in State."

G. globosum, hawthorn rust. New York, "Very severe in vicinity of Ithaca." Much more prevalent than last year; Pennsylvania, in Center County, more than last year; Wisconsin, about the same amount as last year; Iowa, "Very prevalent."

G. juniperi-virginianae, apple rust. Virginia, the Shenandoah National Park.

Podosphaera oxyacanthae, powdery mildew. Virginia, the Shenandoah National Park.

Venturia inaequalis, apple scab. Massachusetts, "uncommonly injurious in all parts of the State."

CUPRESSUS:

Coryneum cardinale, cypress bark canker. California, on Monterey cypress, Cupressus macrocarpa. This most famous tree species of America is threatened with extinction (PDR 21: 336-337).

DIOSPYROS VIRGINIANA:

Cephalosporium wilt. Tennessee. The first time this disease of persimmon had been found in the United States. The only area found to be infected was the central part of the State, in Rutherford and Cannon Counties (see maps PDR 21, page 338). The area where the infection occurred in 1933 or 1934 as far as could be determined, contained no living trees. Adjacent areas had 80 percent of the trees dead and the remainder infected (PDR 21: 251-252, 338).

FRAXINUS:

Cuscuta sp. (dodder), on white ash, F. americana, in Maryland, Kentucky, and Tennessee (PDR 22: 23).

Piggotia fraxini, leaf spot. North Carolina, on white ash in Raleigh, very abundant on trees on the State College campus but apparently not causing damage.

GLEDITSIA TRIACANTHOS:

Witches' broom (virus). In October 1937, T. J. Grant and Carl Hartley found in Ohio what was believed to be the first case of broom disease on honey locust. The second example of this disease was found in Kentucky. Subsequently, correspondence from John L. Sheldon stated that Mrs. Sheldon had seen broomed honey locust in the vicinity of Morgantown, West Virginia (PDR 22: 31).

ILEX:

Cladosporium sp., scab-like spot, has been found on holly leaves in Oregon which makes them look unsightly (PDR 22: 61).

Phomopsis sp., canker. Washington, at Montesano, Grays Harbor County.

Phyllosticta opaca, leaf spot. Texas, on Ilex opaca in Cherokee County. "A serious disease of the ornamental holly tree."

Rhytisma ilicincola, leaf spot. Texas, in Harrison County, on I. cassine (yaupon).

Sphaeropsis sp., leaf spot. New Jersey.

Leaf necrosis, cause unknown. Washington at Everett and Tacoma.

Winter injury. Washington, at Everett.

JUGLANS:

Cuscuta sp., dodder. Kentucky, at Hopkinsville on J. nigra. First report on this host to the Survey (PDR 22: 23).

Gnomonia leptostyla, leaf spot and blight. New York, on butternut, J. cinerea, more prevalent than last year. Found in Allegany, Tompkins, and Otsego Counties. New Jersey, Warren County, on walnut.

Dying due to heat and drouth continued to be important in Kansas.

JUNIPERUS:

Chaetomium sp. associated with leaf and twig blight. Texas, on Irish juniper. First report on this host to the Survey.

Gymnosporangium aurantiacum, rust. Maine, on J. communis depressa.

G. clavipes, quince rust. New Jersey; Texas, trace on J. virginiana.

G. davisii, rust. Maine, on J. communis depressa in Hancock County.

G. exiguum, rust. Texas, trace on J. virginiana in Dallas County.

G. juniperi-virginianae, apple rust. Connecticut, New York, Wisconsin, and Iowa on J. virginiana; New Jersey, general.

Phomopsis sp., blight. Kentucky and Missouri on J. ashei; Virginia, Kentucky, Tennessee, North Carolina, and Indiana on J. virginiana.

Phomopsis juniperovora, nursery blight. New York; New Jersey; Oklahoma, one report, fungus new to State.

Heart rot, caused by an undetermined wood-decaying fungus. Oklahoma, "accompanied by injury from flat-headed apple-tree borer and drought, the complex being very destructive."

Leaf fall, cause unknown. Spokane County, Washington.

LIQUIDAMBAR:

Sphaeropsis sp. was associated with small cankers on one tree at Princeton, New Jersey, probably not the primary cause. There was some healing over.

LIRIODENDRON TULIPIFERA:

Alternaria sp., leaf spot. Ohio, at Green Springs.

Sphaeropsis sp., canker. New Jersey, in Mercer County.

MADDENIA sp.:

Bacterial wilt. Washington, at Everett, Snonomish County. The host was reported as "Maddenia tree?." The genus is allied to Prunus, and includes five species in China and the Himalayas, of which only one, M. hypoleuca Koehne, appears to be in cultivation, according to Rehder.

MALUS:

Venturia inaequalis, scab. Massachusetts, "Scab on flowering crab apple trees, M. ioensis plena, was uncommonly injurious in all parts of the State"; Maryland, on M. coronaria.

PICEA:

Cytospora sp., canker. New Jersey, "Generally distributed in northern and central New Jersey on *P. canadensis* and *P. pungens.*"

C. kunzei, canker (PDR 22: 58).

Leaf fall, cause unknown. Washington, in Spokane County.

PINUS:

Cenangium sp., twig blight. New York, one report from Nassau County on *P. pungens.*

Coleosporium ipomoeae, rust. Arizona on *P. leiophylla*, "From forest in Huahuaca Mountains."

Coleosporium solidaginis, rust. Connecticut, on *P. resinosa* in Fairfield County.

C. vernoniae, rust. Texas, in Angelina County.

Cronartium coleosporioides, blister rust. Washington, on *P. ponderosa* in Spokane County.

C. comptoniae, rust. Connecticut, on *P. montana mughus* in Hartford County, *P. murrayana* in Fairfield County, *P. nigra* in New London County, and *P. sylvestris* in Windham County.

C. quercuum, rust. Connecticut, on *P. sylvestris* in Middlesex and Windham Counties, new host for State; Delaware on *P. virginiana*; Wisconsin, on *P. banksiana.*

C. ribicola, white pine blister rust.

SPREAD OF WHITE PINE BLISTER RUST IN 1937 (With Figure 33):

During 1937 the blister rust disease of white pine materially extended its previous known distribution, showing that conditions were favorable for its spread in several of the white pine forest regions of the country. In the sugar pine region of California infections on Ribes were found to be generally distributed in Siskiyou County and scattered infections were found in Shasta, Trinity and Tehama Counties. The more southern infection points were located 125 miles south of the Oregon border in the Coast Range Mountains along the headwaters of the Trinity River and 120 miles south in the Sierra Nevada just below Lassen Volcanic National Park. Previously the rust had been found at only 5 infection points in Del Norte and Siskiyou Counties, all within 5 miles of the Oregon border.

The spread of the disease on Ribes over such an extensive area in the sugar pine region of California in 1937 may be expected to result in the establishment of several pine infection centers that, beginning

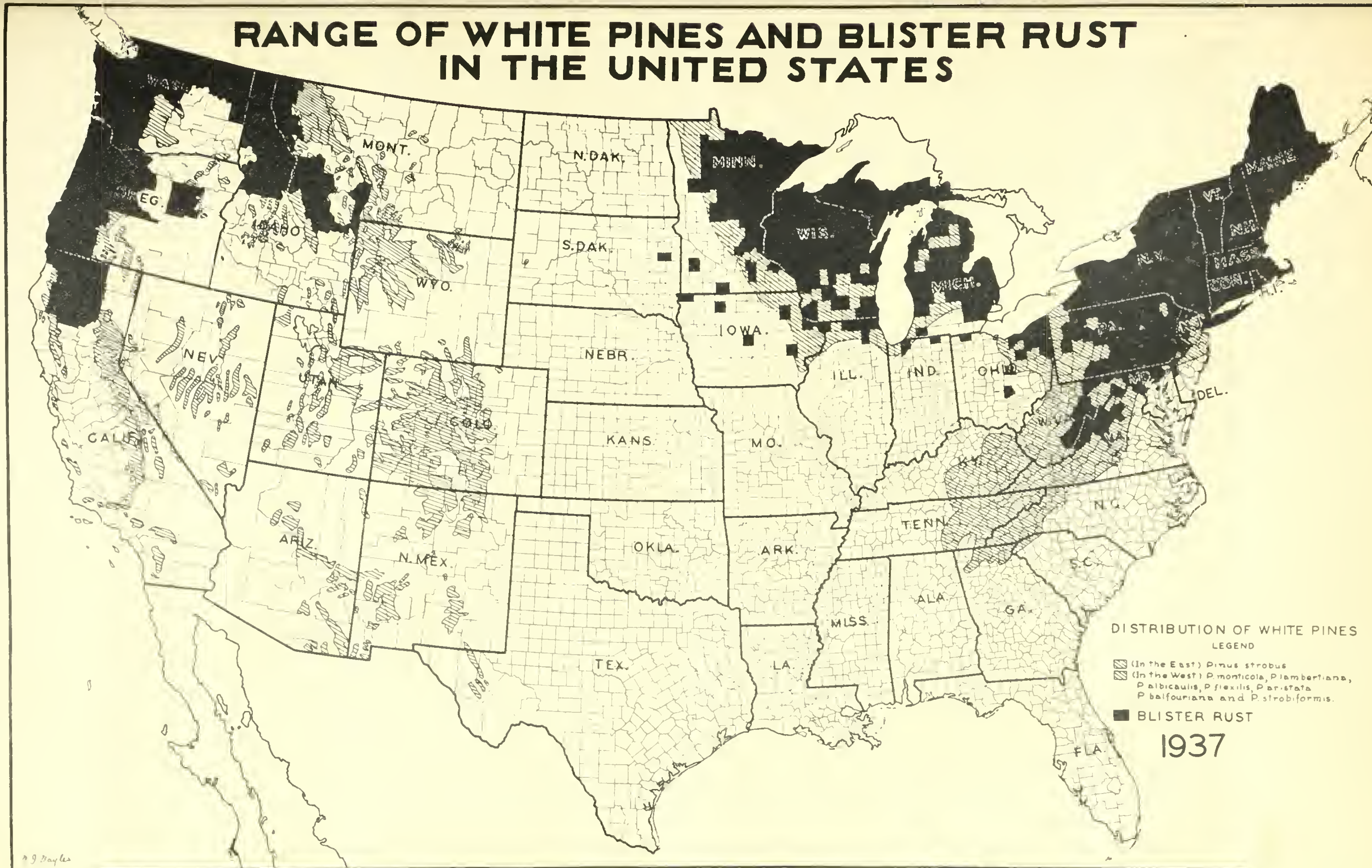

Figure 33. Distribution of white pine blister rust (Cronartium ribicola) in the United States in 1937.

in 1940 or 1941, will be distributing aeciospores and intensifying the rust locally as well as furthering its southward spread in the region. From then on, the disease may be expected to increase rapidly on the sugar pine with resultant serious damage to young growth in the forest areas involved.

In the western white pine region of Idaho, where the rust was first found in 1927, although numerous infection centers have been determined as of 1923 and 1925, rapid and serious intensification of the disease has been occurring on white pine in unprotected areas, and it is now evident that many young stands may be a total loss before the Ribes can be eradicated. The rust has also attacked the susceptible white bark pine which grows at the higher altitudes. These species are found over rather extensive areas in southwestern Montana, and in Wyoming and Colorado. Scouting during September resulted in the finding of infection on Ribes at 16 points in the Bitterroot, Beaverhead, Deer Lodge and Gallatin National Forests. The discovery of the rust on the Beaverhead Forest marked the first extension of the known range of the disease in the West to the east of the Continental Divide. The most eastern location was found on the Gallatin National Forest within 19 miles of the northwestern corner of Yellowstone National Park and 26 miles of the Wyoming line.

In the North Central region many white pine stands already have been damaged by blister rust. During 1937 the disease was found for the first time on white pine in Antrim County, Michigan; the Bad River Indian Reservation in Minnesota, and Monroe, Sauk, LaCrosse, Brown, Trempealeau, Florence, Kewaunee and Marinette Counties, Wisconsin. On Ribes the disease was found for the first time in Palo Alto County, Iowa; McHenry, Winnebago, Boone, Lake and Kane Counties, Illinois; Clinton, Washtenaw, Arenac, Gratiot, Wayne, Livingston, Ogemaw, and Shiawassee Counties, Michigan; Fairfield and Lorain Counties, Ohio; and Trempealeau, Kenosha, Racine, Milwaukee, Walworth and Waukesha Counties, Wisconsin. Practically all of the infection on Ribes in Iowa, Illinois and Wisconsin Counties resulted from the spread of the rust on cultivated black currants.

In the Northeastern region, blister rust infection is general, the amount of the disease varying considerably in different localities. There are many local areas where infection on pine ranges from 10 to nearly 100 percent of the trees in unprotected areas. In well protected areas, pine infection has practically ceased, following the eradication of Ribes.

In the Southern Appalachian region extending from Maryland to Georgia, blister rust was found for the first time on Ribes in New Castle County, Delaware; in Harford, Baltimore and Carroll Counties, Maryland; and Alleghany County, Virginia. The disease is now present in most of the counties in the white pine belt extending from Maryland southward along the Appalachian Mountains to central Virginia and West Virginia, and more or less damage has occurred locally on several areas. The further southward spread of the disease should be slow as there are practically no cultivated black currants and the native Ribes, which are less abundant and much more localized than in other white pine regions, are being eradicated in advance of the natural spread of the disease.

(Division of Plant Disease Control, Bureau of Entomology and Plant Quarantine).

(See also PDR 21: 275-276, 428-429; 22: 139).

Fomes annosus, causing death of Pinus palustris in plantations in Louisiana (PDR 22: 140).

Hypoderma lethale, needle blight, on P. nigra austriaca in Suffolk County, New York.

Pestalozzia sp., needle blight. Texas, trace on P. sylvestris. First report from this State.

Phoma sp., dieback. Oklahoma, in Oklahoma County. "Probably a sequence of drought injury."

Sphaeropsis sp., twig blight. New Jersey, "Much worse this year than before."

Sphaeropsis ellisi, leaf and twig blight. Maine, New York, New Jersey, Pennsylvania, and District of Columbia.

Canker, cause unknown, on P. strobus. Wisconsin at Itasca Park and Menominee Indian Reservation; Minnesota, Lake Vadnais and Red Lake Indian Reservation, "canker on tips of young trees (5-26 years) growing in plantations. Looks important at Red Lake and Menominee."

Scorch, caused by drought. New York on P. strobus. "General throughout the central part of the State."

PLATANUS:

Ceratostomella sp., canker. Pennsylvania.

Gnomonia veneta, anthracnose. New York, "An unusual amount on young nursery trees of P. acerifolia." New Jersey, "Very bad year for this anthracnose. Even the London plane, P. acerifolia, usually considered fairly resistant, showed heavy infection, defoliation, and dying of twigs this year in southern New Jersey," (see also PDR 21: 277); Pennsylvania, mostly in southeastern part of State; Virginia (PDR 21: 218); Kentucky, "Severe over most of the State. Many trees are nearly completely defoliated"; Illinois, "curious type of outbreak, mild at first but long continued and eventually quite injurious to foliage. Much less than last year"; Kansas, less than usual.

Microsphaera alni, powdery mildew. New York, on Platanus sp., and P. acerifolia.

Bark discoloration and stag-head, cause undetermined but apparently due to a fungus. Louisiana (PDR 22: 140).

POPULUS:

Hypoxylon sp., canker. Minnesota, "Found at Lake City, Waseca, Cloquet, Itasca, Anoka," on P. tremuloides.

Melampsora sp., rust. Wisconsin, less than last year, weather too dry.

Nectria sp., canker. Minnesota on P. tremuloides, "common at the base of living trees 6 to 10 inches in diameter on southeast corner at University Forest Experiment Station, Cloquet. Has not yet been found north of the Twin Cities."

Taphrina aurea, yellow leaf blister. Washington, at Aberdeen.

Bacterium tumefaciens, crown gall. Wisconsin.

Heterodera marioni, root knot. Arizona, "Observed in one tree only, in badly infested yard."

PRUNUS:

Botrytis cinerea, grey mold, on P. glandulosa in Connecticut, first report to the Survey on this host.

Sclerotinia fructicola, brown rot canker. New York in Westchester County on flowering almond.

Taphrina mirabilis, hypertrophy. Arkansas, on wild plum.

PSEUDOTSUGA TAXIFOLIA:

Rhabdocline pseudotsugae, needle blight. New York, found in occasional plantings in Suffolk County.

QUERCUS:

Coryneum sp., die-back. "Die-back of white, red, and black oaks is on the increase in northern New Jersey, and a Coryneum is constantly associated with it."

Cronartium cerebrum, rust. Minnesota, on Q. borealis, "Only scattered, light infections found at Itasca Park, in August."

Fomes robustus, white heart rot. Fomes robustus (identified by Ross W. Davidson), the cause of a white heart rot of living oak, was collected three times on Quercus borealis var. maxima in the vicinity of Hayesville, North Carolina, in September 1937. This fungus, in addition to rotting heartwood, appears to kill large areas of sapwood, thus producing cankers on the bole. The sporophores were found on the killed sapwood. Since they are similar in appearance to those of Fomes igniarius, it is possible that these two species have been confused by early collectors, thus explaining the dearth of collections under the name Fomes robustus. (Elmer R. Roth, Division of Forest Pathology in cooperation with Civilian Conservation Corps.)

Gnomonia veneta, anthracnose. New Hampshire; Massachusetts; Connecticut in Hartford, New Haven, and Fairfield Counties, more prevalent than usual; New York; "Unusually severe in New Jersey this season, particularly in the southern part of the State. As usual, in an epidemic year, the white oak, Q. alba, is severely infected"; Pennsylvania, more prevalent than last year, reported from Adams County; Maryland and Virginia on Q. alba; Kentucky on Q. macrocarpa; Wisconsin, less than last year, weather too dry.

Monochaetia desmazieri, leaf spot. Virginia on Q. rubra (PDR 21: 218).

Nectria spp., canker. New Hampshire.

Strumella coryneoidea, canker. Minnesota, two cankers were found at Waseca, one on a tree 4 inches, the other on a tree 14 inches in diameter, on Q. borealis [Q. rubra ambigua].

Taphrina coerulescens, leaf blister. Connecticut, in Hartford County; New York in Jefferson County; Maryland, District of Columbia; Virginia; North Carolina, widespread, "This disease was severe again for the third year, resulting in much interest in the effects that the disease may have on the longevity of the tree." (PDR 21: 291-292); South Carolina; Florida; Texas; Arkansas.

RHUS:

Taphrina. Arkansas. "Taphrina on sumac, which was very abundant in 1935, has not been seen but is no doubt present."

ROBINIA PSEUDOACACIA:

Cuscuta sp. The known distribution of dodder has been extended to Maryland, Illinois, Missouri, and Arkansas, in the last few years on R. pseudoacacia. This year it was found at Hopkinsville, Kentucky (PDR 22: 23).

Witches' broom (virus). See PDR 22: 28-31, 53, 255-256.

SALIX:

Cytospora chrysosperma, canker and twig blight. New York in Westchester County; New Jersey; Wisconsin, less prevalent than last year.

Dothichiza populea, canker. New Jersey on S. discolor.

Fusicladium saliciperdum, scab. The distribution of this disease as known at present is shown in Figure 34. Besides the eastern distribution as shown by the map, a specimen of Venturia chlorospora (Ces.) Karst. (the perfect stage of F. saliciperdum) was collected by Ross Davidson, of Forest Pathology in 1930 at Grand Mesa Mountain, Colorado. Reports indicate that this disease was more prevalent and damaging in 1937 than for several previous years. Maine, see PDR 22: 282-283. New Hampshire, found in the following locations: Columbia, Colebrook, Whitefield, Plymouth, Northumberland, Bristol, Bethlehem, and East Kingston; Vermont, "Willow leaf and twig blight was general and severe in Vermont except in the more western section of the State. Around the

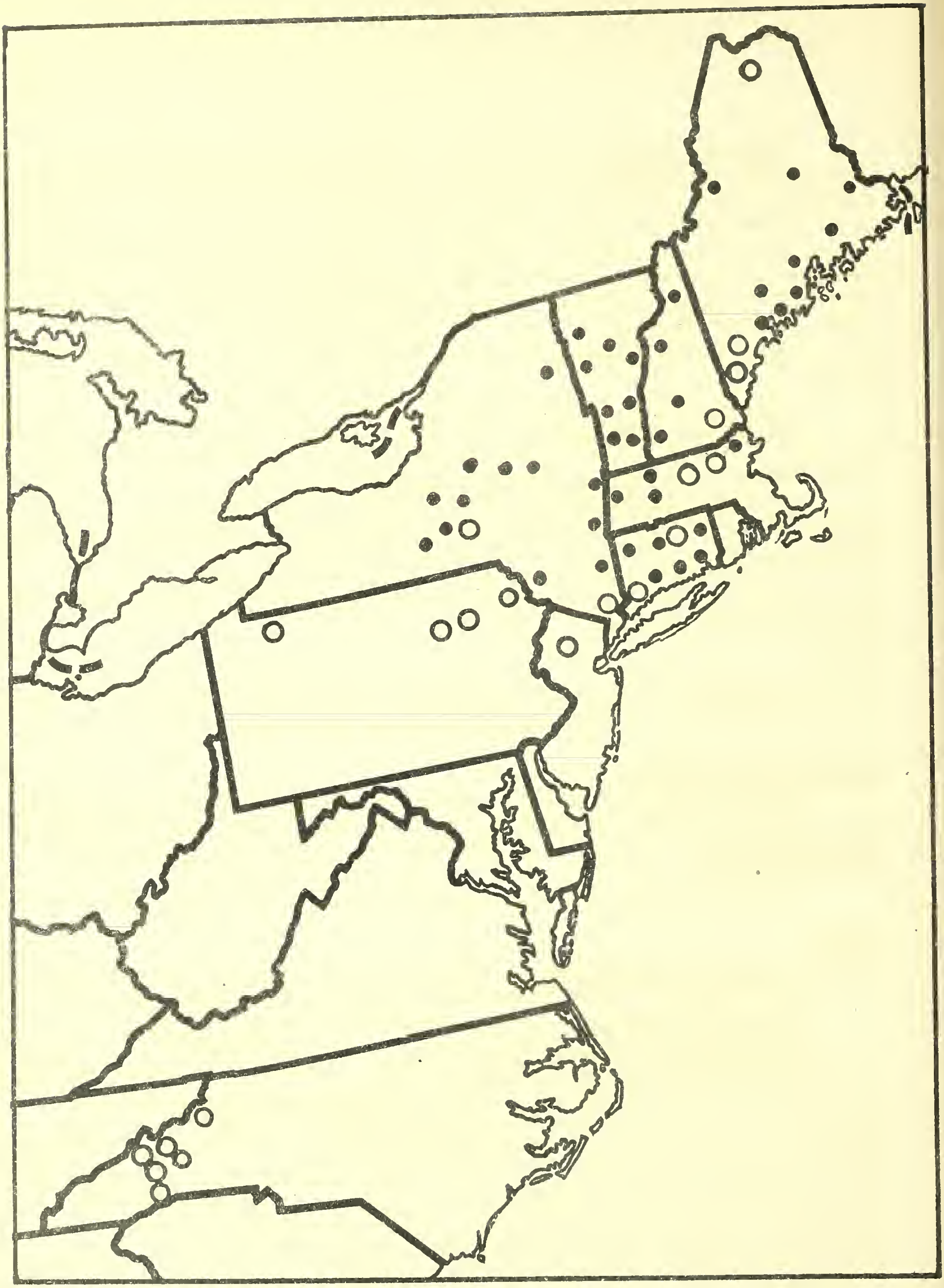

Figure 34. Known distribution of willow scab (<u>Fusicladium saliciperdum</u>) in the United States as reported to the Plant Disease Survey, up to and including 1937. (Dots represent counties where the disease was reported prior to 1930. Circles represent additional counties, where the disease has been reported from 1930-1937 inclusive.)

first of August, however, blackening of foliage appeared to slow down and many trees retained from a third to one-half of their green leaves" (PDR 21: 230, 234, 277-278). G. H. Hepting of the Division of Forest Pathology states, "The willow scab was found commonly in the mountains of western North Carolina. Previous reports had not placed the scab south of northern New Jersey. The southern infections were destructive only locally."

Physalospora miyabeana, black canker. G. H. Hepting also states, "The willow black canker was found commonly in the mountains of western North Carolina. Previous reports had not placed the canker south of northern New Jersey. The southern infections were destructive only locally."

Septomyxa exultata. Virginia, first report from State.

Bacterium tumefaciens, crown gall. New Jersey, observed only on weeping willow, *S. babylonica*; Wisconsin.

Canker, undetermined. West Virginia, "At Lake Lynn, Monongalia County. Small, dark sunken cankers in bark. The cankers observed were from last year's infection."

SCHINUS MOLLE:

Cuscuta subinclusa, dodder. California, "Two pepper trees in the vicinity of Outpost Drive, Hollywood, have died due to heavy infestations of dodder. (PDR 21: 11). There are eleven other pepper trees in this locality which are infected with dodder; two in Coldwater Canyon, Beverly Hills, and one in Stone Canyon." (Johnstone).

SCIADOPITYS VERTICILLATA:

Phyllosticta sp., Rhode Island. This is the first report to the Survey of the organism on this host (PDR 22: 59).

Sphaeropsis sp. New Jersey. Only report of occurrence on this host (PDR 22: 59).

SORBUS:

Bacillus amylovorus, fire blight on *S. americana* in West Virginia, "Old 1937 cankers with *Sphaeropsis* secondary." More prevalent than last year.

Gymnosporangium sp., rust. Idaho, on *S. americana*.

G. aurantiacum, rust. Maine in Hancock County, on *S. dumosa*.

Phyllosticta sp., leaf spot. Washington County, Oklahoma.

Physalospora obtusa, black rot. New Jersey.

TAXUS:

Die back. Rockland County, New York (due to lack of water or low temperatures); Washington in Walla Walla County, cause unknown.

THUJA:

Botrytis sp., leaf blight. Cumberland County, New Jersey on *T. orientalis*, first report on this host.

Chaetomium sp., twig blight. Smith County, Texas. "This organism recovered from cultures of diseased material quite regularly, but thought not to be pathogenic."

Winter injury. Everett, Snohomish County, Washington.

TSUGA:

Botrytis sp., tip blight. New Jersey.

Melampsora abietis-canadensis, stem-cone rust. Fairfield County, Connecticut on T. canadensis. Also on T. caroliniana in Fairfield County. "New host to State."

Pucciniastrum myrtilli, rust. Fairfield County, Connecticut on T. canadensis.

ULMUS:

The following special reports on Ceratostomella ulmi, Dutch elm disease, have been contributed by the Division of Forest Pathology and the Bureau of Entomology and Plant Quarantine.

DISTRIBUTION AND SPREAD OF THE DUTCH ELM DISEASE DURING 1937:

There was a 25 percent decrease as compared to 1936 infections in the number of confirmations of Dutch elm disease infected trees during the 1937 foliar season. During 1937, 6,268 elms were confirmed as infected by Ceratostomella ulmi. One hundred and ninety-seven of these were found as a result of elm sanitation work performed prior to the summer scouting. In the course of systematic summer scouting, scouts located 5,497 trees which were later confirmed as infected. Between October 1 and the end of the year elm sanitation workers turned in a total of 405 confirmations. The year-end grand total of elms confirmed in the United States since discovery of the disease in Ohio in 1930 is 28,106. The elm population in the main area where the diseased trees are found is conservatively estimated as 16,000,000 elm trees two inches in diameter or larger. Mortality due to Dutch elm disease among these trees exposed to infection has been limited to less than two trees per thousand to date. This main region is still confined to an area within an approximate radius of 50 miles of New York City, and now totals 5,222 square miles. (See Figure 35) There is likewise a so-called 10-mile protective zone surrounding this area which comprises an additional 2,979 square miles and in which the scouting and sanitation activities of the eradication program are carried on for the purpose of determining and minimizing spread of the disease.

Extensions of the main tri-State area throughout which infections are discontinuous and scattered were limited to five small townships, all contiguous to localities in which incipient infections previously had been discovered. The newly added townships - in each of which known infections were limited to a single diseased elm each - are Alexandria, Hunterdon County, New Jersey, Cornwall, Orange County, New York, and Redding, Weston, and Wilton in Fairfield County, Connecticut.

Increases in the work area in which field operations are conducted involved the additions to the so-called infected zone of 28 square miles in New Jersey, 29 in New York, and 32 in Connecticut.

Activities outside the major infected area resulted in the discovery of five confirmations near Wiley Ford, West Virginia (possibly an extension of the Cumberland, Maryland area), a single diseased tree at Athens, Ohio, and 32 additional confirmations in the Indianapolis, Indiana area (See Figure 35). The disease was not found in Baltimore, Brunswick, and Cumberland, Maryland, Norfolk, Virginia, and Cleveland, Ohio, where infections had been eradicated in previous years. (E. G. Brewer, Bureau of Entomology and Plant Quarantine).

NUMBER OF SUSPECTED AND CONFIRMED SAMPLES OF DUTCH ELM DISEASE IN 1937:

In 1937 the total suspect samples submitted to the Dutch Elm Disease Laboratory at Morristown, New Jersey, was 84,636, of which 67,006 were received from June to September, inclusive. The specimens were from 32 States, the District of Columbia, and the Province of Quebec, Canada. Ceratostomella ulmi was isolated from samples from 6,268 trees. The distribution of cases of Dutch elm disease by States was as follows: New Jersey, 4830; New York, 1274; Connecticut, 126; Indiana, 32; West Virginia, 5; and Ohio 1. (E. G. Kelsheimer and L. M. Fenner, Division of Forest Pathology in cooperation with Civilian Conservation Corps).

KNOWN DISTRIBUTION OF TWO ELM SCOLYTIDS, IMPORTANT INSECT VECTORS OF THE DUTCH ELM DISEASE FUNGUS, 1937. (With Figure 35):

Scolytus multistriatus Marsham is by far the most important insect vector of the Dutch elm disease fungus in this country as indicated by laboratory research and field observations. The adult beetles carry the disease organism and inoculate the elm trees by feeding in the crotches of small branches or by boring through the bark to the xylem in their attempts to make brood galleries. Adults of Hylurgopinus rufipes (Eich.) that are contaminated with the fungus likewise inoculate elm trees when these insects attempt to bore through the bark to make brood galleries. In addition they may effect inoculation through their habits of hibernating in the bark of living trees since these hibernating beetles sometimes bore through the bark into the xylem and infection may take place during this process. Since these two species of bark beetles are definitely associated with the transmission and distribution of the disease organism, it is of interest to know their distribution.

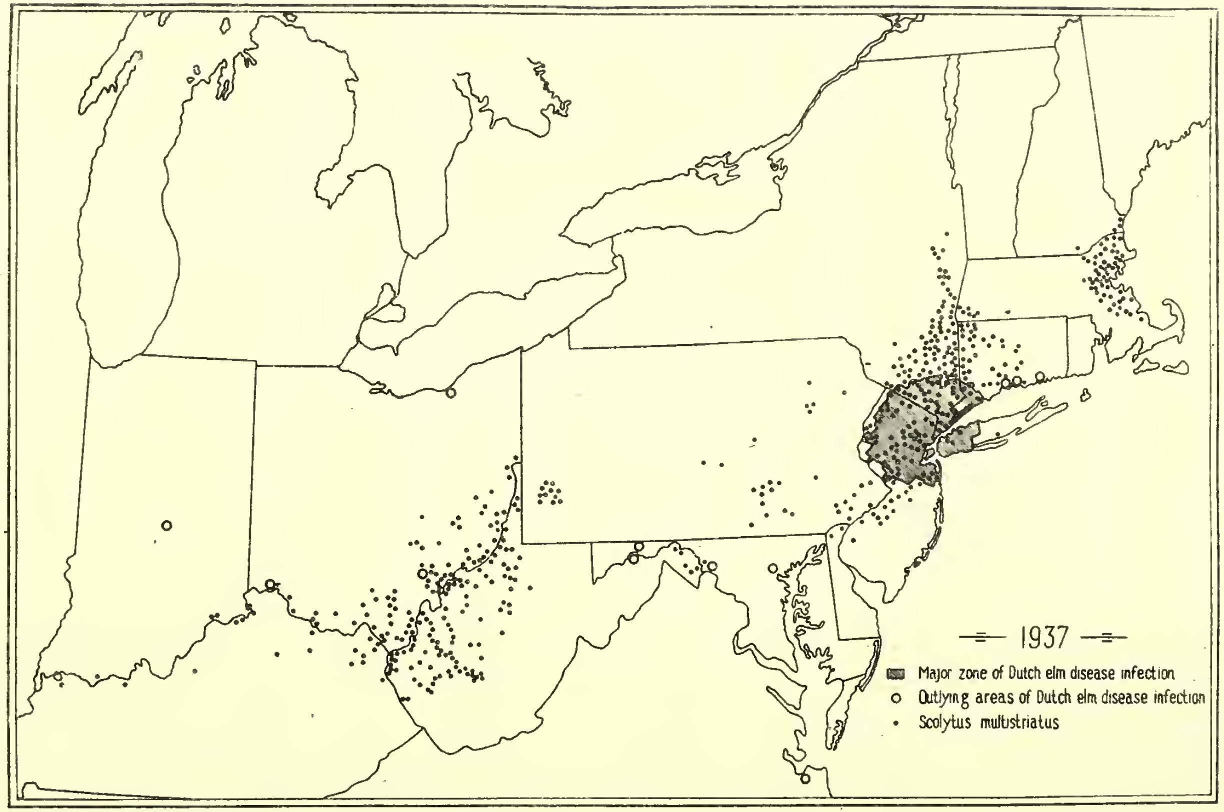

Figure 35. Distribution of the Dutch elm disease and of Scolytus multistriatus in the United States in 1937.

Around the major area infected by the Dutch elm disease in New York, New Jersey and Connecticut the distribution of the smaller European elm bark beetle, *S. multistriatus*, extends about 145 miles north of New York City to Quaker Springs, New York, and to Great Barrington and New Marlboro in southwestern Massachusetts. It extends into Connecticut to North Canaan, Avon, Glastonbury, Middleton, and Madison. The beetle occurs on Long Island, New York, as far east as Bay Shore, about 40 miles from New York City. It has been taken in all counties of north and central New Jersey, its distribution being limited only by the scarcity of elms in the southern counties. Its range extends to New Castle County, Delaware, and as far west as Thomasville, Harrisburg, Lewistown, Sunbury, Wilkes-Barre, Kingston, Sterling and Stroudsburg in Pennsylvania.

A separate and apparently earlier introduction of the species was found in the vicinity of Boston, Massachusetts, as early as 1904. This infestation extended in 1937 into southern New Hampshire, west 20 miles from Boston to Sudbury, Massachusetts, and 40 miles southeast to Plymouth, Massachusetts. The Dutch elm disease fungus has not yet been found in the Massachusetts area.

In 1936, *S. multistriatus* was found in the vicinity of Parkersburg, West Virginia. Its establishment in this section was probably the result of shipping imported burl elm logs from Baltimore, Maryland, to central-west veneer factories. Its wide distribution from Parkersburg leads one to believe that its introduction into this region occurred ten or more years earlier. Subsequent scouting showed the species to be established over a large area in southwestern Pennsylvania, Ohio, West Virginia, Kentucky, and Indiana, and as far west as Henderson and Evansville respectively in the last two mentioned States. Most of the infested area on both sides of the Ohio River lies in Ohio, West Virginia and Kentucky. (It extends into West Virginia for approximately 65 miles.) Other localities where the species occurs are in Jefferson and Berkeley Counties, West Virginia, and Washington County, Maryland. More extensive scouting would probably connect this area solidly with the area mentioned above that borders the Ohio River.

The native elm bark beetle, *H. rufipes*, is known to occur in Canada and in northeastern, southeastern and central parts of the United States. It has been taken as far south as Decatur, Alabama, and Yazoo City, Mississippi, and as far west as Kansas City, Missouri, and Lawrence, Kansas. Beetles or galleries have been taken in all the counties and outlying cities of this country where trees infected with the Dutch elm disease have been found. (C. W. Collins, Bureau of Entomology and Plant Quarantine).

(See also PDR 21: 276, 292, 346; 22: 306-307, 429.)

Cytospora sp., Nevada.

Dothiorella ulmi. Die-back of elm caused by Dothiorella ulmi (Cephalosporium sp.) was recorded for 29.4 percent of the 84,636 samples submitted to the Dutch Elm Disease Laboratory, Morristown, New Jersey, in 1937. The distribution of these 24,858 cases was approximately the same as in former years, being in native stands and in planted elms in Central and Northeastern United States and Eastern Canada. Several distinct variations of this organism have been recognized in original isolates and compared in single-spore and single-hyphal cultures on several media. (L. M. Fenner, Division of Forest Pathology in cooperation with Civilian Conservation Corps) Reports to the Survey show the disease in Hartford County, Connecticut; New York, in Oneida and Dutchess Counties on U. americana; Minnesota, specimens collected from 4 infected trees at Faribault, also specimens collected at Minneapolis.

Gloeosporium inconspicuum, leaf spot. Texas. Trace in Travis County.

Gnomonia ulmea, black leaf spot. New Hampshire; Massachusetts, "not only appeared unusually early but continued to develop during the latter part of the season" (PDR 21: 293-384); Connecticut, in Hartford, Litchfield, and Middlesex Counties; New York, reported from Jefferson, Monroe, Livingston, Cattaraugus, and Tompkins Counties; New Jersey; Pennsylvania; District of Columbia; Virginia; Texas; Alabama; Ohio; and Illinois.

Nectria cinnabarina, canker. New York, more prevalent than last year on U. pumila in Erie, Wayne, and Suffolk Counties.

Sphaeropsis, canker. Less prevalent than last year in Wisconsin.

Taphrina ulmi, leaf blister. Virginia (PDR 21: 218).

Verticillium sp., wilt. New Jersey; Vermont (PDR 21: 278). Verticillium sp. was isolated during 1937 from 2.1 percent of the 84,636 samples submitted to the Dutch Elm Disease Laboratory, Morristown, New Jersey. These cases were reported for specimens from 16 States. The isolation of Verticillium from a specimen of elm from Arizona was recorded for the first time at this laboratory. It is believed that the technique followed in the isolation of Ceratostomella ulmi is not optimum for the isolation of Verticillium and that actually a higher proportion of trees are affected by this disease than is indicated by the figures. (E. G. Kelsheimer, Division of Forest Pathology in cooperation with Civilian Conservation Corps.) (See also PDR 22: 22-23).

Heart rot caused by an undetermined wood decay fungus. Oklahoma, "accompanied by injury from flat-headed apple-tree borer and drought, the complex being very destructive." More prevalent than usual.

Mosaic. Massachusetts (PDR 21: 292).

Winter injury. Washington, in Lincoln and Whitman Counties.

WASHINGTONIA GRACILIS FILIFERA:

Root rot, cause unknown, but cultures of roots give pure growth of Fusarium (PDR 21: 374), in Arizona.

DISEASES OF ORNAMENTAL AND MISCELLANEOUS PLANTS

References from Plant Disease Reporter:

Boyd, O. C. Disease survey notes for Massachusetts. Reporter 21: 229-230.
________. Observations on plant diseases in Massachusetts for 1937. Reporter 21: 378-385.
Harrar, J. G. Some unusual diseases of ornamentals in Virginia. Reporter 21: 217.
__________, and S. A. Wingard. Diseases of Virginia ornamental trees. Reporter 21: 218.
Hildebrand, E. M. Infectious hairy root on rose. Reporter 21: 36.
Jenkins, Anna E. Additional records of violet scab. Reporter 22: 86-88.
__________. Distribution of Sphaceloma and Elsinoë in California. Reporter 22: 187.
McWhorter, Frank P. Narcissus mosaic and early maturity. Reporter 22: 147.
Pirone, P. P. Diseases of herbaceous ornamentals in New York in 1937. Reporter 21: 369-371.

ABUTILON THEOPHRASTI:

Mosaic (virus). Kansas, "Considerable number of plants in cucumber field affected at Manhattan Experiment Station plots.

ACONITUM:

Sclerotium delphinii, root and crown rot. New Jersey.

ALTHAEA ROSEA:

Cercospora althaeina, leaf spot. Michigan; Iowa, "Generally prevalent and seed borne."

Puccinia heterospora, rust. Texas, in Lamb County.

Puccinia malvacearum, rust. Massachusetts; Connecticut, noted in Fairfield and New Haven Counties; New York, more generally widespread and destructive than for many years; New Jersey; Pennsylvania, general, usual amount; Michigan, "Less than usual despite favorable moisture conditions. No explanation"; Wisconsin, "So completely reduced in 1936 that there was not enough inoculum for a good start in 1937"; Colorado; Washington, in Whitman County.

AMARANTHUS:

Albugo bliti, white rust. Texas, common in May and June on *A. retroflexus*; Ohio.

Mosaic (virus). Kansas, "A few plants in the Experiment Station (Manhattan) cucumber field were affected.

AMPELOPSIS:

Cercospora ampelopsidis, leaf spot. "Virginia creeper near Culpeper, Virginia was conspicuously spotted with both Cercospora and Guignardia - frequently both occurred on the same leaf."

Guignardia bidwellii, black rot leaf spot. Massachusetts, Connecticut, New York, and District of Columbia on A. tricuspidata (PDR 21: 251); New Jersey and Virginia on Virginia creeper.

ANTIRRHINUM MAJUS:

Botrytis sp., blight. Pennsylvania, more prevalent than last year; Minnesota, "Complete loss of flower crop in one greenhouse during a period of warm humid weather."

Cladosporium spp., leaf and stem disease. Virginia, in the greenhouse (PDR 21: 217).

Colletotrichum antirrhini, anthracnose. Colorado.

Phoma spp., leaf spot and stem canker. Virginia, in the field and greenhouses (PDR 21: 217). P. antirrhini, Michigan, "Developed extensively in varietal trial plants in Horticulture Department plantings at East Lansing. Leaf spots and stem cankers equally abundant, damage not great."

Puccinia antirrhini, rust. Reported from New York and New Jersey; Pennsylvania, "considerable in greenhouses, but very little in outdoor plantings"; Michigan, "Less injurious than usual out of doors although moisture conditions were very favorable. Form II was collected in greenhouses in Lansing and Kalamazoo. Usual prevalence in May in greenhouses"; Wisconsin, less than usual on account of dry weather; none seen in Kansas; reported from Colorado; North Dakota, more than last year; Washington, general along the coast.

Sclerotinia sclerotiorum, stem rot. Michigan, "Common in many greenhouse plantings, especially at Mount Clemens."

Sclerotium rolfsii, southern blight. Texas, observed in Hidalgo and Smith Counties.

Mosaic (virus). New York, reported from greenhouse in Ontario County; Kansas, "Noted in gardens where cucumbers with mosaic infection were present."

AQUILEGIA:

Phyllosticta aquilegicola, stem rot. Observed in Pacific County, Washington.

Sclerotinia sclerotiorum, crown rot. Pennsylvania, more prevalent than last year in Lancaster and Philadelphia Counties.

Mosaic (virus). Kansas, noted in several gardens.

ARISAEMA TRIPHYLLUM:

Puccinia podophylli, rust. Sussex County, New Jersey.

ARTEMISIA TRIDENTATA:

Puccinia atrofusca. Gunnison County, Colorado.

AZALEA:

Corticium stevensii, thread blight. Reported from Louisiana in West Feliciana and East Baton Rouge Parishes. Only reports of occurrence on this host (PDR 22: 50).

Exobasidium vaccinii, leaf curl. Connecticut, on A. calendulacea, new host to State"; Texas.

Bark splitting (caused by winter injury where not protected by straw). Long Island, New York.

Drought injury. King County, Washington.

BEGONIA:

Bacterium sp., leaf spot. New York, "Rather common in many greenhouses."

Rhizoctonia solani, stem rot. P. P. Pirone reported this disease prevalent in several greenhouses throughout New York State and some in New Jersey.

Heterodera marioni, root knot. In New York on Long Island.

Leaf necrosis (non-parasitic). Grays Harbor County, Washington.

BERBERIS:

Verticillium albo-atrum, wilt. Delaware, "Scattered throughout State, killing sections of hedges of B. thunbergi or individual plants.

BUXUS:

Macrophoma candollei, leaf spot. North Carolina, "Abundant throughout the State, especially on plants weakened by root troubles, low temperatures, and red spider"; New Jersey, general on weakened specimens of B. sempervirens in Essex County.

Nectria rousselliana, canker. New Jersey on B. sempervirens; North Carolina, "Found occasionally."

Verticillium spp., wilt, on B. sempervirens. Virginia (PDR 21: 217).

CALLISTEPHUS CHINENSIS:

Botrytis cinerea, leaf blight. New Jersey, in Sussex County, "particularly under cloth shade."

Basidiophora entospora, downy mildew, on China aster, affected all the plants and caused a loss of about 50 percent in the fields of a commercial grower in Hidalgo County, Texas. This seems to be the first record of the occurrence of a downy mildew on C. hortensis, in this country (PDR 21: 141).

Coleosporium solidaginis, rust. Observed in Monroe and Wayne Counties, New York; total loss 2 percent in Center County, Pennsylvania; less prevalent as compared with average year in Wisconsin.

Erysiphe cichoracearum, powdery mildew. North Carolina, "Very abundant on both greenhouse and field-grown plants."

Fusarium conglutinans callistephi, wilt. Connecticut; New York (PDR 21: 369); New Jersey in Middlesex County, "Under cloth shade even wilt-resistant varieties showed high percentage of loss"; also reported from Wisconsin, Colorado, and Washington; North Dakota, "not found this year."

Phomopsis callistephi, stem canker. Wisconsin.

Yellows (virus). Pennsylvania, 10 percent loss in Berks County; Michigan, "Leafhoppers less abundant than usual and yellows much less conspicuous than in 1936. Commercial plantings mostly in screened houses and very profitable"; Wisconsin, less prevalent than last year. "Practically all commercial growers and many home growers use the shade cloth protection to keep out insect vectors"; Colorado; and Washington in King, Pierce, and Whitman Counties.

CENTAUREA:

Puccinia sp., rust. West Virginia, in Pendleton County, "First report in West Virginia."

P. cyani, rust. New Haven County, Connecticut.

CHRYSANTHEMUM:

Alternaria and Botrytis caused damping-off in Pennsylvania.

Cylindrosporium spp. New York, in Suffolk County.

C. chrysanthemi, leaf spot. New York (PDR 21: 369).

Erysiphe cichoracearum, powdery mildew. New York (PDR 21: 369); New Jersey; Pennsylvania, all during the year in greenhouses.

Puccinia chrysanthemi, rust. New York; Louisiana, in East Baton Rouge, according to State reports and the Plant Disease Survey files, this is the first time chrysanthemum rust has been found in Louisiana (PDR 22: 25).

Septoria sp., leaf spot. Washington, "General on coast."

S. chrysanthemella (S. chrysanthemi) leaf spot. District of Columbia and New Jersey.

S. obesa, leaf spot. New Jersey in Union County.

Verticillium sp., verticillium wilt. New Jersey in Middlesex County; Washington, reported as V. dahliae in King, Kitsap, Pierce, and Thurston Counties.

Aphelenchoides fragariae, leaf nematode. More prevalent than last year in Hartford County, Connecticut.

COLEUS:

Verticillium sp., verticillium wilt. For three successive years this disease has been isolated from coleus growing on the grounds of the Connecticut Agricultural Experiment Station (PDR 22: 25).

COTONEASTER:

Bacillus amylovorus, fire blight and Phymatotrichum omnivorum, root rot, were reported from Arizona.

CYCLAMEN:

Cladosporium cyclaminis, stunt. Illinois, in Cook County.

DAHLIA:

Bacterium tumefaciens, crown gall. Reported again in Connecticut.

Erysiphe cichoracearum, powdery mildew. Michigan, "Common on lower leaves in September in most commercial plantings. No control attempted."

E. polygoni, powdery mildew. New Jersey, in Middlesex County; Pennsylvania, more prevalent than last year in Blair County.

Verticillium dahliae, wilt. Michigan, "In one commercial nursery at Grand Rapids (3 acres) about 2 percent of plants affected. Trace found in all nurseries visited."

Mosaic (virus). Connecticut, reported in occasional plantings in New Haven County; Wisconsin, about the usual amount; Michigan, "Observed in varying amounts in all commercial plantings visited. From trace to 10 percent infected. Some varieties 100 percent infected. One of the serious troubles"; also reported from Colorado.

Ring spot (virus). Michigan, reported as the most common disease of this plant and becoming widespread and injurious in many varieties, very prevalent in commercial plantings everywhere.

Stunt (virus). Connecticut; New Jersey; Pennsylvania.

Heterodera marioni, root knot. Trace reported in Harrison County, Texas.

DELPHINIUM:

Bacterium delphinii, bacterial leaf spot or black spot. Massachusetts; New York; New Jersey; Pennsylvania, southeastern part of State; Michigan, reported as widespread and conspicuous on lower leaves, especially in older plantings; also reported from Wisconsin.

Botrytis sp. Reported from New York; less than usual in Wisconsin.

Erysiphe cichoracearum, powdery mildew. Observed in eastern part of Minnesota; Pennsylvania (E. polygoni).

Fusarium sp., root rot. Common in southern Arizona.

Rhizoctonia solani, stem and root rot. Reported from New York at Ithaca and from New Jersey in Middlesex County.

Sclerotium delphinii, crown rot. New York; New Jersey, Pennsylvania, "This disease limits delphinium growing"; Texas, (S. rolfsii) trace.

Curly top (virus?). Whitman County, Washington.

Mosaic (virus). Eastern and central Pennsylvania.

Stunt (virus). Washington, in Pierce County.

Heterodera marioni, root knot. Arizona, reported as common.

DIANTHUS CARYOPHYLLUS:

Alternaria sp., alternaria leaf spot and branch rot. Connecticut; New York; Pennsylvania; and Colorado. Reported as A. dianthi in Connecticut and New York.

Bacterium dianthi, leaf spot. Michigan, "Becoming increasingly more serious, throughout State. Wide differences in varietal reactions."

B. woodsii, bacterial spot. New Jersey.

Botrytis sp., blossom blight and bud rot. More prevalent than last year in Pennsylvania; Michigan, "About 2 percent of buds affected in one greenhouse at Mt. Clemens in February. Humidity maintained at high level."

Corticium vagum (*Rhizoctonia solani*) stem rot. New York, prevalent in greenhouses. At Manhattan, Kansas, a greenhouse had a very heavy loss in the fall of 1937 due to this disease.

Fusarium sp. Root rot was reported from New Hampshire and Colorado; wilt and stem rot prevalent in greenhouses in New York; stem rot also reported from Colorado; branch rot observed causing serious damage in Senator variety in Michigan, wilt (*F. dianthi*) also common in some very susceptible varieties, mostly Matchless. Majority of good commercial varieties are resistant.

Sporotrichum poae, bud rot. Washington.

Uromyces caryophyllinus, rust. Connecticut; New York; Pennsylvania; and Colorado.

Vermicularia herbarum, stem blight. Texas.

DIANTHUS CHINENSIS and D. LATIFOLIUS:

Septoria dianthi. New York, at Ithaca.

DICENTRA SPECTABILIS:

Sclerotium delphinii, crown rot. New York.

DIGITALIS PURPUREA:

Sclerotinia sclerotiorum, stem rot. New York, first report on this host to Survey.

ERIGERON:

Yellows (aster yellows virus). Kansas, noted occasionally.

EUONYMUS:

Corticium stevensii, thread blight. New host for this disease in Louisiana (PDR 22: 50).

Microsphaera alni, powdery mildew. Texas.

EUSTOMA RUSSELLIANUM:

Alternaria sp., stem blight. Texas.

FILIPENDULA RUBRA:

Sphaerotheca humuli, powdery mildew. New York in Fulton County.

GARDENIA:

Fusarium sp., bud drop and wilt. Colorado.

Phomopsis gardeniae, stem canker. New York; New Jersey.

Heterodera marioni, root knot. New York.

GLADIOLUS:

Bacterium gummisudans, leaf spot. Wisconsin, much less than previous years, dry weather unfavorable for disease.

B. marginatum, scab. New Jersey in Camden County; Pennsylvania, general; Texas, trace in Hidalgo County; Michigan, less than last year, "Moderately dry soil conditions for three weeks in September reduced scab infections; still generally prevalent in commercial plantings"; also occurred in Texas, Washington, and Colorado.

Fusarium sp., fusarium rot, wilt, and yellows. Fusarium rot (*F. oxysporum*) occurred in Pennsylvania again this year, causing slight loss; reported as rot in New Jersey, and dry root rot in Texas; fusarium yellows in Michigan said to be fast becoming a very serious disease in commercial plantings. In January the storage rot phase was very destructive, loss in one cellar $10,000. Most of the best commercial kinds are susceptible. Some good ones like Picardy highly resistant. Basal rot "still of minor importance generally, but this is a new disease that is gradually increasing in commercial stocks"; wilt in Minnesota "Not always distinguished from sclerotinia blight. Many complaints received concerning plants dying from the tips."

Penicillium gladioli, corm rot. Pennsylvania; Washington.

Sclerotinia gladioli, blight and dry rot. Michigan, dry rot "Increasing again after several years of quiescence. Wet seasons most favorable for the disease"; Minnesota, general, not always distinguished from fusarium wilt; also reported from western Washington again this year.

Septoria gladioli, hard rot. West Virginia in Monongalia County; New Jersey; Wisconsin, much less than usual.

Mosaic (virus). Pennsylvania; Wisconsin; Washington.

HEDERA HELIX:

Phyllosticta concentrica, leaf spot. Texas.

P. hedericola, spotting. New York on *Hedera* sp.

Vermicularia trichella, leaf spot. New Jersey.

HELIANTHUS:

Puccinia helianthi, rust. Wisconsin, less than last year on account of dry weather.

HELIANTHUS ARGOPHYLLUS:

Plasmopara halstedii, downy mildew. Texas, common in Cameron and Hidalgo Counties, in Hidalgo County occasional plants heavily infected.

Septoria helianthi, leaf spot. Texas, common in Hidalgo County, lower leaves infected in dense stands.

HYACINTH:

Bacillus carotovorus, bacterial soft rot. Florists in the Los Angeles district of California growing hyacinth plants for the wholesale flower market have suffered losses this season from this disease of the bulbs, the growing plants, and the inflorescence (PDR 22: 31).

IPOMOEA TRIFIDA:

Albugo ipomoeae-panduranae, white rust. Reported as trace in Bell County, Texas.

Phymatotrichum omnivorum, root rot. Texas, Bell County.

IRIS:

Bacillus carotovorus, soft rot. Connecticut in New Haven County; New York; Wisconsin, less than last year due to dry weather; also observed in Pennsylvania.

Bacterial rot (cause not given). New York; Manhattan, Kansas, first report on this host from Kansas; also observed in Washington.

Bacterium tardicrescens, bacterial blight. Massachusetts, tremendous increase in the amount of damage as compared with former seasons (PDR 21: 230, 292, 384).

Didymellina iridis (Heterosporium gracile), leaf spot. Heavy infection during July in Massachusetts (PDR 21: 293); other States reporting the disease are Pennsylvania, Texas, Wisconsin, Minnesota, and Washington.

Fusarium sp., corm rot. Arizona, occurs occasionally on bulbs sent in from other States.

Penicillium sp. Washington, in Pierce County.

Sclerotinia convoluta Drayton (Botrytis convoluta Whetzel & Drayton), wilt or dieback on I. atrofusca in New Jersey, "First report on rhizomatous iris in New Jersey. Material imported under permit and destroyed"; crown rot was found in Ramsey and Dakota Counties in Minnesota again this year, as has been the case for the past 3 years, however, more prevalent this year than last. Fungus active in University Farm area from April 14 to May 5. Also observed in Wright County.

Sclerotium rolfsii, southern blight, on Dutch iris in Texas, 10 percent loss in Hidalgo County, 2 percent loss in State.

Mosaic (virus). New Jersey; West Virginia in Monongalia County on Japanese iris.

Ditylenchus dipsaci, nematode. Livingston County, New York.

IXIOLIRION:

Phytophthora sp., blight. Minnesota, "Most of the plants in a small planting were destroyed, however, the bulbs were still sound in August."

KALMIA:

Phomopsis kalmiae, leaf blight. New Jersey; South Carolina.

Phyllosticta kalmicola, leaf spot. New Jersey; South Carolina; Ohio on K. latifolia.

Septoria angustifolia (S. kalmicola), leaf spot. Connecticut in Fairfield County.

KERRIA JAPONICA:

Coccomyces kerriae, twig and leaf blight. "Caused complete defoliation in one Long Island planting."

LAGERSTROEMIA INDICA:

Fumago vagans, sooty mold. Observed in Cherokee County, Texas.
Oidium sp., powdery mildew. Reported from eastern Texas.
Phymatotrichum omnivorum, root rot. Texas.

LATHYRUS ODORATUS:

Botrytis sp., Minnesota in Ramsey County, "Entire crop of blossoms destroyed in one greenhouse during a period of warm humid weather."

Cladosporium album, leaf mold. New York, occurs mostly in greenhouses.

Erysiphe polygoni, powdery mildew. Colorado.
Microsphaera alni, powdery mildew. New Jersey.
Rhizoctonia sp., root rot. Connecticut; New York; Washington.
Thielaviopsis basicola, root rot. New Jersey; Colorado (PDR 21: 425).

Mosaic (virus). New York, severe in several outdoor plantings on Long Island; New Jersey, in Cape May County; Kansas and Colorado.

LIATRIS:

Sclerotinia sclerotiorum, stem rot. New York.
Verticillium sp., wilt, on *L. pycnostachya* and *L. scariosa* in New Jersey.

LIGUSTRUM:

Glomerella cingulata, anthracnose. Ohio on *L. regelianum* (PDR 22: 51).

Ramularia sp., leaf blight. New Jersey, caused complete defoliation of privet hedge at Flemington, Hunterdon County, on *L. vulgare*.

Chlorosis (non-parasitic). Texas, Bell County.

LILAC:

Microsphaera alni, powdery mildew. An investigation to determine the relative abundance of this disease on species and varieties of lilacs was conducted for four consecutive years at the Arnold Arboretum (PDR 21: 134-138).

LILIUM:

Botrytis sp., blight and gray mold. New Hampshire; New York, very severe; Pennsylvania, in Carbon County, on *L. candidum* (Madonna lily); Wisconsin, less than last year on account of dry weather; Washington, in Lewis County.

B. elliptica, blight. Michigan, "L. candidum generally affected in established plantings where not sprayed. L. regale also injured, especially young plants. Mostly August damage in this species"; Washington, in King and Snohomish Counties.

Uromyces lilii, rust. New York, one case reported in Wayne County.

Mosaic (virus). New York; New Jersey; Michigan, "The most serious disease in out-of-door plantings of L. regale and L. sargentiae, minor importance in L. longiflorum"; Wisconsin.

LONICERA:

Bacterium tumefaciens, crown gall. One report from New Jersey.

Corticium stevensii, thread blight. Reported from Louisiana on L. japonica (PDR 22: 50).

LUNARIA BIENNIS:

Macrosporium sp., leaf blight. Massachusetts (PDR 21: 251).

MAHONIA AQUIFOLIUM:

Cumminsiella sanguinea, rust. Oregon, this season, especially around Portland, a mild fall and continued rains have caused an over-abundant growth of the fungus so that the spotting is decidedly unsightly (PDR 22: 51).

MALVA:

Cercospora malvarum, leaf spot, on M. rotundifolia in Indiana.

Puccinia malvacearum, rust. New Jersey.

MONARDA DIDYMA:

Puccinia menthae, rust. Reported again this year from Connecticut, in Hartford County.

MYRICA:

Rhizoctonia sp., stem rot. Local infection in Essex County, New Jersey.

Stem rot, caused by too much water. New York.

NARCISSUS:

Botrytis narcissicola, smoulder. Reported from Pierce County, Washington.

B. polyblastis, English fire. Washington, in King and Pierce Counties.

Fusarium sp., basal rot. Reported again this year from Pierce County, Washington.

Ramularia vallisumbrosae, blight or white mold, has not been an important commercial disease for two years in Oregon. This year a specimen was sent in by a grower from the Oregon coast (PDR 21: 188; one report from Gray's Harbor County, Washington.

Stagonospora curtisii, leaf scorch, reported again this year in the Puget Sound area of western Washington.

NYMPHAEA:

Alternaria sp., leaf spot. Texas, in Galveston County.

Cercospora nymphaeacea, leaf spot on *Nymphaea mexicana* in Texas (PDR 21: 251).

PACHYSANDRA TERMINALIS:

Volutella pachysandrae. Pennsylvania, this fungus was widely spread around the Philadelphia region and seemed to be devastating large plantings in the spring.

PAEONIA:

Botrytis paeoniae, blight. New Hampshire; Massachusetts (PDR 21: 292); Connecticut, disease of slight importance, reported from New Haven County, New York; New Jersey; Pennsylvania, reported from fifteen counties in central and southeastern part of State, much more prevalent than for several years; Wisconsin, less than usual; Minnesota, reported from Hennepin and Ramsey Counties.

Cladosporium paeoniae, leaf spot. Connecticut; New York; New Jersey; Pennsylvania; Michigan; Wisconsin; and Washington. In Michigan the disease appeared very early in the season, which is unusual. Infection was very heavy on many varieties.

Phytophthora sp., blight. Minnesota, more prevalent than last year in Hennepin and Ramsey Counties.

Rhizoctonia solani, stem rot. New York.

Sclerotium rolfsii, southern blight. Texas, trace in Young County.

Heterodera marioni, root knot. Wisconsin, less prevalent than last year, due to cold winter and hot summer; Oregon.

PAPAVER:

Entyloma fuscum, smut. Texas, in Travis County.

Rhizoctonia sp., stem rot. New Jersey.

PELARGONIUM:

Bacterium pelargonii, leaf spot. Local in New Jersey; Washington in Walla Walla and Snohomish Counties.

Botrytis sp., leaf spot. New Hampshire; New York; New Jersey; and Minnesota. In Minnesota the disease was severe on blossoms in one greenhouse during a period of warm humid weather.

Oedema (non-parasitic). New York.

Crinkle (virus?). Washington.

Mosaic (virus). Washington, in Walla Walla and Spokane Counties.

Leaf necrosis (cause unknown). Washington.

PETUNIA:

Mosaic (virus). Severe outbreak of this disease in a greenhouse in Ardmore, Oklahoma (PDR 22: 81).

PHILADELPHUS:

Septoria philadelphi, leaf spot. Reported again this year from Iowa, less prevalent than last year.

PHLOX:

Erysiphe sp., powdery mildew. New Jersey.

Erysiphe cichoracearum, powdery mildew. New York.

Ramularia sp., leaf spot. Washington, in Snohomish County.

Septoria phlogis, leaf spot. New Jersey.

Sphaerotheca humuli, powdery mildew. New York.

Leaf blight (cause unknown). New York, "Severe this season despite the rainy season."

Root rot (undetermined). Washington.

PHOTINIA:

Cercospora heteromeles, leaf spot. Texas.

PHYSALIS:

Crinkle mosaic (virus). Texas in Cherokee County.

PITTOSPORUM:

Corticium stevensii, thread blight. Louisiana, new host for this disease (PDR 22: 50).

PYRACANTHA:

Bacillus amylovorus, fire blight. One report from Arizona.

Fusicladium pyracanthae, scab. Found in a nursery in Montgomery County, Maryland; scab is abundant in western Oregon almost every fall, but it seemed to be more serious than usual this season (PDR 21: 339).

RHODODENDRON:

Armillaria mellea, root rot. New Jersey.

Pestalotia sp., leaf spot. General in New Jersey, earliest appearance reported from Ocean County.

Phytophthora sp., die-back. Ohio.

P. cambivora, blight. New York on R. carolinianum.

P. cinnamomi, wilt. New Jersey, "This disease is no longer of economic importance due to adequate control measures practiced by commercial growers."

Leaf necrosis (physiological). Reported from Cowlitz County, Washington.

ROSA:

Bacterium tumefaciens, crown gall. Rhode Island, a striking case of varietal resistance in roses to this disease was observed in the greenhouses of one grower at Westerly (PDR 21: 86); New York; Pennsylvania; Texas; Wisconsin; Kansas; and Washington.

Botrytis sp., blight. New York, disease developed in storage, unusually warm weather. Bud blight (*B. cinerea*) was reported again this year from Texas.

Coniothyrium fuckelii, stem canker. New Jersey; Texas, in Smith County; Oklahoma, "drought of last few years evidently a contributing factor to the widespread rose canker problem in the State this year"; Washington.

C. wernsdorffiae, brand canker. Oklahoma, drought a contributing factor causing the disease to be widespread; Colorado.

Corticium stevensii, thread blight. Louisiana, first report from State (PDR 22: 50).

Cryptosporella umbrina (*Diaporthe umbrina*), brown canker. New Jersey; Pennsylvania, more prevalent than last year.

Diplocarpon rosae, black spot, was reported as widespread again this year. In Massachusetts, according to O. C. Boyd, the disease represented perhaps one of the greatest increases in damage above normal in the flower garden. In many instances it caused severe premature defoliation.

Fusarium sp., root rot. Arizona, "Disease resembles verticillium wilt but only Fusarium isolated. Five or six cases; in one, 60 bushes were destroyed by disease in one garden. First found in bushes imported from California."

Mycosphaerella rosicola (*Cercospora rosicola*), leaf spot. Tennessee.

Phragmidium spp., rust. Texas; Wisconsin; Iowa; and California.

Sphaceloma rosarum, anthracnose. Specimens collected at Ithaca, New York on *Rosa* sp., and *R. multiflora*; Pennsylvania, reported from Lancaster County; Tennessee, at Knoxville; North Carolina; Oregon, at Portland; California (PDR 21: 316-317).

Sphaeropsis sp., die-back. Reported from Fairfield County, Connecticut.

Sphaerotheca sp., powdery mildew. Minnesota and California.

S. humuli, powdery mildew. New York, reported from Ontario, Monroe, and Ulster Counties; Pennsylvania, "most severe for several years"; Texas.

Sphaerotheca pannosa, powdery mildew. Massachusetts; Connecticut; New Jersey; Texas; Oklahoma; Kansas; Michigan; Wisconsin; and Washington. In Michigan there was the usual widespread prevalence out-of-doors and in greenhouses.

Heterodera marioni, root knot. Arizona and Texas.

Chlorosis (excess alkalinity). Texas.

Crinkle and streak, said to be virus diseases, were reported from Texas.

Mosaic (virus). Idaho, at Post Falls.

SAMBUCUS sp.:

Corticium stevensii, thread blight. Louisiana, found on elderberry bushes growing under a diseased fig tree (PDR 22: 50).

SOLIDAGO:

Coleosporium solidaginis, rust. Maryland.

Corticium stevensii, thread blight, was found on plants growing adjacent to diseased fig trees in St. James Parish, Louisiana (PDR 22: 50).

Rhytisma solidaginis, tar spot. New Jersey.

SYRINGA:

Bacterium syringae, bacterial blight, was reported from Massachusetts, Michigan, and Washington. In Michigan the disease caused serious damage in one large nursery in May and June. In another nursery where control measures have been practiced for several years, the damage was negligible.

Cladosporium sp., leaf blight, was more prevalent in Pennsylvania this year.

Microsphaera alni, powdery mildew. New York, more prevalent than last year; New Jersey, general; Pennsylvania, less than last year; Texas; Michigan, "Conspicuous, more so than usual in September"; Wisconsin, owing to dry weather, less prevalent than last year; Minnesota, more prevalent than last year; Iowa. An investigation to determine the relative abundance of this fungus on species and varieties of lilacs was conducted for four consecutive years, 1933 to 1936, at the Arnold Arboretum of Harvard University (PDR 21: 134-138).

Phytophthora sp., blight, reported on young shoots in only one planting in Ramsey County, Minnesota.

P. cactorum, blight. New Jersey, in Union County. The disease has been found widespread in Iowa on lilac, according to Clifford H. Meredith (PDR 21: 387), and is the first report from the State.

TAGETES ERECTA:

Coleosporium madiae, rust, was found on a large seed ranch at San Juan, California. This is apparently the first record of a Coleosporium on Tagetes (PDR 21: 374).

Fusarium sp., damping off. New Jersey.

TAMARIX:

Witches' broom (undetermined). Texas.

TARAXACUM OFFICINALE:

Puccinia hieracii, rust. First report from Indiana on this host to Plant Disease Survey.

THALICTRUM FENDLERI:

Puccinia cockerelliana, rust. One report from Colorado.

TULIPA:

Botrytis tulipae, botrytis blight, represented perhaps one of the greatest increases in damage above normal in the flower gardens in Massachusetts; Connecticut; New York; New Jersey; Pennsylvania; Michigan, "Weather very favorable in May and blight developed generally in plantings more than one year old"; Wisconsin, less prevalent than last year on account of dry weather; Washington.

Mosaic (virus). New York.

VACCINIUM:

Rhytisma vaccinii, tar spot, was reported from Marion County, Texas. This is the first report to the Survey on this host from Texas.

VINCA:

Macrosporium, collar rot. Texas.

VIOLA:

Alternaria violae, leaf spot. Reported from Wayne County, New York and Union County, New Jersey.

Cercospora granuliformis, leaf spot. Reported from Ohio for the first time.

C. violae, leaf spot. New York and Illinois.

Colletotrichum violae-rotundifoliae, anthracnose. Texas, one report.

Phoma sp., leaf spot and branch canker, was reported as being extremely damaging in one case in Winchester, Massachusetts (PDR 21: 251).

Ramularia agrestis, leaf spot. Oregon, first report on pansy to the Survey.

Rhizoctonia sp., root rot. Reported from Ramsey County, Minnesota, on pansy.

Sphaceloma violae, scab. Caused about the same damage as last year in Pennsylvania (PDR 22: 86-88).

WEIGELA:

Heterodera marioni, root knot. Texas.

YUCCA:

Coniothyrium concentricum, leaf spot. One report from Connecticut in Litchfield County.

ZANTEDESCHIA:

Phytophthora richardiae, root rot. New Jersey in Monmouth County; Florida, in Orange County on *Z. aethiopica*. This disease has not been previously reported from Florida (PDR 22: 51).

ZINNIA:

Botrytis sp., blight. Pennsylvania, in Erie and Delaware Counties.

Cercospora atricincta, leaf spot. Texas.

Erysiphe cichoracearum, powdery mildew. Reported from New Haven and Hartford Counties, Connecticut; Minnesota, more prevalent than last year; Pennsylvania, general; Texas, in Bell County; Kansas, less prevalent compared with average year; North Dakota, less than last year.

Mosaic (virus). New York; Kansas; and Washington.

DISEASES OF VEGETABLE CROPS

ALLIUM CEPA. ONION:

Leaf blight (Macrosporium sp.?) was common in Willacy and Hidalgo Counties, Texas. Purple blotch (M. porri) was more prevalent than usual in New York, occurring wherever onions were grown and causing a loss of 2 percent. It is becoming more prevalent as late susceptible varieties, such as Ohio Yellow Globe, are being more commonly grown in the State. Purple blotch was also reported from Colorado. Black mold (M. sarcinula parasiticum) follows after blast and downy mildew have caused partial death of the leaves and since both of the primary diseases were severe in New York in 1937, black mold was also more prevalent. It is usually of only slight importance.

Downy mildew (Peronospora destructor) appeared very early and developed to epidemic proportions in Massachusetts, Connecticut, and New York. Conditions permitting this development in New York are described by A. G. Newhall as follows: "Much fog and precipitation in April, May, and June favored infection and spread of downy mildew earlier than ever before. It was cool until the beginning of August." The disease was first found in Wayne County as early as May 12, in garden plantings of multiplier onions in which overwintering of the organism has been demonstrated and from which spread to commercial fields by means of wind-borne spores is indicated by strong evidence. Infection of the commercial crop was first observed in mid-June, also the earliest date recorded for the State, although it did not appear until late in the season in some localities. Bulbs of the late crop were reduced to half size. The loss for the State was estimated at 50 to 100 percent. In Massachusetts, downy mildew appeared in fields from sets about June 15. Usually it is not observed there before the latter half of July, according to O. C. Boyd. It continued to spread rather rapidly during the remainder of June, and was first observed in seed onion fields July 3. During a hot dry period of a few days in early July it was checked temporarily but further spread took place afterward. The reduction in yield of the set crop was about 12 percent, of the seed crop about 10 percent. Downy mildew was also reported from Pennsylvania, Washington, and Oregon. In Pennsylvania, O. D. Burke reported, "Heavy rains caused this disease to be slightly more prevalent than usual but later dry weather resulted in slight losses," a trace being estimated. According to C. E. Owens, downy mildew is apparently becoming more firmly established in the Willamette Valley of Oregon but its severity is dependent upon favorable weather. In both 1936 and 1937 it was more prevalent there than usual, but incidence was somewhat reduced in 1937. The disease was reported from Pierce and Thurston Counties in western Washington. According to H. A. Jones of the Bureau of Plant Industry (in Market Growers' Journal 64: 56. Feb. 1, 1939), downy mildew caused considerable losses in Michigan in 1937.

Pink root (Phoma terrestris) was about as usual or below average in importance in States reporting it, including Massachusetts, New York, Iowa, and Colorado. In New York, it was said to occur in nearly every field but severity was somewhat reduced in 1937 by moist cool soil during the early part of the season. A loss of 3 percent was reported from Iowa.

Smut (Urocystis cepulae). More than usual was reported from Massachusetts, New York, and Illinois. In New York a few fields were plowed up owing to heavy smut infection. Contributory factors, according to A. G. Newhall, were more moisture than usual in May and June and a cooler spring. "Frequent rains caused dilution of the formaldehyde in the soil, and by keeping the soil wet, made growers cut down on the total used so less control was often obtained." A similar condition was reported from Illinois. The loss in New York was estimated at 10 percent from reduction in yield with an additional 1 percent loss in grade. The disease is increasing in importance in all muck areas in that State. The usual amount of smut was reported from Wisconsin and Iowa with 2 percent loss estimated in the latter.

Botrytis allii causing neck rot was reported from New York and Colorado; Botrytis sp. from Wisconsin. Anthracnose (Colletotrichum circinans) was said to be common in New York on the stalks of seed heads, especially where weeds were thick. There was less than usual in Wisconsin. Injury caused by Fusarium sp. and nematodes (? Heterodera marioni) affected about an acre of seedling onions in Sussex County, New Jersey. Bulb rot reported as due to Fusarium cepae was very prevalent in Cumberland County and other sections where onions are commonly grown in New Jersey. F. vasinfectum zonatum f. 1 occurred in the usual amounts in Iowa and was reported from Colorado. Fusarium bulb rot following pink root was less injurious in Massachusetts owing to the reduced amount of the latter disease. Storage losses (various organisms) were prominent in Massachusetts.

Rootknot (Heterodera marioni) was found on white seedling onions in Arizona.

Yellow dwarf (virus) caused a trace of loss in Iowa.

Blast or tipburn (non-parasitic) was very severe in Massachusetts. It caused about 30 percent loss of the seeded crop, and together with downy mildew, about 25 percent of the set crop. Blast was severe in New York and Ohio also.

ALLIUM SATIVUM. GARLIC:

The following diseases were reported by G. E. Altstatt from Fayette and Lavaca Counties in Texas: Bulb rot (*Aspergillus* sp.) caused 5 percent loss, and dry rot (*Diplodia* sp.) from a trace to 1 percent. Bulb rot (*Helminthosporium* sp.) caused damage ranging from a trace to 10 percent. The Survey has no other record of this disease in this country. Southern blight (*Sclerotium rolfsii*) occurred in traces. Bacterial soft rot (? *Bacillus carotovorus*) was important, the loss caused being 25 to 35 percent. A disease reported as mosaic or streak resembles the virus-induced lily mosaic, but the cause is not determined as yet. Infection ranged from 10 to 100 percent. "Splits", another disease of undetermined cause, believed to be due to nutritional or water relations, caused losses up to 65 percent in Fayette County, and from 2 to 5 percent in Lavaca County.

ANETHUM GRAVEOLENS. DILL:

The only disease reported on this host was leaf and stem blight caused by *Cercosporina anethi*, from Texas. One ten-acre field in Hidalgo County was 100 percent affected, and the loss resulting was at least 25 percent, according to G. H. Godfrey.

APIUM GRAVEOLENS. CELERY:

Early blight (*Cercospora apii*) was unusually destructive in the important celery-growing regions of New York, Florida, and Michigan. There was more early blight in New York than for several years, according to A. G. Newhall, partly because of abundant rain which favored spread in seed beds and in early plantings, and partly because of heavy infection of seed of the extensively used Michigan Golden variety. The disease occurred wherever seed from a certain source was used. A total loss of 20 percent estimated included 15 percent from lowered production. G. R. Townsend reported that favorable weather including high temperatures in January, and night fogs favoring sporulation and infection, resulted in increased prevalence in the Everglades region of Florida. Ray Nelson reported one of the most severe outbreaks known in Michigan, "almost equal to that of 1933. The loss in the summer crop was at least 40 percent. The late crop was also seriously damaged owing to heavy infection of young plants in August." Well distributed rains and heavy dews produced very favorable moisture conditions;

temperature, however, was favorable for only short periods, being mostly too cool. The loss in Michigan was said to be 15 percent, of which 10 percent was from reduction in yield. In Massachusetts early blight appeared early and was unusually severe and difficult to control; in New Jersey it was said to be severe where control measures were not practiced; in northern Ohio it was severe in some instances. In North Carolina, according to R. F. Poole, "Celery is grown in gardens only, and while heavy infection was observed, the losses were small." In Pennsylvania, the usual amount was reported with a loss of 3 percent. In Wisconsin there was said to be less than usual.

Fusarium yellows (F. apii and F. apii pallidum) was more noticeable than usual in Massachusetts, possibly because of rather high soil temperatures, according to O. C. Boyd. In New York, New Jersey, Pennsylvania, Michigan, and Wisconsin, there was said to be the usual amount, and the disease was reported from Colorado also. A. G. Newhall reported that "Fusarium yellows (both species) is gradually spreading in the muck areas of western and central New York; but losses are being held down by the prompt use of the Michigan Golden variety." Ray Nelson estimated a loss of 1 or 2 percent in Michigan. High rainfall and lower than usual soil temperatures during July and August inhibited development of the disease, although in one 120-acre planting in Van Buren County it caused a total loss of 20 acres. In the important Kalamazoo County area the use of resistant varieties such as Michigan Golden, Florida Golden, or Curly Leaf, is annually reducing losses. All of the commercial golden self-blanching types are susceptible. Other diseases reported as caused by Fusarium sp. were wilt in New Jersey and Wisconsin and root rot in Colorado.

Pink rot, watery soft rot (Sclerotinia sclerotiorum). Charles Chupp reported this disease as more prevalent than usual in the field in New York, where it is always serious in storage. The usual amount occurred in Pennsylvania, where the loss was estimated at 1 percent.

Late blight (Septoria apii and S. apii-graveolentis) was reported from Massachusetts as unusually conspicuous. In New York it was apparently less prevalent generally than usual, according to A. G. Newhall, ".....since the average amount of seed infection was lower, and August was hot. M. B. Linn reported it as rather severe on Staten Island in September and October, and M. C. Richards as severe on Long Island." In New Jersey it was reported as very severe in the Great Meadows in Warren County, and occurred also in Monmouth and Union Counties. In Pennsylvania there was more than usual, with a loss of 6 percent estimated by O. D. Burke. J. D. Wilson reported it as especially severe in northern Ohio, where it appeared early and was very difficult to control. In Michigan late blight equalled early blight in importance, although according to Ray Nelson, who estimated 10 percent loss from reduction in yield and 5 percent from lowered quality, "It was difficult to estimate actual losses from Septoria since early blight was nearly always a contributing factor. Late blight caused severe damage to the crop in most sections, and was largely responsible for low quality in the late crop." He mentioned excessive rainfall and favorable temperatures during the period of greatest damage in September as contributing to the severe development of late blight. In Wisconsin there was said to be less than usual. The disease was reported from Colorado, western Washington, and Tillamook County, Oregon.

Bacterial diseases: Soft rot (Bacillus carotovorus) was reported from New York, New Jersey, and Pennsylvania. In New York "High temperatures and humidity seemed to favor the disease, and it also seemed to follow blight damage," with the result that there was more soft rot than usual, according to Charles Chupp. Bacterial blight (Bacterium apii) was observed in only one or two fields in New York. In Michigan, according to Ray Nelson, "Bacterial blight was noted for the first time since about 1924 or 1925. It was unquestionably seed-borne in the cases observed."

Root knot (Heterodera marioni) was reported from New York as causing considerable damage in one plant bed in Wayne County, and from Michigan as observed occasionally in Kalamazoo County with only slight loss.

Virus diseases: Mosaic was reported from New York as always common by September, but not very destructive; from New Jersey; and from Washington. In one case in New Jersey the cucumber virus was the one concerned. Virus yellows was less important than usual in New York, possibly because of the heavy rainfall (more than 5 inches) in June, according to A. G. Newhall. The disease was also reported from King and Pierce Counties in western Washington.

Non-parasitic diseases: Black heart was reported by A. G. Newhall as of less than the usual slight importance in New York, where the heavy spring rains produced enough moisture reserve in muck soil to prevent its development. It was observed late in the season in a few shallow fields after the August hot spell. Bolting was reported from western Washington. Cracked stem (attributed to boron deficiency) was less troublesome than usual in Massachusetts, and was reported in western Washington and from various parts of Oregon.

ARTICHOKE, JERUSALEM. See HELIANTHUS TUBEROSUS.

ASPARAGUS OFFICINALIS. ASPARAGUS:

Rust (Puccinia asparagi) apparently returned to its usual slight importance in New Jersey, where, although the disease was generally distributed, very little damage was reported in the fields in which infection was severe in 1936. Besides New Jersey, occurrence of rust was reported from Connecticut, Maryland, Illinois, Wisconsin, and North Dakota. The Department of Plant Pathology reported a considerable amount of dying of seedlings caused by Rhizoctonia sp. in a few fields on hard soil in New Jersey. In many cases, only the above-ground parts were killed and new sprouts were arising from the crown. "Dried roots" (cause unknown) was reported from Washington.

BEAN. See PHASEOLUS.
BEET, GARDEN. See BETA VULGARIS.
BEET, MANGEL WURZEL. See BETA VULGARIS MACRORHIZA.

BETA VULGARIS. GARDEN BEET:

Scab (Actinomyces scabies). Slight amounts were observed in a few fields in Ontario County, New York. In New Jersey, the disease was reported as very severe in one case only, where beets had been planted in the same field in which scab appeared in 1934-1935. The usual amount was reported from Wisconsin. Blight (Alternaria sp.) was reported from New Hampshire. Somewhat more leaf spot (Cercospora beticola) than usual was reported from Connecticut and New York, and in New Jersey the disease was said to be severe in some plantings. The usual amount or less was reported from Pennsylvania, with a loss of 1 percent, Ohio, Wisconsin and Kansas.

Corticium vagum causing damping-off was reported from New Jersey, North Carolina and Illinois. In North Carolina, Pythium ultimum was the cause of heavy loss of seedlings, according to R. F. Poole. Pythium sp. was reported from Illinois. Damping-off due to various organisms caused a loss of 1 percent in Pennsylvania.

Root knot (Heterodera marioni) was reported from Hidalgo County, Texas.

Curly top (virus) was severe in Maverick County, Texas, where 50 percent infection resulted in a loss of 3 to 5 percent. Loss for the State was a trace. Mosaic (virus) was reported from Washington.

Dry rot (undetermined) was reported from Washington. Girdle (non-parasitic) "possibly results from boron deficiency," according to Charles Chupp, who reported from New York, "Specimens were sent from Green Lawn, Nassau County, Long Island, and some girdle was observed in Ontario County. Specimens were also received from Roosevelt, Long Island." Heat injury was reported from New Jersey, and internal black spot from New York.

BETA VULGARIS MACRORHIZA. MANGEL WURZEL:

Leaf spot (Cercospora beticola) occurs wherever the host is grown in New York, according to Charles Chupp. It was also reported from Texas. Root rot caused by Fusarium, species undetermined, was reported from Montesano, Gray's Harbor, Washington, the first time such a disease has been reported to the Survey.

BRASSICA ALBA. CURLY LEAF MUSTARD:

White rust (Albugo candida) was severe in some experimental plantings at the Rio Grande Substation in Texas (PDR 21: 170).

BRASSICA NAPUS. RAPE:

Club root (Plasmodiophora brassicae) was reported from New Jersey.

BRASSICA OLERACEA ACEPHALA. KALE:

Powdery mildew (probably Erysiphe polygoni), a disease seldom reported on kale, caused severe damage in a field in eastern Virginia (PDR 21: 141). Yellows (Fusarium conglutinans) was reported from New York, in Nassau County, Long Island.

BRASSICA OLERACEA var. BROCCOLI:
(Probably mostly var. italica).

Black leaf spot (Alternaria brassicae) was reported from New York and Texas, and club root (Plasmodiophora brassicae) from New York. Black rot (Bacterium campestre) was reported from New York, where it was observed in September on broccoli grown near cauliflower, and from Wisconsin.

BRASSICA OLERACEA BOTRYTIS. CAULIFLOWER:

Black leaf spot (Alternaria brassicae) caused slight damage in Massachusetts and New York as usual. In New York it was said to be severe in a few fields on Long Island. In Bexar County, Texas, 75 percent infection and losses of 1 to 15 percent were reported. For the State as a whole the loss was 1 percent, according to G. E. Altstatt.

Gray leaf spot (A. herculea) was reported with A. brassicae from New York. Wire stem (Corticium vagum) occurred in scattered seed beds on Long Island, New York, and caused considerable damage in some, according to H. S. Cunningham.

Yellows (Fusarium conglutinans) was reported on cauliflower from Wisconsin only.

Downy mildew (Peronospora parasitica) is apparently rare on cauliflower, according to Charles Chupp. It occurred on seed beds on Long Island, New York, throughout the season and caused considerable damage to plants in the later-planted beds. Injury was confined to seed beds, according to H. S. Cunningham. M. C. Richards reported that the disease was present in a few fields in September. Downy mildew was also reported from New Jersey, on plants in coldframes.

Club root (Plasmodiophora brassicae) was said to be more troublesome than usual in Massachusetts (PDR 21: 365-366). It was reported as occurring in seed beds locally in New York. In Illinois it was serious in plantings on contaminated soil (see Cabbage). In Michigan Ray Nelson estimated 1 to 2 percent loss, and stated that club root was the cause of a considerable reduction in yield in 200 acres in Allegan County.

Watery soft rot (Sclerotinia sclerotiorum) was apparently more prevalent than usual in New York, because of high temperature and humidity, according to Charles Chupp.

Chemical injury, cause not reported, occurred in a greenhouse in New Jersey. The entire lot of 30,000 plants had a grayish appearance. The cotyledons were more severely affected than the real leaves. Deficiency diseases were reported from New York by Charles Chupp. "What was apparently magnesium deficiency was observed in one field in Delaware County. Potash deficiency (tipburn) was found in a few fields where the proportion of superphosphate was very high as compared to that of potash."

BRASSICA OLERACEA CAPITATA. CABBAGE:

Black leaf spot (Alternaria brassicae) was reported from Massachusetts, New York, New Jersey, Pennsylvania, North Carolina, Texas, and Wisconsin. In North Carolina it was said by R. F. Poole to be "abundant especially on plants held in the field for some time following maturity. It caused much decay during wet periods." Seventy-five percent infection occurred in Bexar County, Texas, with a loss of 1 to 15 percent for the County; however, the loss for the State was 1 percent. Loss in Pennsylvania was estimated at 0.6 percent; in New York at a trace. Gray leaf spot (A. herculea) was reported from New York, with A. brassicae.

Wire stem (Corticium vagum) is "always a destructive disease in New York," according to Charles Chupp, "not only in the seed bed, but it reduces the size of the heads when affected seedlings are transplanted to the field." In 1937 there was the usual amount, with loss from 0.5

to 2 percent. The usual prevalence was noted in Pennsylvania, where O. D. Burke reported wire stem causing injury in one field as well as in many seed beds, the loss resulting being estimated at 0.5 percent. In Kansas it was observed on seedlings.

Yellows (Fusarium conglutinans) was not observed anywhere in Massachusetts, according to O. C. Boyd (PDR 21: 366). A. A. Dunlap reported it in experimental plots and stated that the disease had been found occasionally in cabbage fields in southern Connecticut during the past 3 or 4 years. "It was more common on Long Island than usual, and is gradually spreading in upstate New York," according to Charles Chupp. "Specimens were sent from Suffolk and Nassau Counties on Long Island, and also from Niagara, Albany, Monroe, Ontario, Rensselaer, Orleans, Genesee, Wayne and Cattaraugus Counties in upstate New York. An ever-increasing amount of resistant seed is being used." Scattered reports were received in New Jersey. O. D. Burke reported that "Yellows was of the usual considerable importance in Pennsylvania, although because of lower temperatures and greater moisture supply it was less prevalent than last year. It caused a loss of 10 percent. In this State the disease occurs wherever cabbage is grown. Resistant varieties are used almost exclusively in certain counties, thus reducing State losses. The resistant varieties Marion Market, Globe, and Early Detroit are well liked but many other resistant selections are used." In Maryland less than usual, with a loss of 3 percent, was reported; in West Virginia more. In North Carolina, according to R. F. Poole, "Yellows was very severe in certain areas of the mountains and in light sandy soils. Resistant varieties stood up well." Yellows was reported by G. F. Weber for the first time from Florida, where it caused damage in the vicinity of Bartow (PDR 21: 282). It was thought to be introduced on plants sent from Wisconsin for winter seed production about 1920. A trace was reported from Texas. In Illinois, K. J. Kadow reported it as generally important where cabbage was grown on infested soils, especially in market gardens where susceptible varieties are used. "Affected soil is increasing in Michigan but the disease is seldom found in areas of heavy commercial production. It occurs mostly on high land plantings and in market gardens," according to Ray Nelson, who estimated 1 percent reduction in yield and stated that the disease was less prevalent than in 1936, owing to high rainfall and lower than normal temperatures. R. E. Vaughan reported that yellows is spreading to new territory in Wisconsin, evidently through the sale of infected plants. J. G. Leach reporting from Minnesota stated that "Losses are being reduced by the use of resistant varieties, but they are not yet used extensively enough. Although it was hot during the middle of the season, moisture conditions did not favor development of yellows, and prevalence was about as usual, with a loss of 2 percent." Six percent loss was reported from Iowa. The usual amount occurred in Kansas, and the disease was reported from Colorado (PDR 21: 425).

Downy mildew (Peronospora parasitica) is usually a late-season disease in Massachusetts, but this year it caused more damage to the early than to the late crop, according to O. C. Boyd (PDR 21: 365). In New York Charles Chupp reported that loss was observed than for a number of years. Downy mildew occurred in seed beds in New Jersey, North Carolina, and Texas, and was found in several fields in Pennsylvania.

Black leg (Phoma lingam) occurred in the usual amounts in Massachusetts, wherever seed treatment and crop rotation were not practiced, according to O. C. Boyd (PDR 21: 365-366). Hot water seed treatment has almost eliminated black leg from New York, according to Charles Chupp. It was observed in two fields in Cortland County, planted from infested seed beds, and in one field in Nassau County, Long Island. Specimens were sent from Cortland and Cattaraugus Counties.. Heavy losses occurred in some plantings in New Jersey. Less than usual was reported from Pennsylvania, Maryland, and Wisconsin, and the usual trace from Minnesota. The disease was reported for the first time from Oklahoma by K. S. Chester, from Payne County.

Club root (Plasmodiophora brassicae) was said to be of the usual prevalence in most States, although in Massachusetts it appeared earlier and caused more damage than in most years, according to O. C. Boyd, and J. C. Walker reported it as more prevalent than usual in Wisconsin, but stated that fields known to be infested were being utilized for other crops. Club root is always a problem on some farms in New York, according to Charles Chupp, and M. C. Richards reported it as very severe in the Hicksville area on Long Island. The loss for the State was said to be 0.5 to 2 percent. K. J. Kadow reported it as very serious in plantings on contaminated soil in Illinois, with losses of cabbage and cauliflower up to 60 percent, but the State average was estimated to be between 5 and 10 percent. (PDR 21: 405). In Allegan County, Michigan, "Club root has become prevalent in recent years in restricted areas of intensive production," according to Ray Nelson, who reported the usual amount with a trace of loss. In both Pennsylvania and Indiana the loss was said to be 0.5 percent, and the disease was also reported from Connecticut, and from Washington in King and Pierce Counties.

Head rot (Rhizoctonia sp.) was less prevalent than usual in Wisconsin. Drop (Sclerotinia sclerotiorum): A few affected heads were observed in New York, especially in over-mature crops.

Bacterial soft rot (Bacillus carotovorus): In New York, according to Charles Chupp, cabbage-harvesting was delayed because of poor prices and the over-mature cabbage was often injured by bacterial soft rot, with a loss estimated at a trace to 0.5 percent. R. F. Poole reported much loss of late summer cabbage in North Carolina. Soft rot was also reported from New Jersey and Kansas.

Black rot (Bacterium campestre): The very general use of seed treatment has greatly reduced the loss from this disease in recent years. In 1937 it was locally severe in Massachusetts, but in most sections caused about the usual amount of damage when seed treatment and crop rotation were not observed, according to O. C. Boyd (PDR 21: 365-366). Charles Chupp reported that in New York, "Since the general practice of hot water seed treatment, there is almost no black rot on cabbage. In September some cabbage immediately adjoining cauliflower was affected. In one case about 40 acres were affected in Rockland County, with from 40 to 60 percent loss in each field. There were a number of fields on different farms, all planted with stock from one plant grower. The seed was not treated." Less than usual was reported from Pennsylvania and Minnesota, and much less from Maryland. In Kansas it was noted only occasionally. On the other hand, more than usual was reported from Wisconsin by J. C. Walker, who stated that several cases were observed where infection was brought in with early plants from the South. At the Lower Rio Grande Substation in Texas, G. H. Godfrey reported high incidence in February, ranging from a trace to 40 percent with an average of 5 percent loss to the spring crop in Hidalgo County and a trace to 1 percent for the State (PDR 21: 170). Loss estimates reported were 2 percent in Pennsylvania, 1 percent in Minnesota, a trace to 1 percent in Texas, 0.5 percent in Maryland, and traces in New York and Iowa. Occurrence was reported from Louisiana.

Root knot (Heterodera marioni): A trace of injury was reported from Texas.

Mosaic (virus) was reported from Illinois, with slight loss, and from Wisconsin.

Black leaf speck (non-parasitic, due to low storage temperatures and lack of ventilation) was reported from New York, and Michigan. In the latter State, according to Ray Nelson, "It was observed in cabbage stored in poorly ventilated out-of-door pits. It developed in January when the heads were removed to a warm place."

Bud injury due to frost was reported from Wisconsin.

Oedema (non-parasitic--mechanical or physiologic) was less important than usual in New York.

Tipburn (non-parasitic): One field in Monroe County, New York, was seriously affected, but only traces were observed in most of the State, according to Charles Chupp, who reported that the disorder is due to potash deficiency caused by the application of an excess of superphosphate in proportion to the amount of potash. Tipburn was also reported from New Jersey, where it occurred mostly in the southern part.

BRASSICA OLERACEA CAULORAPA. KOHL-RABI:

Club root (Plasmodiophora brassicae) was severe in some plantings in New Jersey.

BRASSICA PEKINENSIS. PETSAI CABBAGE, CHINESE CABBAGE:

Club root (Plasmodiophora brassicae) was reported from New Jersey on Chinese cabbage grown in muck soil in a region where cabbage had not been grown for many years.

BRASSICA RAPA. TURNIP:

Black leaf spot (Alternaria brassicae) was reported from New Jersey and Texas. White spot (Cercosporella albomaculans) was reported by Charles Chupp as statewide in New York. It was said to have caused considerable loss on one farm in Tioga County. A bacterial blight, reported as due to Bacterium sp., caused serious loss in early fall turnips in North Carolina, according to R. F. Poole. A mosaic of extreme crinkle type, possibly due to the cabbage mosaic virus, occurred in Brazos and Cherokee Counties, Texas.

BROCCOLI. See BRASSICA OLERACEA var.
CABBAGE. See BRASSICA OLERACEA CAPITATA.
CANTALOUPE. See CUCUMIS MELO.

CAPSICUM ANNUUM. PEPPER:

Black spot (Alternaria sp.) was rather common in New York, following sunscald, blossom-end rot, and other diseases and injuries. It was common in many parts of New Jersey. Fruit rot (Alternaria sp.) was reported from Colorado. Early blight (Alternaria solani) was found on peppers in Illinois but was not important.

Anthracnose (cause variously designated, although probably the same), Colletotrichum sp., causing fruit rot, was present to some extent in late summer in New York. C. nigrum was reported from Louisiana and Ohio. Glomerella cingulata was reported from Louisiana, on Cayenne, Bell, and Sport varieties. Gloeosporium piperatum in Pennsylvania caused 2 percent reduction in yield and 1 percent loss from fruit rot.

Blight (Phytophthora capsici) is the limiting factor in the growing of peppers in Fremont County, Colorado, according to William A.

Kreutzer (PDR 21: 425). In 1937 it was especially severe, and caused losses of a trace to 50 percent. Traces were observed in most fields in the Arkansas Valley district. Fruit rot (Phytophthora sp.) was reported from New York.

Verticillium wilt (Verticillium sp.) was reported on pepper for the first time in this country in 1937, from two States, one on the Pacific, the other on the Atlantic Coast, first as a serious disease in southern California, by B. A. Rudolph and W. C. Snyder, and shortly afterward from Connecticut by A. A. Dunlap, who also stated that it was severe in affected fields (PDR 21: 404, 426).

Gray mold (Botrytis cinerea) was reported from New Jersey. Leaf spot (Cercospora capsici) occurred on bell peppers in Louisiana. Slime mold (Fuligo ovata): Young plants received from a greenhouse in Niagara County, New York were covered with the fruiting slime mold, according to Charles Chupp. Damping-off (Rhizoctonia sp.) was reported from New Jersey. Southern blight (Sclerotium rolfsii), in Louisiana, "occurs chiefly on bell peppers, but is also found on Cayenne, Tabasco, and Sport varieties," according to L. H. Person.

Bacterial spot (Bacterium vesicatorium) was somewhat more injurious than usual in Massachusetts, mostly on the foliage, according to O. C. Boyd (PDR 21: 367). In New York Charles Chupp reported that it was common and rather destructive on Long Island but scattered and of no importance up-State. The loss was said to be a trace to 1 percent. There was much less than during the previous year in New Jersey, according to the Department of Plant Pathology. K. J. Kadow reported it as occurring on both leaves and fruit in Illinois, but with slight losses. There was less than usual in Wisconsin.

Root knot (Heterodera marioni) was common on chili peppers in Atascosa County, Texas, the loss in the affected area being 20 to 30 percent but averaging only a trace to 0.5 percent in the State.

Dodder (Cuscuta sp.) attacked 5 to 10 percent of one field in Atlantic County, New Jersey.

Virus diseases: Mosaic incidence in New York was reported by Charles Chupp as gradually being reduced by the eradication of weed hosts. Mosaic was abundant in most fields in New Jersey but much less prevalent than it had been in 1936. Mosaic occurred on both sweet and hot peppers in Puerto Rico. A variety of mosaics was reported from Texas, including pepper mosaic on sweet pepper, a yellow mosaic which seemed to be due to the yellow-tobacco-mosaic virus on bell peppers and pimento peppers, and interveinal mosaic on bell peppers (PDR 22: 10). No spotted wilt was found in New York in the Hudson Valley or on Long Island where it occurred last year, according to Charles Chupp. One specimen was sent in from Niagara County in October (PDR 21: 320). Vein banding was reported from Cherokee County, Texas.

Albinism (probably genetic) was reported from Texas. Blossom-end rot (non-parasitic) was injurious in Massachusetts.

CARROT. See DAUCUS CAROTA.
CAULIFLOWER. See BRASSICA OLERACEA BOTRYTIS.
CELERY. See APIUM GRAVEOLENS.

CICHORIUM ENDIVIA. ENDIVE and ESCAROLE:

Bottom rot (Rhizoctonia solani) caused heavy destruction in a field of endive following an earlier crop of celery that had been only mildly affected, in Connecticut, according to A. A. Dunlap. On broad-leaf escarole in New York it was about as usual on Staten Island, and less severe on Long Island.

Yellows (virus) was reported from New York. On Staten Island M. C. Linn reported that "it caused less than 1 percent loss to the midsummer crop of endive, and was slightly less prevalent than during the past few years on broad-leaf escarole. Heavy rainfalls seemed to have kept down the population of the leafhopper vector on Staten Island." "There was much less yellows on broad-leaf escarole on Long Island as compared to 1936," according to M. C. Richards.

CITRULLUS VULGARIS. WATERMELON:

Anthracnose (Colletotrichum lagenarium): Charles Chupp reported that "More early watermelons are being grown in New York. A few patches were seriously affected by anthracnose. The total loss was a trace to 0.5 percent." Less than usual was reported from Maryland, Virginia, and North Carolina; and much less in Kansas, although some serious infections were noted locally. Anthracnose was also reported from New Jersey, Texas and Iowa. In Maryland and Virginia reductions in yield of 1 and 7 percent were reported, respectively, with an additional 2 percent loss from lowered quality of the fruit in Maryland.

Fusarium wilt (Fusarium niveum) was reported from Riverhead, Long Island by O. A. Reinking. This is the first report of occurrence of fusarium wilt on watermelon in New York. The disease was also reported from New Jersey; from Virginia, where Harold T. Cook noted the usual amount, with 5 percent loss, but remarked, "The low loss is due to avoidance of wilt-infested land for watermelon growing"; North Carolina, where, according to R. F. Poole, "It was severe in the sandy soils of the eastern part. Five- to seven-year rotations have been effective in reducing losses. Heavy losses follow continuous plantings"; from Texas where it caused loss in Wise and Cherokee Counties ranging from 15 to 75 percent, and an average loss of 15 percent; from Iowa where there was less than usual, according to S. Younkin, but the loss was reported as 20 percent; and Kansas, where there was also less than usual.

The only report of powdery mildew (Erysiphe cichoracearum) was from New York, with the notation, "Almost none present." Seedling loss due to Pythium sp. caused reduction in yield of 30 percent in Iowa, according to S. Younkin.

Bacterial wilt (Bacillus tracheiphilus) was reported by E. A. Walker from Maryland, where there was less than usual and much less than last year, and the reduction in yield was estimated at 2 percent. It occurred in Oklahoma also.

Root knot (Heterodera marioni) was important in Texas. Losses from 10 to 85 percent were reported in Cherokee and Tyler Counties, and the average for the State was said to be 20 to 25 percent.

Virus diseases: Crinkle mosaic was reported from Texas. Curly top was reported by B. F. Dana as causing severe injury to tips and runners of the vines in the Hermiston area of Oregon (PDR 22: 83). Mosaic caused a trace of loss in Iowa.

Albinism (probably genetic) was reported from Texas.

CUCUMBER. See CUCUMIS SATIVUS.

CUCUMIS MELO. CANTALOUP:

Leaf blight (Alternaria cucumerina): Charles Chupp reported "the worst epidemic of this disease in New York that has been observed for at least 25 years. It was most severe where weeds were present to hold the moisture. Loss was 5 to 10 percent." In other States reporting there was the usual amount or less.

Anthracnose (Colletotrichum lagenarium) was reported as more prevalent than usual in New York, Maryland, and northern Ohio; in other States reporting, including Massachusetts, Connecticut, Pennsylvania, Wisconsin, Iowa, and Kansas, there was the usual amount or less. In New York, according to Charles Chupp, there was the most "that has been observed in the State for at least 25 years. Many fields were completely killed before picking was two-thirds completed. Loss was 10 to 15 percent." In Maryland, 1.5 percent, and in Pennsylvania 1 percent, loss was estimated.

Fusarium wilt: The cause was reported as *Fusarium* sp. in Connecticut and New York, as *F. bulbigenum* var. *niveum* f. ? in Minnesota, and as *F.* [*bulbigenum*] *niveum* in Washington. In New York the disease is gradually spreading in Monroe and Niagara Counties, according to Charles Chupp. It has not been observed in that State except along Lake Ontario. J. G. Leach reported a 2 percent loss in Minnesota, in Hennepin and Ramsey Counties, where the disease is spreading and becoming more destructive each year.

Downy mildew (*Pseudoperonospora cubensis*) was more prevalent than usual in Maryland and Virginia, where losses were estimated at 1 percent and 10 percent, respectively. It was severe in Tarrant County, Texas, where G. H. Godfrey reported 25 percent loss, but for the State as a whole 1 percent was estimated. Occurrence was reported in Massachusetts, Connecticut and New Jersey also. In Wisconsin and Iowa it was not observed.

In New York, *Cephalothecium roseum* caused some rot following anthracnose cankers on the fruit, according to Charles Chupp. About the normal amount of scab (*Cladosporium cucumerinum*) occurred in Massachusetts. In New York, because of high August temperatures, almost no scab infection developed until September. More powdery mildew (*Erysiphe cichoracearum*) than usual was reported from Virginia, where Harold T. Cook estimated a loss of 5 percent. One percent loss was reported from Texas. Slight amounts occurred in Connecticut and New York. Stem canker (*Mycosphaerella citrullina*): In 1937 there was sufficient rain in New York to prevent wind injury or sand chafing at the base of the stem and almost no stem canker occurred, according to Charles Chupp. The disease was reported from Massachusetts. Damping-off (*Pythium* sp.) caused a loss of 30 percent in Iowa, according to S. Younkin, and was reported from New Jersey. "Leaf blight (*Septoria cucurbitacearum*)," according to Charles Chupp, "was not a serious disease in New York, but was more commonly present than it has been known to be for at least 25 years. Leaves, stems, and fruits were affected. The loss was a trace."

Bacterial wilt (*Bacillus tracheiphilus*) seemed to be more prevalent than usual in New York in the early spring, but later in the season there was less than average. The loss was reported as 0.5 to 1 percent. Other loss estimates were 3 percent in Maryland and 4 percent in Iowa. The disease was also reported from New Jersey. In Kansas it was not observed in 1937.

Mosaic (virus). The usual amount or less occurred in States from which it was reported. In New York Charles Chupp reported, "Since growers are practicing weed eradication, mosaic is becoming a minor problem up-State. Weed eradication has not seemed of much benefit on Long Island."

CUCUMIS SATIVUS. CUCUMBER:

Leaf blight (Alternaria cucumerina): In New York, in contrast to its severity on cantaloup, there was only a little on cucumbers, with only a trace of loss, according to Charles Chupp. Less than usual was reported from Maryland, with 1 percent loss, and Wisconsin.

Scab (Cladosporium cucumerinum) was of the usual importance or less, although reported as locally severe in some cases. In New York, Charles Chupp reported almost no scab until late September; however, fruit loss was considerable in several fields in Suffolk County on Long Island, according to H. S. Cunningham. In one locality in Atlantic County, New Jersey, "Heavy infection occurred suddenly during a wet, foggy period following a drought, and about five acres were abandoned." In Pennsylvania, O. D. Burke reported, "Scab was found in only three counties, with considerable loss in Crawford County but only slight losses elsewhere. The loss in quality is estimated at 2 percent." The usual amount occurred in Massachusetts and less than usual in Wisconsin.

Anthracnose (Colletotrichum lagenarium) was of the usual prevalence in Massachusetts, Connecticut, Pennsylvania, and Indiana; and less prevalent than usual in New York, Maryland, and Wisconsin. None was observed on cucumbers in New York, although the disease was severe on cantaloups. In Pennsylvania, anthracnose was seen in only a few fields. On the other hand, it was unusually severe in northern Ohio, according to J. D. Wilson. Presence of anthracnose was reported from Iowa.

Downy mildew (Pseudoperonospora cubensis): "Losses were negligible to early plantings of cucumbers in Massachusetts, but normally heavy in late cucumbers," according to O. C. Boyd. The usual amounts were reported from Connecticut and Maryland. In New York and Wisconsin it was not observed.

Powdery mildew (Erysiphe cichoracearum) was reported from New Hampshire, New York and Texas. Fruit rot (Phytophthora capsici) was reported from Colorado by W. A. Kreutzer. Damping-off due to Pythium sp. and Rhizoctonia solani was severe in some plantings in New Jersey. Pythium sp. was the cause of 10 percent loss in Iowa. Fruit rot (Pythium sp.) was reported from Colorado. Timber rot (Sclerotinia sclerotiorum) was observed in a few greenhouses in New York.

Bacterial wilt (Bacillus tracheiphilus): In New York, more than usual was reported on Long Island, but injury was severe in only one locality. The average was slightly less than usual for the State as a whole and the loss was estimated at 0.5 to 2 percent. The disease was prevalent in many sections of New Jersey and was observed to be severe in one small planting. Less than usual was reported from Maryland and Wisconsin. S. Younkin estimated 15 percent loss in Iowa. The disease was also reported from Colorado.

Angular leaf spot (Bacterium lachrymans) was reported from New York; from Pennsylvania, where it caused severe defoliation in Lancaster County but little injury elsewhere; from Ohio, where it caused severe losses in some instances; from Wisconsin, as much less prevalent than usual; and from Colorado. A loss of 5 percent was estimated in Pennsylvania.

Root knot (Heterodera marioni) was reported from New Jersey, in greenhouses, and from Texas.

Curly top (virus) was reported from Washington (See also PDR 22: 82). Mosaic was widely reported in the usual amounts or less. In West Virginia, C. R. Orton reported much more than usual. In a planting in Preston County in which the yield normally is 300 bushels per acre, it was not more than 50 bushels and the total loss was at least 1000 bushels.

CUCURBITA sp. GOURD:

Anthracnose (Colletotrichum lagenarium): "Not since records have been kept in New York has there been as much anthracnose on gourds and muskmelons as this season," according to Charles Chupp.

CUCURBITA spp. SQUASH:

Blossom rot (Choanephora cucurbitarum) "has not been recorded previously for Arizona. It was found in a small garden in October," according to J. G. Brown. Anthracnose (Colletotrichum lagenarium) was reported from one location in Madison County, New York. Powdery mildew (Erysiphe cichoracearum) was said to be common in many plantings in New Jersey and was reported from Texas.

Bacterial wilt (Bacillus tracheiphilus) was reported from New Hampshire, New York, and New Jersey. Bacterial blight (Bacterium cucurbitae) was prominent on squash in Massachusetts. A light infection was observed in one field in Monroe County, New York.

Nematode (presumably Heterodera marioni) was reported from New York.

Virus diseases: Curly top was reported from Washington and mosaic from Texas.

CUCURBITA MAXIMA. WINTER SQUASH:

A "vine-rot" disease, with which Fusarium spp. are commonly found associated, caused heavy losses in certain fields in Massachusetts, according to O. C. Boyd (PDR 21: 362). Stem canker (Mycosphaerella citrullina) was of about the usual prevalence on winter squash in Massachusetts (PDR 21: 362). Leaf spot (Phyllosticta cucurbitacearum) was collected in Indiana. Leaf spot (Septoria cucurbitacearum) was reported from Massachusetts.

Virus diseases: Curly top was reported from Oregon (PDR 22: 83). Mosaic was more prevalent than usual in Massachusetts (PDR 21: 362).

CUCURBITA PEPO. PUMPKIN; MARROW SQUASHES:

Fruit rot (Mycosphaerella citrullina) was observed on pumpkin on a very few farms on Staten Island, New York. It had been noticed previously, in 1935. Its occurrence seemed to be correlated with rainfall, according to M. B. Linn. Leaf spot (Septoria cichoracearum) was reported on pumpkin from Massachusetts (PDR 21: 362). Bacterial blight (Bacterium cucurbitae) was reported on pumpkin from Massachusetts (PDR 21: 362).

Curly top (virus) was reported on Boston Marrow squash in Washington (PDR 22: 83).

CUCURBITA PEPO CONDENSA. SUMMER SQUASH:

Scab (Cladosporium cucumerinum) was common in Massachusetts. Powdery mildew (Erysiphe cichoracearum) was reported from Connecticut in the usual amount. Stem canker (Mycosphaerella citrullina) was unusually prevalent on summer squash in Massachusetts (PDR 21: 362). Blossom-end rot (Sclerotinia sclerotiorum) was reported from New York. Leaf spot (Septoria cucurbitacearum) occurred in Massachusetts.

Virus diseases: Curly top was reported from the Pacific Northwest (PDR 22: 83), and mosaic from Massachusetts (PDR 21: 285, 362).

DAUCUS CAROTA. CARROT:

Leaf blight (Cercospora apii carotae) was more prevalent than it had been observed to be for a number of years in Massachusetts and in up-State New York, and in northern Ohio it caused severe losses in some fields. In one field in New York the disease was controlled by dusting with copper lime dust. A loss of 1 to 2 percent was reported for New York and 1 percent for Texas.

Leaf blight (*Macrosporium carotae*) was also said to be more damaging than usual in both Massachusetts (PDR 21: 367), and New York, and in both it was more important than the cercospora blight. Charles Chupp reported, "more in up-State New York than I have observed for a number of years," and according to M. C. Richards, it was "general and severe on Long Island." The loss was estimated at 2 to 5 percent. The disease was locally very severe in Texas (PDR 21: 171), where it caused losses up to 75 percent, averaging 25 percent, in Hidalgo County, although the loss for the State was about 0.5 percent, according to G. H. Godfrey. K. J. Kadow reported it as severe in some early plantings in Illinois but with small average losses. A loss of 0.5 percent was estimated in Pennsylvania. The disease was reported from Connecticut and Ohio. A leaf spot said to be due to *Alternaria* sp. was reported by L. H. Person as general but of slight importance in Louisiana.

Black rot (*Alternaria radicina*) occurred to a slight extent in storage in New York. Root rot (*Phymatotrichum omnivorum*) was reported from Texas. Root rot (*Sclerotinia sclerotiorum*) is always present in storage in New York, according to Charles Chupp. A trace was observed on carrots in the field. The loss was 2 or 3 percent. Southern blight (*Sclerotium rolfsii*) was reported from Texas as of general occurrence, with a loss of 1 percent.

Bacterial soft rot (*Bacillus carotovorus*) was reported from Connecticut and from New York as State-wide, with loss up to 0.5 percent. Soft rot and second growth, caused by *Bacillus carotovorus* and weather conditions, was more prevalent in Minnesota than usual, according to J. G. Leach, who reported that hot and dry weather in midseason was followed by good weather later and the consequent second growth of new shoots was injured by dipterous insects and soft rot. The loss was said to be 2 percent.

Root knot (*Heterodera marioni*) was reported from Texas. Nematodes of species not designated caused rather severe injury to carrots on muck soil in Wayne County, New York, according to L. E. Curtis. R. W. Samson reported an undetermined nematode found on carrots in muck soil at Columbia City, Indiana.

Yellows (aster yellows virus): In New York, yellows was most prevalent on Long Island, but was also observed on carrots on the muck soil up-State, according to Charles Chupp. It was slightly less severe than in previous seasons.

DILL. See ANETHUM GRAVEOLENS.
EGGPLANT. See SOLANUM MELONGENA.
ENDIVE. See CICHORIUM ENDIVIA.
ESCAROLE. See CICHORIUM ENDIVIA.
GARLIC. See ALLIUM SATIVUM.
GOURD. See CUCURBITA sp.

HIBISCUS ESCULENTUS. OKRA:

Black root rot (Thielaviopsis basicola) was reported from New Jersey. This is apparently a new or at least an unusual host for the organism, the report being the first in the Survey files. According to the Department of Plant Pathology, in the case observed, many plants were severely stunted. Verticillium wilt (V. albo-atrum) was also reported from New Jersey.

HORSERADISH. See RADICULA ARMORACIA.

IPOMOEA BATATAS. SWEETPOTATO:

Soil rot or pox (Actinomyces sp.) is becoming increasingly important in Louisiana and Kansas. In both States it was said to be more prevalent in 1937 as compared with both the preceding year and the average. In Louisiana, according to L. H. Person, "It caused a total loss on approximately 150 acres. Sulfur applied at the rate of 700 to 1000 pounds per acre has given promising results but has only been tried for one season and at one location." O. H. Elmer reported that in Kansas "In some fields a large number of roots are culls because of this disease. Contaminated areas are enlarging rapidly in fields where sweetpotatoes have been grown in the last few years." In New Jersey the disease was reported as general but causing serious losses only in localized areas. Losses reported were 1.5 percent in Maryland, 1 percent in Louisiana and Kansas, 0.1 percent in Texas, and a trace in North Carolina.

Black rot (Ceratostomella fimbriata), according to reports, was less prevalent than usual in the field. A loss of 15 percent was reported from Tennessee, 3 percent from Louisiana, 2 percent from Maryland, Virginia, and Kansas, 1 percent from Oklahoma, 0.1 percent from Texas, and traces in New Jersey, Pennsylvania, North Carolina, Kentucky, and Iowa. In North Carolina, according to R. F. Poole, the loss in storage was heavy. J. G. Brown reported that in Arizona, where the crop is of minor importance, black rot caused greatest loss in storage houses not properly disinfected.

Stem rot and wilt (Fusarium bulbigenum batatas and F. oxysporum f. 2): Increase in prevalence was reported from several States, including Maryland, Tennessee, North Carolina, Louisiana, and Kansas. In Tennessee, according to W. C. Pelton, "The loss varies a great deal from year to year but the fungus is estimated to be present in 60 percent of the soils used for this crop in the principal sweetpotato producing counties. In 1937 it caused a loss of about a third of the crop in these counties." In North Carolina R. F. Poole reported the most wilt seen in ten years and much more than last year when a similar report was made. Percentage losses estimated were 30 in Tennessee, 25 in Iowa, 15 in North Carolina, 7 in Virginia, 6 in Kansas, 4 in Oklahoma, and traces in Pennsylvania, Kentucky and Louisiana. The disease was also reported from Connecticut and from Long Island, New York.

Scurf (Monilochaetes infuscans): In North Carolina, according to R. F. Poole, "During the past five years this disease has been so greatly reduced by the practice of control measures that it is difficult to find in commercial plantings." The highest reported was 5 percent in Kentucky, while 2 percent was estimated in Virginia and North Carolina, and a trace in Maryland and Tennessee. The disease was not observed in Kansas.

Mottle necrosis (Pythium spp.): In New Jersey, according to the Department of Plant Pathology, "During 1937 there seemed to be more trouble from mottle necrosis than in any previous year. This disease is somewhat erratic in its appearance, indicating that special soil or local weather conditions may play an important role in determining infection and development of the disease. In New Jersey, for instance, we have records to show that mottle necrosis was prevalent in 1924 and 1925, again in 1931 and 1932, and again this year, 1937. In the intervening years, there was either no infection or so little that no reports were received. Twenty-five to 30 percent infection was reported from one field in Ocean County during 1937. Slight cases have been found in Atlantic, Cumberland, and Gloucester Counties. The disease was, therefore, widely spread in New Jersey and apparently only requires certain weather conditions to develop as a troublesome disease in any of our important sweetpotato growing sections." Besides New Jersey, mottle necrosis was reported from North Carolina, with one percent loss, and South Carolina and Iowa with traces.

Stem canker (Corticium vagum) occurred in plant beds in New Jersey and Kansas. Foot rot (Plenodomus destruens) was reported from Pennsylvania, with a loss of 1 percent, and Maryland and Virginia with traces of loss. Sclerotial blight (Sclerotium rolfsii) was reported from North Carolina.

Storage rots (various fungi): Of the organisms mentioned specifically, Rhizopus spp, including R. nigricans, causing soft rot, and Fusarium oxysporum, causing surface rot, were reported to be most important as usual. Soft rot was responsible for losses estimated at 10 percent in Iowa and North Carolina, 5 percent in Virginia, 2.5 percent in Louisiana, 2 percent in Kansas, and 1 percent in Oklahoma, and was reported from New Jersey. Surface rot caused 10 percent loss in North Carolina, 3 percent in Virginia and Oklahoma, and 2 percent in Louisiana. Dry rot (Diaporthe batatatis) was reported as very severe in a storage house in New Jersey. Traces of Java black rot (Diplodia tubericola) and of charcoal rot (Sclerotium bataticola) were reported from Maryland and North Carolina.

Mosaic (undetermined): A trace was reported from Iowa. In Kansas the disease was observed frequently on Nancy Hall but not on other varieties, according to O. H. Elmer.

KALE. See BRASSICA OLERACEA ACEPHALA.

LACTUCA SATIVA. LETTUCE:

Gray mold rot (Botrytis cinerea) was reported by O. C. Boyd as more damaging to the main spring crop in Massachusetts than usually. In New York, according to Charles Chupp, there was generally less than usual owing to greater care in keeping humidity in the plant beds low, although M. C. Richards reported it as very severe on Long Island in the spring.

Downy mildew (Bremia lactucae), according to Charles Chupp, is "becoming more general in New York, since the Iceberg variety is grown more commonly. Some of Jagger's resistant strains are being used. M. C. Richards reported the disease as general and severe in Nassau County. It caused a loss for the State of 0.5 to 1 percent." In New Jersey the Department of Plant Pathology reported the disease as very prevalent in greenhouses on the early spring and winter crop, but causing small losses because largely limited to the older leaves.

Drop (Sclerotinia spp.) was reported as somewhat more important than usual in Massachusetts in the early crop, and in New York (S. sclerotiorum) where it was especially severe on Staten Island and Long Island. S. sclerotiorum was also reported from Pennsylvania with 2 percent loss, and from Texas. S. minor was reported from New Jersey.

Bacterial leaf spot (Bacterium marginale): Charles Chupp reported from New York that a disease resembling this was observed on Long Island; however, no isolations were made.

Virus diseases: Big vein was reported from Long Island in Nassau County. Mosaic was reported from New York on Long Island, and from New Jersey. Yellows (aster yellows virus), according to the Department of Plant Pathology, was "prevalent throughout New Jersey late in the fall, but was more severe in the north. Infection was prevented by the use of a five-foot high cheesecloth screen around a small plot; and was greatly reduced by early roguing out of infected plants and by dusting with insecticide to control the leafhopper."

Bottom rot (Corticium vagum) was reported from Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, North Carolina, Ohio, and Washington. Anthracnose (Marssonina panattoniana) was serious in one field in Erie County, New York, and traces occurred in other scattered localities. It was reported from California for the first time (PDR 21: 141) by C. E. Scott and M. W. Gardner; and from Washington. Wilt (Pythium sp.), which had not been observed in New York since about 1931, was found in three fields in Nassau County on Long Island, according to Charles Chupp, who stated, "This is apparently the same disease as the one reported to be caused by Aplanobacter rhizoctonia, for bacteria follow the Pythium." Leaf spot (Septoria consimilis) was found in New York, in one field in Columbia County and in one planting of Cos lettuce on Staten Island.

Tip burn (non-parasitic) caused more damage than usual to the spring crop in Massachusetts; was severe in August in New York; and was less important than usual in Wisconsin.

LEEK. See ALLIUM PORRUM.
LETTUCE. See LACTUCA SATIVA.

LYCOPERSICUM ESCULENTUM. TOMATO:

Early blight (Alternaria solani): In certain regions a marked increase in amount of early blight over the past several years was reported, warm wet weather being mentioned as the chief factor in many instances. In seven States, including Connecticut, New York, Pennsylvania, Maryland, Indiana, Illinois, and Michigan, the disease was said to be more to much more prevalent than during 1936 or the average year. In Massachusetts it was reported as slightly more prevalent than usual, and in Ohio it caused severe losses in some instances. In no State was it said to be less prevalent than usual. Heavy August rains and the "warmest August since 1890" caused the serious development in New York, according to J. G. Horsfall. "Rainfall was heaviest from Rochester to Wayne County, where the disease was most serious." O. D. Burke reported that in Pennsylvania "Heavy rains at setting and during the growth period favored the disease, which caused very serious losses throughout the State." Abundant rainfall was also mentioned in Indiana, Illinois, and Tennessee. Heavy infection of southern-grown plants was reported as an additional factor in Illinois and Michigan. Some heavy losses were reported, up to 25 percent in New York and Pennsylvania, and 15 percent in Connecticut and Michigan. Other loss estimates are 8 percent on tomatoes grown for canning in Maryland, 6 percent in Indiana and in Maryland on tomatoes for market, 5 percent in Wisconsin and Tennessee, 4 percent in Illinois, 3 percent in Ohio, 2 percent in Louisiana and Texas, 1 percent in Virginia and North Carolina, and traces in Minnesota and North Dakota.

Nailhead spot (Alternaria tomato) was reported specifically only from Louisiana, with 2 percent loss, and from Maryland, Kentucky and Michigan with traces.

Stem "sore shank" (Alternaria sp.): A disease reported under this name was said by D. G. A. Kelbert to be a very important trouble in Manatee County, Florida. In 1937 there was much more than usual. "Warm, humid weather prevailed during the seedbed stage, and sufficient moisture was maintained to make conditions ideal for disease development. The disease apparently starts in seedbeds and, unnoticed, is transplanted to the field, causing a stem spot which later girdles the plant or dries up and breaks the plant off at the point of infection, usually close to the ground."

Alternaria sp. was associated with fruit rot in Texas. A. fasciculata found on a tomato fruit in Texas apparently followed blossom-end rot. A. tenuis also was reported from Texas.

Leaf mold (Cladosporium fulvum) is usually considered a greenhouse disease in northern regions. In 1937 it caused severe injury in many fields of trellised tomatoes in eastern and southeastern Massachusetts, according to O. C. Boyd, but losses were not heavy in well-sprayed fields. In Pennsylvania there was more than usual, mostly in greenhouses, with 1 percent loss. Other States from which it was reported are Connecticut, New York, Texas, Wisconsin and Iowa.

Anthracnose, or ripe rot, (Colletotrichum phomoides) appeared earlier and was more severe in New York than in any season for a number of years, according to Charles Chupp, who reported, "In the midst of the picking season some canners rejected the crop of whole fields because of ripe rot. Inasmuch as this disease usually is present only to a slight extent near the end of the season, the epidemic must be the result of the peculiar combination of weather conditions," the combination being, as reported by J. G. Horsfall, "heavy rains in August and early September and a very warm August. This is an uncommon disease but it was very severe this year and caused general excitement. It reduced yield, reduced grade, increased the mold count in the canners' pack." M. C. Richards reported the disease as general in Nassau County on Long Island, where it caused much loss, especially on plum tomatoes. An estimate of 15 percent loss for the State was reported. Anthracnose was also said to be more prevalent than usual in New Jersey, especially in late plantings, and in Michigan. In Maryland and Indiana, the usual prevalence was reported, with losses of 0.5 and 1 percent respectively, and 0.2 percent was estimated in Ohio. In Kansas, according to O. H. Elmer, the season was very dry and the tomato crop very small, but this disease was observed near Wichita to be causing decay of a considerable number of fruits.

Fusarium wilt (Fusarium bulbigenum lycopersici) was reported as of the usual importance or less with percentage loss estimates of 10 in Virginia, 5 in Tennessee and Texas, 3 in North Carolina, 2 in Louisiana, Indiana, and Illinois, 1.5 in Maryland, 1 in Kansas, and traces in Pennsylvania, Florida, Ohio, Kentucky, Michigan, Minnesota and Montana. Reports were also received from Connecticut, New Jersey, Oklahoma, and Arizona. In New York, according to Charles Chupp, "Although some fields showed plants with internal browning and other symptoms of wilt, isolations by Dr. Otto Reinking proved in each case that it was not fusarium wilt." K. Starr Chester reported that in Oklahoma, "Fusarium wilt is at times very destructive in greenhouse culture, especially when, as is frequently the case, it is associated with root knot."

A root rot said to be caused by Fusarium sp. was reported from Colorado.

Helminthosporium sp. was observed occasionally on sunburned fruit in Texas.

Sour rot (Oospora lactis parasitica) was reported from Hidalgo County, Texas.

Black spot (Phoma destructiva) was more prevalent than usual in New York, especially in September and October. It appeared in several fields of fall tomatoes in Louisiana. It was also reported from Virginia and Tennessee, with losses of 1 percent in each State, Pennsylvania and Texas with traces, New Jersey, and Arizona.

Texas root rot (Phymatotrichum omnivorum) caused losses ranging from a trace to 2 percent in a few Texas counties.

Late blight (Phytophthora infestans) was again generally unimportant. It was not observed in Massachusetts. In New York it began to be rather widespread during August but was checked by high night temperatures, except in the northernmost part of the State. In Pennsylvania more than usual was reported but the loss was only a trace. Late blight was also reported from the region around the Puget Sound in Washington.

Buckeye rot (Phytophthora parasitica): R. F. Poole reported this as severe on late tomatoes in North Carolina, especially on fruit touching the soil, and estimated 1 percent loss. Traces were reported from Maryland and Texas.

Soil rot (Rhizoctonia solani) was reported from Pennsylvania, with 4 percent loss, from North Carolina with 2 percent, and from Texas with a trace.

Timber rot (Sclerotinia sclerotiorum) was found in New York in a few greenhouses where air drainage was poor.

Southern blight (Sclerotium rolfsii) was observed at one place in Hancock County, Indiana, on three plants. Losses ranging from a trace to 30 percent were caused in Texas, the average being estimated at 2 percent. Two percent was reported from North Carolina also, and a trace from Virginia.

Leaf blight (Septoria lycopersici) has been of comparative unimportance during recent years but in 1937, according to reports, a marked increase took place over much of the area in which early blight showed a similar increase, and apparently owing to the same factors, i.e., warm, wet weather. However, in the region where early blight was reported as most pronounced, i.e., Connecticut, New York, and Pennsylvania, septoria blight was relatively much less serious. On the other hand, in Tennessee, Michigan and Iowa, the latter disease caused a greater loss. The percentage losses reported were 20 in Michigan, 10 in Tennessee, 5 in Connecticut, New York, Kentucky, Ohio and Iowa, 3 in North Carolina, 2 in Pennsylvania and Illinois, 1 in Virginia and Indiana, and traces in Maryland, Texas, and Wisconsin. Occurrence was also reported from New Hampshire, Massachusetts, New Jersey, and Louisiana. In Kansas, according to O. H. Elmer, the season was very dry and scarcely any leaf spot developed.

Gray spot (Stemphylium solani) was reported by D. G. A. Kelbert to be less prevalent than usual in Manatee County, Florida. He stated that "the greatest damage occurred in seedbeds where the disease caused defoliation and stem cankers. Badly affected plants are unfit for transplanting."

Verticillium wilt (Verticillium albo-atrum) was reported for the first time from Florida, where it was severe in Manatee County. The fungus had not previously been known to occur in the State, according to George F. Weber (PDR 21: 282). The disease was also reported from Massachusetts, Pennsylvania, Ohio, Oregon, and Washington.

Bacterial canker (Aplanobacter michiganense) was widespread as usual, but losses caused were negligible.

Bacterial soft rot (Bacillus carotovorus) was reported from Texas.

Bacterial wilt (Bacterium solanacearum) occurred in New Jersey and Indiana on Georgia-grown plants. There was more than usual in North Carolina, according to R. F. Poole, who estimated 6 percent loss. Two percent was reported from Virginia and 1 percent from Wisconsin; elsewhere loss was very slight.

Bacterial spot (Bacterium vesicatorium): In eastern Virginia, owing to wet weather, bacterial spot was very severe and caused an unusually heavy loss, estimated by Harold T. Cook at 10 percent from reduction in yield and 2 percent from loss in quality. More than usual was reported from Illinois also, with 2 percent loss estimated. A loss of 1 percent was reported from Wisconsin; in other States reporting losses were less. According to Charles Chupp, the disease was common on peppers on Long Island, New York, but rarely was present on tomato.

Root knot (Heterodera marioni) is always present in a few greenhouses in New York, but to a less extent now than formerly, according to Charles Chupp. Other northern States reporting occurrence in greenhouses with slight or no loss were Pennsylvania, Michigan, and Wisconsin. In southern States, the heaviest loss reported was 12 percent from Texas (PDR 22: 9). In North Carolina and Tennessee, 5 percent was estimated; in Virginia and Kentucky a trace. Rootknot was also reported from Oklahoma, where it aggravated the effects of fusarium wilt. The disease was observed occasionally on tree tomato in Texas.

Curly top or yellows (virus) was reported from Texas, Colorado, Arizona, Utah, Idaho, Washington, and Oregon. Loss estimates were 10 percent in Idaho, a trace to 5 percent in Oregon, and 2 percent in Texas. (See also PDR 21: 243; 22: 7, 82-84). Symptoms resembling those of potato leaf roll were associated with curly top in Texas in some cases.

Fruit mottle (virus suspected) was reported from Texas (PDR 22: 8).

Mosaics (viruses, mostly not distinguished) were generally reported as occurring with the usual prevalence or less. Losses estimated were 5 percent in Connecticut, Illinois, and Louisiana; 2 percent in Minnesota, Iowa, and North Carolina; 1 percent in Pennsylvania, Michigan, North Dakota, Virginia, and Texas; and traces in other States reporting estimates. In New York Charles Chupp reported that "Although mosaic still causes heavy loss in an occasional field or greenhouse, it is becoming a minor trouble of tomatoes because of weed eradication." Specific viruses involved were reported in some cases. According to O. H. Elmer, in Kansas "The cucumber virus 1 (fern leaf), and tobacco virus 1 were both noted commonly, cucumber virus 1 more frequently than it had been. Also, a fern leaf virus of tomato was noted that caused a decided yellow mosaic when transferred to cucumbers." Cucumber virus 1 was also reported in New York, Illinois, and Texas. From the last-named State a number of mosaic diseases were reported, including a crinkle mosaic resembling the potato disease of the same name, dwarf mosaic, fern leaf caused by cucumber virus 1, leaf curling mosaic, and a yellow mosaic possibly caused by the virus of tobacco yellow mosaic (PDR 22: 7-8).

Spotted wilt (virus) was not observed on tomato in New York in 1937. A loss of 3 percent was reported from Texas (PDR 22: 7), 0.5 percent in Illinois, and traces in Michigan, mostly in greenhouses, and Wisconsin, and occurrence was reported from Washington also.

Streak (virus) was reported from New Jersey, Pennsylvania, West Virginia, Michigan, and Wisconsin, with slight losses generally. In West Virginia it was observed to be causing 10 percent loss in one greenhouse. This is the first report received by the Survey from West Virginia.

Blossom-end rot (non-parasitic): Considerably less than the usual amounts occurred in most States reporting in the region from Michigan and Tennessee eastward to Maryland and Connecticut. This is the area where the leaf spot diseases were unusually prevalent and the moist weather that favored this development would have the opposite effect on blossom-end rot, as indicated in the report from New York by J. G. Horsfall--"Rains in June gave the plants a good start for the season. The July drought induced blossom-end rot on the light soils, but it disappeared with the fall rains." Charles Chupp reported blossom-end rot as present in the State in a few western counties where rainfall was less abundant. In Maryland and Tennessee, also, abundant moisture was reported as responsible for the decrease in amount. An additional factor was reported by O. D. Burke from Pennsylvania--"The amount of blossom-end rot was less than usual, owing to the severe epiphytotic of Alternaria rots, which destroyed many fruits prior to the time blossom-end rot usually appears." On the other hand, in New Jersey some fields were plowed under because of the severity of blossom-end rot, according to the Department of Plant Pathology. In Wisconsin there was said to be more than usual, while the usual prevalence was reported from Minnesota, Iowa and North Dakota. In Minnesota, J. G. Leach reported that hot, dry weather in midseason following a moister spring favored blossom-end rot. Losses estimated were 8 percent in Iowa, 4 in Minnesota, 3 in North Carolina and Louisiana, 1 in Connecticut, Pennsylvania, Texas, Wisconsin and North Dakota, and smaller amounts in other States.

Blotchy ripening (non-parasitic), according to Charles Chupp, is a problem of increasing importance in New York.

Several diseases of non-parasitic or undetermined cause were reported from Texas (PDR 22: 6-8).

MANGEL-WURZEL. See BETA VULGARIS MACRORHIZA.
MUSKMELON. See CUCUMIS MELO.
OKRA. See HIBISCUS ESCULENTUS.
ONION. See ALLIUM CEPA.
PARSLEY. See PETROSELINUM HORTENSE.
PARSNIP. See PASTINACA SATIVA.

PASTINACA SATIVA. PARSNIP:

The only reports of disease on parsnip were of the leaf spots caused by Cercosporella pastinacae in Massachusetts, New York, and Illinois, and by Ramularia pastinacae in New York.

PEAS. See PISUM SATIVUM.
PEPPER. See CAPSICUM ANNUUM.

PETROSELINUM HORTENSE. PARSLEY:

Leaf blight (Alternaria sp.) was severe on one farm in Hidalgo County, Texas. All plants were affected and the quality was materially reduced. Root rot (Phymatotrichum omnivorum) was reported from Texas. Yellows (aster yellows virus) was observed in one field on Long Island, New York. Yellows (non-parasitic): "Considerable damage was done on several farms on Long Island by a disease thought to be physiological in nature. Symptoms were reddening of the leaves with later yellowing and death."--M. C. Richards.

PHASEOLUS LUNATUS MACROCARPUS. LIMA BEAN:

Leaf blotch (Cercospora cruenta) was reported by Harold T. Cook as general in eastern Virginia. Pod blight (Diaporthe phaseolorum) was reported from New York as rather generally present on Long Island but relatively unimportant, injury being confined to the leaves. It was said to be severe in some plantings in New Jersey, and less prevalent than usual in Maryland. Root rot due to Fusarium spp. and other organisms caused a loss estimated at 2 percent in Maryland. Seed and root rot due to Fusarium sp. was reported by G. R. Townsend from the Everglades section of Florida. Downy mildew (Phytophthora phaseoli) caused 1 percent loss in Maryland and was reported from New York and New Jersey. Rust (Uromyces phaseoli typica) was reported from Maryland only.

Bacterial diseases: Abundant rainfall favored the development of bacterial blight in eastern Virginia, according to Harold T. Cook, who estimated a loss of 10 percent, of which half was from reduction in yield. The cause was reported as Bacterium sp. In Suffolk County on Long Island, New York, Bacterium phaseoli was found in a few fields with poor air drainage, according to Charles Chupp. The bacterial spot caused by Bacterium vignae was unusually prevalent on Long Island. Charles Chupp reported, "It has never been observed to be so destructive as it was this season on Long Island." This disease was also reported from Maryland.

Virus diseases: Curly top was reported from Oregon (PDR 22: 83), and mosaic from Long Island.

PHASEOLUS VULGARIS. BEAN:

Wilt (Fusarium spp.) was less prevalent than usual in Wyoming, where G. H. Starr estimated a loss of 1 to 2 percent. Root rot (Fusarium, species not designated) was of the usual moderate importance in Pennsylvania, where reduction in yield was estimated at 4 percent. Although the disease was generally present, moisture and temperature conditions did not favor its excessive development, according to O. D. Burke, who reported, "Moisture was abundant so that the yield of slightly diseased plants was not affected and temperatures were not unusually high for long periods during the growing season." The usual amounts or less occurred in Maryland, with 2 percent loss, and in Michigan and Iowa, with traces. Dry root rot (Fusarium martii phaseoli) was reported from New York, Wisconsin, Montana, Colorado, and Idaho, on dry beans, and from New Jersey, Virginia, Kentucky, and Idaho on green beans. The disease was said to be endemic in the dry shell bean-growing section of New York. In Weld County, Colorado, cool weather and slow growth favored infection of early planted beans by Fusarium and Rhizoctonia and much of the acreage was replanted (PDR 22: 43). The loss from the two diseases was about 10 percent. Other losses reported were 5 percent in Kentucky, 2 in Virginia, 1 in Wisconsin and Montana, and a trace in Idaho.

Leaf spot (Alternaria fasciculata) was reported from Colorado. Angular leaf spot is caused by Cercospora columnaris, according to Charles Chupp, who wrote, "The fungus has in the past been known as Isariopsis griseola, but it is the same as Cercospora columnaris. In New York this disease apparently occurs only in Cattaraugus County, where it has been found each season for many years on the Indian reservation." The disease (organism reported as I. griseola) was more prevalent than usual on snap beans in the Everglades section of Florida, according to G. R. Townsend. Anthracnose (Colletotrichum lindemuthianum) was less prevalent than usual in most States reporting it. Factors contributing to the decreased amount were the use of western seed in Maryland, and the occurrence of hot, dry weather in Minnesota at the time pods were being formed. In Iowa more than usual was reported. In Illinois the losses were heavy in some isolated plantings but were generally not great. Losses reported were small, the greatest being 3 percent in Iowa. Stem canker, wire stem (Corticium vagum) was widely reported with losses ranging from a trace to 5 percent. In Weld County, Colorado, this disease, together with dry root rot, was responsible for much replanting of early planted field beans (PDR 22: 43). Powdery mildew (Erysiphe polygoni) was more prevalent than usual on the fall crop in eastern Virginia, where Harold T. Cook estimated a loss of 4 percent from reduction in yield and an additional 3 percent loss in quality. It was said to be more prevalent than usual in Pennsylvania also but the loss there was only a trace. In other States--Maryland, Florida, North Carolina, and Texas--the usual amounts with losses not exceeding 1 percent were reported. Damping-off, root rot (Pythium sp.) was reported from New

Jersey and Louisiana. Sclerotinia rot (Sclerotinia sclerotiorum) was reported from Randolph County, West Virginia, on leaves. The disease occurred in the Puget Sound region of Washington and C. E. Owens reported a considerable amount of cottony rot caused by this fungus found in one or two fields near Eugene, Oregon. Southern blight (Sclerotium rolfsii) was reported from the usual range with slight losses. Rust (Uromyces phaseoli typica) returned to its normal unimportance in some of the areas where it was epidemic last year, including Massachusetts, New York, Pennsylvania, and New Jersey; in Virginia, while less destructive than during 1936, it was still much more abundant than usual; and in Florida there was a further increase. Percentage loss estimates were 8 in Florida, 7 in Virginia, 5 in North Carolina, 2 in Colorado; and traces in New York, New Jersey, Pennsylvania, Ohio, Maryland, Kentucky, Tennessee, Texas, Washington, and California (PDR 21: 96, 367, 427; 22: 2-4, 11, 43-44).

Bacterial diseases: Traces of bacterial wilt (Bacterium flaccumfaciens) were reported from Michigan, where there was less than usual on Kidney beans; and 1.5 percent loss from Wyoming. Precipitation that was normal or above with heavy rains, and cool weather during the early part of the growing season favored infection by and spread of the halo blight organism, B. medicaginis phaseolicola, in some western areas, in Montana, Wyoming, and Colorado. Both the common and halo blights were more prevalent and caused more damage than had occurred since 1928 in Weld County, Colorado. The outbreak there has been described in the Reporter (PDR 22: 39-43). Similar favorable conditions, including early snow, hail, driving rains, and a cool spring were reported by G. H. Starr from Wyoming. He reported that beans grown under irrigation, mostly for green beans, were severely affected by halo blight, "The Powell area (Big Horn County) suffered heaviest loss, with 40 to 50 percent, the Worland area (Washakie County) less with 20 to 25 percent, and the dry land section (Laramie County) least with only a trace. A few fields were not worth harvesting in Big Horn County." (PDR 21: 328-329). In Massachusetts halo blight was favored by frequent rains during May and June and became more injurious than usual and was more important than the common blight, according to O. C. Boyd (PDR 21: 366). Luther Shaw reported halo blight as important locally in North Carolina, occurring only where infected seed was planted. Halo blight was not present in the spring crop of snap beans in the Everglades section of Florida, according to G. R. Townsend, but there was more than usual in fall plantings from 1937 seed. Here also infection and spread was favored by wind-driven rain. L. H. Person reported that bacterial blights were very important, as usual, in Louisiana. Several fields observed were practically a total loss, only one picking being made. The halo blight was considerably the more damaging. J. H. Muncie reported the usual moderate amounts of halo blight on Kidney beans in Michigan. The disease was also reported from Washington. Percentage losses reported as due to halo blight were: on dry beans, Wyoming 10, Montana 5, Wisconsin 1, Michigan and Idaho, trace; on green beans, Wyoming 20, Louisiana 10, North Carolina 5, Virginia 2, elsewhere traces. Loss estimates in some other States include both halo blight and the common blight (B. phaseoli). The latter was, as already mentioned, much more severe than usual in the important seed-bean producing area of Weld County, Colorado, according to Zaumeyer, Wade, and Mullin (PDR 22: 39-43). In Wyoming, "The common blight is found principally in the southeastern portion of the State (dry land) where seed beans primarily are grown," according to G. H. Starr. It caused much less damage than the halo blight in that State and was of moderate importance as usual. This blight was reported as occurring in the usual amounts or less in most other States, although it was locally severe in some. In Arizona, according to J. G. Brown, "It is present at the higher altitudes and is found occasionally in the lower valleys where it is of only minor importance." Percentage losses reported as due to common blight were: on dry beans, 2 in Michigan and Montana, 1 in Wisconsin, 0.5 in Wyoming, trace in Idaho; on green beans, 5 in Kentucky; 2 in Illinois, Maryland, Louisiana; 1 in Virginia; 0.5 or less in Wyoming, Pennsylvania, Ohio, North Dakota, and Idaho. The disease was also reported from New Jersey and Washington. Estimates of loss from both blights are: on dry beans, 20 percent in Colorado and 2 percent in Minnesota; on green beans, 15 percent in Colorado, 6 in Iowa, 2 in Minnesota and Oklahoma.

Virus diseases: Curly top caused losses in Idaho estimated at 10 percent on green beans and 5 percent on field beans; in Texas at 0.5 percent. Occurrence in the Pacific Northwest is reported by B. F. Dana (PDR 22: 83, etc.). Mosaic was widely reported as occurring in the usual amounts, with losses ranging from a trace to 5 percent. In New York the reduced amount of disease in green Refugee beans was striking, according to Horsfall, Burkholder, and Reinking (PDR 21: 318-319). A few cases of yellow mosaic were observed in the State.

A disease known as "one-sided mosaic", which affects only one side of the leaf or plant, was reported from New York, and what is apparently the same thing from Texas. The cause is unknown but may be genetic (PDR 21: 318-319).

PISUM SATIVUM. PEA:

Root rots caused by various organisms: "Root rot is a very serious limiting factor in New York, and may eventually drive peas out of the State as mosaic drove cucumbers off Long Island," according to J. G. Horsfall, who reported root rot as more destructive than usual in 1937, owing to copious rains in May and June which favored infection and a July drought which aggravated the effects of the disease. He reported the loss as 25 percent. Root rot was of negligible importance in the scattered commercial plantings in Massachusetts but caused heavy losses in home gardens. A loss of 3.5 percent was reported from Montana, and 1 percent from Michigan. Aphanomyces euteiches caused losses reported as 10 percent in Pennsylvania, 5 percent in Maryland, 3 percent in North Carolina, 1 percent in Wisconsin, and traces in Ohio and Idaho. Severe occurrence in one field was reported from New Jersey. This fungus is often found on wilt-resistant selections in Wisconsin, especially on low, poorly drained soil, according to R. E. Vaughan. It has not been identified definitely in cultures or collections from New York. Fusarium sp. and F. martii pisi (F. solani martii f. 2) were reported from Pennsylvania, New Jersey, Ohio, Michigan, Wisconsin, Colorado, southern Arizona, and Washington. Losses, when reported, were small, the highest being 1 percent. Rhizoctonia solani was designated as the cause of 50 percent loss in Connecticut, where root rot was much more prevalent than usual, was said to be very important, as usual, in Florida, and was reported, in addition, from North Carolina, Ohio, Michigan, Colorado, Arizona, and Washington. According to J. G. Brown, this organism and Fusarium sp. causing root rot are very important in Arizona, where "Peas are a winter crop and the weather is always favorable for the disease on irrigated land in the southern part of the State. The acreage of peas is small but valuable, since the winter price for green peas is usually good. One field of 160 acres was almost a total loss. The disease appeared in November, 1937." Black root rot due to Thielaviopsis basicola was said to be the cause of considerable losses in New Jersey, especially in irrigated land.

Ascochyta blights (A. pinodella, A. pisi, and Mycosphaerella pinodes), although favored by a rainy spring, were of negligible importance in peas grown for canning in New York, because of the use of seed from western irrigated regions. Losses in Maryland were estimated as 2 percent in market peas and 0.3 percent in canning peas; in Montana as 1 percent. In addition to New York, A. pisi was reported specifically from Pennsylvania, New Jersey, North Carolina, Tennessee, Ohio, and Michigan; and M. pinodes from North Carolina. Ascochyta sp. causing leaf spot was reported from Island County, Washington.

Wilt (Fusarium orthoceras pisi) was reported as causing losses of 1 percent in Pennsylvania and Wisconsin, and traces in Maryland, Michigan, and Idaho. The general use of resistant varieties has reduced the importance of this disease in Maryland, according to C. E. Temple. Fusarium sp. causing wilt was reported from New Hampshire, New York, and doubtfully from Washington. J. G. Horsfall reported "This disease, strangely enough, has not yet become serious in New York, one of the big pea States." Near-wilt caused by Fusarium vasinfectum pisi (F. oxysporum f. 8) was reported from Maryland, Wisconsin, Montana, and Idaho.

Other fungous diseases reported include botrytis blight (Botrytis sp.) from Washington; scab (Cladosporium pisicola) from North Carolina and Washington; powdery mildew (Erysiphe polygoni), which caused 1 percent loss in Texas, and negligible losses in other States, including Pennsylvania, western Maryland, where it occurred on the late market crop, North Carolina, Florida in the Everglades section, Wisconsin, Montana, Wyoming, where it was general on peas grown under irrigation, Idaho, and Washington, on the coast; ashy stem blight (Macrophomina phaseoli) from Texas; downy mildew (Peronospora pisi) from North Carolina, Wisconsin, and Washington; damping-off (Pythium and Rhizoctonia) from Illinois; and leaf blotch (Septoria pisi) from New York, where it was favored by the wet June and caused a loss estimated at 1 percent, Ohio, and Wisconsin.

Bacterial blight (Bacterium pisi) caused mostly negligible losses in States reporting. J. G. Horsfall reported, "According to Dr. Burkholder's isolations, this organism is rare in New York. It is only seldom observed in the field."

Root knot (Heterodera marioni) was reported only from Texas, where it was said to be general but causing only a trace of loss.

Virus diseases: Mosaic was very severe on Long Island and in New Jersey. According to Charles Chupp, "It is not known how many viruses were present but because of late planting and unusually early appearance of aphids more than half of the crop on Long Island was destroyed by the combination of viruses." H. S. Cunningham reported, "Late maturing and late planted peas on Long Island were virtually a total loss. Many fields were plowed under as not worth harvesting." The Department of Plant Pathology in New Jersey reported the "most severe case on record. Mosaic was the cause of total crop failures in many fields. The severe infection was apparently associated with the abundance of winged aphids which migrated from clover and alfalfa fields to peas. The most severe cases occurred in regions where pastures or meadows were in close proximity to pea fields." A loss of 5 percent was reported from Illinois, 1 percent from Wisconsin, and traces from Pennsylvania, Maryland, North Carolina, Montana, Wyoming, and Idaho. Mosaic was said to be general on the coast in Washington. Streak was reported only from Wisconsin, where it caused a loss estimated at 1 percent.

Non-parasitic diseases: Fertilizer burning was reported from Washington. "Physiological leaf spot" occurs only in certain fields in New York and seems to be a symptom only recently separated from the root rot complex, according to J. G. Horsfall. A "physiological spotting" was reported from Washington also.

PUMPKIN. See CUCURBITA PEPO.

RADICULA ARMORACIA. HORSERADISH:

White rust (Albugo candida) was reported from New York as very general but not causing losses on Long Island; from New Jersey as severe in many plantings and causing complete defoliation in some; from Pennsylvania, where it was much more prevalent than usual and caused a loss of 3 percent; and from Illinois, where although much less serious than usual, with losses of less than 5 percent, it was still the most troublesome disease of horseradish. Leaf spot caused by Alternaria sp. was reported from New Jersey; by Cercospora armoraciae from Illinois; by Ramularia armoraciae from New York as always rather common but doing no serious damage. Verticillium wilt (V. dahliae) was reported from Snohomish County, Washington. Bacterial soft rot was severe on one farm on Long Island, according to M. C. Richards. Bacterium campestre armoraciae was reported from Illinois. A disease of undetermined cause designated as rough bark was said to be the cause of heavy losses in some plantings in New Jersey, where it has been prevalent for many years but was unusually severe in 1937. It is characterized by the presence of dry corky cankers.

RADISH. See RAPHANUS SATIVUS.
RAPE. See BRASSICA NAPUS.

RAPHANUS SATIVUS. RADISH:

White rust (Albugo candida) was reported by Charles Chupp as "still the most important disease of radish in greenhouses in New York. It is controlled where rotation or soil sterilization is practiced, together with spraying or dusting soon after the radishes are up." It was reported from Wisconsin as much less prevalent than usual. Scab (Aphanomyces scaber) was reported from Wisconsin; stem rot (Corticium vagum) from New Jersey. Downy mildew (Peronospora parasitica) caused severe injury to leaves of red radish with resulting loss of the crop on several farms on Long Island, according to M. C. Richards. It was also reported from New Jersey. Other parasitic diseases reported include black root (Pythium aphanidermatum) from Wisconsin, and black rot (Bacterium campestre) from New Jersey. Soluble salt injury was reported from New York by Charles Chupp as follows: "Salt deposits stretch from Syracuse to the edge of Irondequoit. Near the latter place, both surface soil and surface water have enough salt to affect radish growth seriously in some houses."

RHEUM RHAPONTICUM. RHUBARB:

Leaf spot (Ascochyta rhei) was reported from New Jersey; anthracnose (Colletotrichum erumpens) from Pennsylvania. The leaf spot caused by Phyllosticta straminella occurs generally in New York and may be rather serious when not controlled. In 1937 it was rather severe in spring and late summer on Staten Island and general but not important on Long Island, according to M. B. Linn and M. C. Richards, but the loss was only a trace. Crown rot (Phytophthora cactorum) was found in several plantings in Pennsylvania but was severe in only one, in Lancaster County, according to O. D. Burke, who estimated 1 percent loss in the State. O. H. Elmer reported that drought has caused much loss in Kansas, where "Plantings have been dying out each year for the past few years, owing to insufficient soil moisture and to heat. Only a few plantings are left in the State."

RHUBARB. See RHEUM RHAPONTICUM.

RUMEX ACETOSELLA. SORREL, "SOURGRASS":

M. B. Linn reported that on Staten Island, New York, "Four beds were almost completely destroyed on two different occasions by a tip and margin burn. Whether this was due to soluble salt injury or to injury caused by some unknown industrial gas is not known. It was not sulfur-dioxide injury. In addition, there was some spotting on the leaves."

SALSIFY. See TRAGOPOGON PORRIFOLIUS.

SOLANUM MELONGENA. EGGPLANT:

Early blight (Alternaria solani) was reported from Massachusetts and New York as more prevalent than usual, and from Connecticut in the usual amounts. Anthracnose (Colletotrichum atramentarium) was more important than usual in Pennsylvania, where it caused a loss estimated at 3 percent. Sooty mold (Fumago vagans) was abundant and locally injurious in southern Texas. Phomopsis blight (Phomopsis vexans) was reported from Connecticut; New York, on Staten Island and Long Island; New Jersey, where the fruit spot was said to be very prevalent after a wet period at the end of August; Pennsylvania, where 2 percent loss was estimated; and Puerto Rico. Cortical root rot probably due to Sclerotium rolfsii was reported from southern Texas. Wilt (Verticillium albo-atrum) was said to be still the limiting factor in New York, and was reported from New Jersey as generally prevalent as usual, from Pennsylvania as causing a loss of 1 percent, and from Massachusetts and Connecticut. Seedling wilt due to the meadow nematode, Pratylenchus pratensis, caused total loss in one area in Dimmit County, Texas.

SOLANUM TUBEROSUM. POTATO:

Scab (Actinomyces scabies): More than usual was reported from Massachusetts, Michigan, and Wisconsin, and from Dade County, Florida.

In Massachusetts, according to O. C. Boyd, two factors were operative, the hot dry weather of July and August, and, in certain parts of the Connecticut Valley, soil reaction modified by silt deposits from the flood of March 1936. In Dade County, Florida, George D. Ruehle reported scab as much more prevalent than in any past year and the cause of serious losses on a few farms, with the average for the section estimated at 5 to 6 percent. In the Hastings section of northern Florida, however, loss was slight as usual, according to A. H. Eddins. J. H. Muncie reported the rather high estimate for this disease of 12 percent in Michigan, explaining the estimate as follows: "The loss estimate is based on reports from State inspectors. Fifty percent of the potatoes classed as unmarketable are scabby and 30 percent of all potatoes are unmarketable." Other loss estimates of 1 percent or more were: 5 percent in Iowa, 4 in Pennsylvania and Maryland, 3 in Florida, 2 in Indiana and Minnesota, 1.5 in Wyoming, and 1 in Oklahoma.

Early blight (Alternaria solani) was reported as somewhat more prevalent than usual in Vermont and Michigan. In other reports where a comparison was made, the usual amount or less was indicated. In Michigan, J. H. Muncie mentioned maturity hastened by drought and a long period of infection after the fall rains began as increasing loss. Tuber rot was reported from Vermont, where, according to H. L. Bailey, "There appeared to be somewhat more than usual of early blight in fields under inspection and in one large lot of Irish Cobblers a considerable amount of alternaria rot has been found." Losses estimated at 1 percent or more are 5 percent in Michigan, 3 in Tennessee, 1.5 in Vermont, and 1 in Maine, Maryland and North Carolina.

Fusarium wilt and rot: Wilt caused by Fusarium avenaceum (Fr.) Sacc., according to John G. McLean (Phytopath. 28: 16), was first observed in Wisconsin in the summer of 1936 and has since been collected throughout the State. A loss of 25 percent was reported for 1937. Fusarium wilts caused by F. oxysporum f. 1 and F. solani eumartii were generally reported as usual, in the normal amounts or less, with losses ranging up to 10 percent in South Dakota and 5 percent in Wyoming, and down to a trace in several other States, the most common estimate being 1 percent. In Minnesota the low loss reported, 1 percent, was not due to an actual decrease in amount but to the fact that purple top wilt, which had previously been confused with fusarium wilt, is now known to be a distinct disease. Seed-piece decay (Fusarium spp.) was less troublesome than usual in Florida, in both the Everglades and Hastings sections. Dry rot due to Fusarium spp. was reported from Texas, Wyoming, and Washington.

Late blight (Phytophthora infestans) was favored by rainy weather and was much more prevalent than usual on the Atlantic Coast from Florida north to Long Island. Seed used in the Hastings section of

Florida was severely infected, and some fields were replanted because 60 to 90 percent of the seed or sprouts were killed. In the Everglades section the disease was comparatively less important, although more common than usual. Late blight rarely occurs in eastern North Carolina, but in 1937 it caused severe injury in many fields in Pamlico County and was generally prevalent along the coast. Development of tuber rot was prevented in this State by early but normal harvesting. The disease was general on the fall crop in the Norfolk section of Virginia and caused much loss from tuber rot in storage, and the late crop was affected in Maryland also, with an average loss in storage of 50 percent. Losses were reported as heavier than usual in Pennsylvania, reduction in yield in some counties amounting to almost half of the crop. Late blight appeared earlier than usual in Massachusetts but its development was checked by hot weather in July and losses were about normal. In Vermont both moisture and temperature were relatively unfavorable and the disease was of moderate importance. In the lower Rio Grande Valley of Texas, where late blight does not often occur, considerable alarm was caused by an outbreak that resulted in losses of 75 percent in some fields. The disease was said to be general on the coast in Washington. It was not observed in the Middle Western States. Losses reported were: Maine, 2 percent; New Hampshire, 5; Vermont, 1 percent each from reduction in yield and from tuber rot; Pennsylvania, 12 percent from reduction in yield, 4 percent from tuber rot; Maryland, 1 percent reduction in yield, 7 percent tuber rot; Virginia, 2 percent reduction in yield, 10 percent tuber rot; West Virginia, 10 percent; North Carolina, 1 percent; Florida, in the Hastings section 7 percent reduction in yield and 8 percent tuber rot, in the Everglades section 2 percent reduction in yield; Texas, 5 percent; Tennessee, a trace; Ohio, 0.2 percent.

Leaf spot (Cercospora concors), according to Charles Chupp, has been reported in New York only a few times during the past 25 years, but in 1937 it was found in at least two fields and was probably present in many more. Stem canker (Corticium vagum) was widespread as usual. Losses estimated were mostly from 1 to 3 percent, the highest being 5 percent in Kansas. Sclerotinia rot (Sclerotinia sclerotiorum) was reported as even less prevalent than usual in the Hastings section of Florida. Southern wilt (Sclerotium rolfsii) was reported from Florida, Louisiana, and Oklahoma. In Oklahoma 8,000 bushels dug one week prematurely showed a very rapid and destructive rot for a week or ten days, automatically checked as the tubers matured in storage. Early maturity combined with late harvesting resulted in common occurrence of silver scurf (Spondylocladium atrovirens) in Pennsylvania. The disease was observed in some places in central New Jersey. Verticillium wilt (Verticillium albo-atrum) was reported from Maine, New York, New Jersey, and Maryland.

Seed piece decay caused by various factors (see also under Fusarium) was reported over a wide area. H. L. Bailey reported from Vermont, "There were many cases where stands were very poor. In one observed not over 25 percent of the seed in a five-acre field had come up and the seed pieces were rotted. In other cases sections of fields planted at different times from the rest had much seed decay." Wet weather favored seed piece decay in all parts of Massachusetts, but especially in the flooded areas along the Connecticut River, according to O. C. Boyd. Losses reported were: Vermont, 5 percent; Maine, 3; North Carolina, Ohio, Kansas, Montana, and Wyoming, 2; Virginia, 0.5; Maryland, Florida, Minnesota, and Idaho, traces. Seed piece rot of undetermined cause was reported from Washington.

Bacterial wilt and soft rot (now known to be bacterial ring rot caused by Bacterium sepedonicum): Occurrence of this disease in the United States was reported for the first time in 1937. The disease had previously been reported from Canada, and its presence in Maine had been observed for some time prior to the report by Bonde (Phytopath. 27: 106-108. Jan. 1937). In the Hastings section of Florida it was favored by rains during the last ten days of the growing period and caused a loss of 5 percent, according to A. H. Eddins. It was also reported from Pennsylvania by O. D. Burke, who stated that it appeared in Lehigh County and was probably introduced on seed from Maine.

Other bacterial diseases: Water rot (Bacillus carotovorus) was said to be of slight importance in the Everglades section of Florida, but was much more prevalent than usual in the Hastings region. Blackleg (Bacillus phytophthorus), except in West Virginia and in the Hastings section of Florida, where it was said to be much more prevalent, and in Massachusetts and Connecticut, where it was more prevalent than usual, was reported as occurring in the normal amounts or less. Losses estimated were moderate, although the disease was locally severe in some cases. Bacterial wilt, brown rot (Bacterium solanacearum) was much reduced in importance in the Hastings section of Florida. It was also reported from Maryland, North Carolina, and Texas.

Dodder (Cuscuta arvensis) was observed in Whitman County, Washington.

Nematodes: H. S. Cunningham reported root knot (Heterodera marioni) as occurring in scattered fields and local areas on Long Island, and causing loss, due to deformation of the tubers, which was serious in small sections but negligible in relation to the total crop area. A trace of damage from root knot was observed in a few fields in the Everglades section of Florida, according to George D. Ruehle. Injury, possibly due to nematodes, was observed in some fields in Monmouth, Salem, and Cumberland Counties, New Jersey, and was so serious in a few fields that the crop was plowed under. Several species of nematodes were obtained from the injured sprouts but were not definitely established to be the cause of the injury.

Virus diseases: Leaf roll and mosaics were reported, for the most part without particular comment, as of about the usual prevalence. Losses have been reported in the Crop Loss Estimates. According to R. E. Vaughan, J. C. Walker and R. H. Larson reported that they had never seen leaf roll in Wisconsin. Crinkle mosaic was said to be of less than its usual slight importance in Wisconsin, owing to masking by high temperatures and to the reduced prevalence of the insect vectors. It occurred on Triumph and in small amounts on Green Mountain in the northern counties. Acronecrosis, acropetal necrosis, and calico were reported as occurring locally in Washington. Curly dwarf was reported from Texas. Traces of giant hill were reported from Michigan and Pennsylvania. The usual amount of haywire occurred in Louisiana, and the disease was observed in Texas for the first time, a trace being noted in Hidalgo County. Moron was of slight importance in Michigan, as usual. Net necrosis, reported as due to virus, was found in six to eight tubers per bushel during bin inspections in New Hampshire. Spindle tuber was found throughout the entire area covered during a potato disease survey in Oklahoma, but was less noticeable than mosaic. A mild form of witches' broom was occasionally observed in Texas. Yellow dwarf was said to be much more prevalent than usual in Wisconsin, where it is an important disease. Traces were reported from Maryland and Wisconsin.

Hopperburn (caused by leafhoppers) and tipburn (non-parasitic) were more prevalent than usual in Vermont, Michigan, Iowa, and North Dakota. In other States, incidence was said to be about as usual. Conditions favoring development in Vermont were reported by H. L. Bailey as follows: "Plantings were generally late owing to excessively wet ground. The plants grew very rapidly, however, during July and early August, with plenty of moisture but warm growing conditions. They began ripening prematurely in late August, with tipburn and hopperburn major causes favored by extreme heat." Drought was favorable for hopper injury in northern Michigan, according to J. H. Muncie. W. E. Brentzel reported that leafhoppers were more abundant than usual in North Dakota. Losses reported were: West Virginia, 15 percent; Vermont and Michigan, 10; Iowa, 7; Tennessee and Wisconsin, 5; North Carolina, Indiana and Minnesota, 3; Pennsylvania, Maryland, and Ohio, 1; Louisiana, 0.5.

Blue stem (cause undetermined): In 1934 C. R. Orton reported "bronzed wilt" to the Survey from northern West Virginia. "This is a disease which has appeared for two years and is rapidly increasing. The plants wilt and become bronzed, and internal necrosis is prominent. A Fusarium is associated but is probably secondary." Later the disease was reported under the term "undescribed disease" (Orton and Hill, Phytopath. 27: 137; Journ. Agr. Res. 55: 153-157). It is now being called "blue stem". The disease is widely distributed throughout the Appalachian Plateau in West Virginia and has become a limiting factor there since it was first observed in 1931. In a trip made in August 1937 through Pennsylvania, New Jersey, New York, Connecticut, Massachusetts, and Vermont, blue stem was observed only in certain regions of Pennsylvania and New York. It is also known to occur in Maryland (ibid., Amer. Potato Journ. 15: 72-77).

Purple top wilt (cause undetermined): This disease has been reported to the Survey from Minnesota and North Dakota. It was believed by J. G. Leach and Henry Darling in their first report from Minnesota (PDR 19: 299-302, 1935) to be an unusual manifestation of fusarium wilt. In 1937, the first year in which purple top wilt was segregated from fusarium wilt in reports to the Survey, the loss in Minnesota was estimated by Leach at 10 percent; in North Dakota by W. E. Brentzel at 5 percent. Both Leach and Brentzel remark that since the disease was recognized as a distinct trouble it had been of slight importance, but that in 1937 there was considerably more. In both States it was said to be general in its distribution. Details of its development in North Dakota in 1937 are reported by Brentzel in PDR 22: 44-45.

Wilt of undetermined cause in Louisiana: In 1937 L. H. Person reported more of this disease than previously. His brief description is, "Plants wilt near the end of the growing season. Some plants show discoloration of the vascular tissue; others do not."

"Z" disease, attributed to Fusarium sp., was reported by O. D. Burke as occurring in scattered places in Pennsylvania, the only locality mentioned being Centre County.

Miscellaneous troubles reported as of non-parasitic or undetermined cause: Non-parasitic internal greening, net necrosis said to be due to low temperature, a tuber rot of unknown cause, and tuber rot due to mechanical injury were reported from Washington. Magnesium deficiency was said to be more pronounced than usual in Massachusetts, probably because of leaching of soils by heavy rainfall. Second growth and knobby tubers were reported from New Jersey. Spindling sprout, cause unknown, was of the usual slight importance in Michigan. Sprain, cause undetermined, was reported as a major factor on sandy soils in Wisconsin, where losses of 50 percent were common. Sunscald was general in New Jersey and was noted on the early-dug crop in Wisconsin.

SORREL. See RUMEX ACETOSELLA.
SPINACH. See SPINACIA OLERACEA.

SPINACIA OLERACEA. SPINACH:

White rust (Albugo occidentalis) was reported for the first time on spinach, from Texas, where it caused considerable damage (PDR 21: 114-115).

Wilt (Fusarium sp.) is becoming an important factor on Long Island. In 1937 50 percent of the crop was destroyed during late August and September in one area, according to M. C. Richards. Harold T. Cook reported the disease as widely distributed and important in the Norfolk area in Virginia. He estimated a loss of 3 percent. Five percent loss was reported from Maryland. Downy mildew (Peronospora effusa) was more prevalent than usual in Pennsylvania and Maryland, with losses of 3 and 1 percent respectively. It was general on overwintered spinach on Long Island but was less severe than usual in the fall. In Arkansas and Texas it was locally severe, and occurrence was reported from Connecticut. Damping-off due to Pythium and Rhizoctonia was reported from Virginia and Illinois. Curly top (virus) caused 10 percent loss in Texas. Mosaic or blight (virus) was unusually important in New York and Maryland. In New York, according to Charles Chupp, it had never occurred so far north before. He reported, "Blight caused injury as far north as Malone, Franklin County, and was unusually severe in Oswego County. The resistant varieties have proved to be fairly satisfactory and there was very little blight on Long Island because of the widespread use of resistant varieties."

SQUASH. See CUCURBITA SPP.
SWEETPOTATO. See IPOMOEA BATATAS.
TOMATO. See LYCOPERSICUM ESCULENTUM.

TRAGOPOGON PORRIFOLIUS. SALSIFY:

White rust (Albugo tragopogonis) was reported from New York and Wisconsin, and powdery mildew (Erysiphe cichoracearum) and leaf blight (Sporidesmium scorzonerae) from New York.

TURNIP. See BRASSICA RAPA.
WATERMELON. See CITRULLUS VULGARIS.

DISEASES OF SUGAR CROPS

BETA VULGARIS. SUGAR BEET:

Root rots due to various organisms were said to be of average importance. Rhizoctonia solani causing root or crown rot was generally reported, as usual, but losses estimated were small. In Wyoming 25 percent loss was observed in one field that had been planted continuously in sugar beets for the past six or eight years. Rhizoctonia, Fusarium, and other organisms were associated in causing 2 to 5 percent loss in sugar beets grown under irrigation in Wyoming. Various fungi, including Rhizoctonia and Pythium, caused 1.5 percent loss in Michigan. Fusarium conglutinans was reported by W. A. Kreutzer to be the cause of a root rot of sugar beet in Colorado. Aphanomyces was reported as the cause of 2 percent loss in Iowa. A loss of 8 percent from root rots was estimated in Montana.

Southern blight (Sclerotium rolfsii) was found on sugar beet in Arizona for the first time in 1937, in an isolated field grown for seed in Santa Cruz County. The loss in the field was about 50 percent. This was the second time the fungus had been noted in Arizona, the first record being in 1936 on Delphinium (PDR 21: 248).

Leaf spot (Cercospora beticola) was general in occurrence and mostly of the usual importance or loss. In Michigan it was favored by heavy rainfall and moderate temperatures and was more prevalent than usual. The loss there was estimated at 15 percent. Other estimates are: Ohio, 10 percent; Minnesota, 2; Pennsylvania, 1; elsewhere, traces. Leaf spot and root rot (Phoma betae) was reported from the usual range with small losses. Damping-off due to Pythium spp. caused loss in Iowa estimated at 10 percent, and damping-off due to various fungi was reported from Minnesota.

Only traces of loss were reported as caused by the sugar-beet nematode (Heterodera schachtii) in the western areas where it occurs.

Losses from curly top (virus) were generally, as reported by J. M. Raeder for Idaho, "down to a minimum owing to the use of resistant beets," and no estimate was greater than a trace.

SACCHARUM OFFICINARUM. SUGAR CANE:

These notes on sugar cane diseases in 1937 have been contributed by members of the Division of Sugar Plant Investigations.

Spread of mosaic (virus) in 1937, as compared with the unprecedented high spread of 1936, was more nearly normal. As a consequence, roguing of seed plots of mosaic-susceptible varieties was greatly facilitated and the results were so gratifying that this work is being greatly expanded in 1938. Added impetus has been given to a general demand for mosaic-free seed cane because of the very general increase of this disease in Co. 290 in 1936 and 1937, and the realization of the urgent necessity for maintaining the highest possible productivity in Co. 281. The latter was deeply impressed upon all Louisiana planters by the unseasonal freezing weather in November 1937 that resulted in heavy losses because of laxity in windrowing and/or the lack of sufficient acreage of Co. 281 to be windrowed. Co. 281 has been heavily infected in many fields since 1934.--E. M. Summers.

Red rot (Colletotrichum falcatum) as a cause of germination failure of plant cane in 1937 was limited largely to C.P. 28/19 planted early the previous fall on heavy soils. Such germination reduction and subsequent loss of stands was closely associated with injury by root rot (Pythium arrhenomanes). Abnormally warm weather during January caused unseasonal growth of the cane, which was frozen back to the ground late in the month. Abnormally cool and wet weather which followed in February and March favored the destruction of seed roots by root rot, resulting in further weakening of the seed cuttings, food reserves of which had been partially exhausted by the growth in January. The combined effect of this physiological exhaustion and the destruction of seed roots prolonged the semi-dormancy of the cuttings, during which period red rot caused further deterioration of them. This initial reduction of stands was further aggravated by a drouth in April and May, when many plants which had not become established on their own root systems were left stranded in dry soil near the surface without any effective root system penetrating into the moister soil at deeper levels. Some stands which were originally satisfactory were reduced during the spring by the loss of plants traceable directly to this root injury.

Brown spot (Cercospora longipes) was found on three additional plantations in the southeastern parishes of the State, where it had evidently been spread by the transportation of seed cane by the plantations from previously infected areas. The disease was most severe on the very susceptible, unreleased seedling, C.P. 29/291, the unauthorized increase of which on several plantations has resulted in the dissemination of the disease. Late in the season, on the same plantations, the disease was moderate to severe on the commercial varieties Co. 281, C.P. 28/19 and 29/320, and slight on C.P. 807. Since brown spot usually does not develop in severe form on these varieties until late September or October when they have nearly reached their maximum growth, it is not believed that it constitutes a serious hazard to them. Brown spot has been widespread on susceptible varieties in the sugar cane-growing areas of southern Florida for many years. Since 1934 it has occurred at the Houma station, and on several plantations on certain susceptible varieties, particularly the C.P. 29/291.

Sheath rot (Cytospora sacchari) caused slight injury to stubbles of C.P. 28/19, resulting from the killing or stunting of secondary shoots. The fungus was also found on decaying seed cane of this variety, but the observations indicated that in many instances at least it was a secondary invader following initial injury by other agencies.

Traces of or slight injury by the following diseases were noted on the commercial sugar cane varieties: Pokkah bong (Fusarium moniliforme), brown stripe (Helminthosporium stenospilum), black rot (Ceratostomella adiposum), red stripe (Bacterium rubrilineans), and mottled stripe (B. rubrisubalbicans). Stipple (physiological) occurred on C.P. 29/116 and white stripe (undetermined) was common on stubbles of C.P. 28/11 and occasionally observed on other commercial varieties in the spring.--E. V. Abbott.

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Supplement 105, "List of causes of fungous and bacterial plant diseases in Maine to 1936 inclusive," is indexed on pages 51-60.

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