THE PLANT DISEASE REPORTER

Issued By

THE PLANT DISEASE SURVEY

Division of Mycology and Disease Survey
BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING
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SUPPLEMENT 173

HOST INDEX OF THE PARASITIC FUNGI OF SZECHWAN, CHINA

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Plant Industry Station　　　　Beltsville, Maryland

HOST INDEX OF THE PARASITIC FUNGI OF SZECHWAN, CHINA

Lee Ling[1]

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The present index is an extension and revision of a preliminary one with same title published in 1942[2]. Additional collections and corrections on the identification of both fungi and hosts have been made since then.

The Province of Szechwan, roughly triangular in shape, lies approximately between 28-34.5 N. latitude and 100.5-106 E. longitude. The total area is estimated at 340,000 square kilometers. Topographically it comprises a great structural basin and a high plateau. The basin is drained by the Yangtze River and its tributaries. Rimming this hilly basin is a more or less continuous belt of mountains with an altitude up to 3,000 meters. In the northwestern part of the Province the mountains are replaced by the so-called Eastern Tibetan Plateau, with altitude generally ranging from 3,000-4,000 meters. Some high peaks are covered with snow throughout the whole year and are not rarely elevated above 5,000 meters.

The climate of Szechwan is roughly shown in table 1.

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[1] Formerly in charge, Taiwan (Formosa) Agricultural Research Institute; now with Agricultural Division of the United Nations Food and Agricultural Organization.

[2] Ling, Lee. Host index of the parasitic fungi of Szechwan. Nanking Journal 11:117-142. 1942.

Table 1. Climate of Szechwan

Geographic region	Climatic zone	Altitude, meters	Annual temperature, °C.	Annual rainfall, mm.
The Szechwan basin	Subtropic	Below 1,000	17-19	900-1,400
	Warm temperate	1,000-2,500	7-17	1,100-1,500
	Cool temperate	2,500-3,000	3-7	1,400-2,250
Eastern Tibetan Plateau	Semi-desert (warm)	1,000-2,800	11.7-14.1	152-423
	Semi-arid steppe (cold)	2,800-3,300	6-7	500-700
	Alpine tundra	3,300-4,000	1-5 (?)	500 (?)
	Glacial desert	4,000-5,600	-5 (?)	300 (?)

Regarding the distribution of vegetation and crops in the province, Wilson[3] gives a clear description according to the "vertical zonation" of climate; briefly, they are as follows:

(1) Below 600 meters: The "belt of cultivation," with bamboos, palms, cypress, pine, tung oil, oranges, vegetable tallow, insect white wax, as typical trees; rice, cotton, sugar-cane, maize, tobacco, sweetpotatoes and legumes as summer crops; and wheat, rape and cabbage, Irish potatoes, legumes, and hemp as winter crops.

(2) Between 600 to 1,500 m.: The "evergreen rain forest" belt, with evergreen oaks, Castanopsis, Lauraceae, holly, pines, Cunninghamia, and ferns. Cultivation is still common, the chief crops being similar to the previous zone, but maize displaces rice as the chief food crop and winter crops are less important. The upper limit of rice cultivation is around 1,200 m. Tea is grown.

(3) Between 1,500 to 3,000 m.: Chiefly deciduous flowering trees and shrubs, of genera familiar in North America and Europe; also rhododendrons, conifer, tall herbs and flowering plants. The chief crops are wheat, maize, and Irish potato, the upper limit of maize cultivation being 2,500 m. Walnut and varnish trees are common. Towards the upper limit of the zone, forests of conifers are found.

(4) Between 3,000 to 3,500 m.: A narrow transition belt, mostly moorland, with dwarf bamboo and scrubby shrubs (especially rhododendrons); some large coniferous forests (larch, spruce, and silver fir). Wheat, barley and Irish potatoes are the crops grown.

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[3] Wilson, E. H. A naturalist in Western China. Vols. I and II. London. 1913.

(5) Between 3,500 to 4,800 m.: The limit of tree growth, and also of wheat and barley, is around 3,600 m.; of woody scrub, around 4,600 m.; so that this zone is mostly occupied by herbs and grasses. Rhubarb and other medicines are grown.

(6) Between 4,800 to 5,200 m.: Glaciers and moraines and alpine deserts occur; the limit of vegetation is around 5,000 m., cushion plants and herbs being the highest plants.

The Province has been well known to the botanists by its richness of vegetation since the time E. H. Wilson made his extensive collections from that region. The fungus flora, however, has been only little explored before the outbreak of the Sino-Japanese War. Throughout the war period from 1937 to 1945, the writer has sojourned in that Province for eight years. During that period, numerous survey trips have been made by himself and his colleagues in the Provincial Agricultural Improvement Institute and the University of Nanking. Since those trips were primarily for the purpose of investigation of crop diseases, the area covered has not been extended to the mountainous regions in the border of the Province. Shortly after the ending of the war, the writer left that Province in a hurry. As there seems to be very little chance for him of going back there in the near future to resume the survey work, the index was prepared on the basis of the records in hand. To the writer himself, this index will serve as a memorial to his refugee life of eight years.

The writer wishes to express his obligation to the following gentlemen for their generous help in the identification of either fungi or host plants: Professor F. L. Tai, Dr. C. T. Wei, Dr. E. B. Mains, Dr. Mundkur, Dr. W. P. Fang, Dr. Y. L. Keng, and Mr. C. Y. Yang.

HOST INDEX

ABIES DELAVAYI Franch.
Lophodermium nervisequum (DC., ex Fr.) Rehm: Omei

ABUTILON AVICENNAE Gaertn.
Alternaria abutilonis Speg.: Chengtu
Discosporella phaeochlorina Wei & Cheo: Chengtu
Oidium sp.: Chengtu
Plasmopara skvortzovii Miura: Chengtu

ACER CAUDATUM Wallich var. PRATTII Rehder
Rhytisma punctatum Pers. ex Fr.: Omei
ACER CATALPIFOLIUM Rehder
Ascochyta sp.: Omei
Sawadaea aceris (DC.) Miy.: Kwanhsien
Uncinula polyfida Wei: Kwanhsien
ACER sp.
Sawadaea aceris (DC.) Miy.: Kwanhsien

ACHYRANTHES BIDENTATA Bl.
Albugo achyranthis (P. Henn.) Miy.: Chungking, Kwanhsien, Wenchuan
Cercospora achyranthis Syd.: Kwanhsien

AGAVE AMERICANA L.
Coniothyrium agaves (Mont.) Sacc.: Chengtu

AGROPYRON CILIARE (Trin.) Franch.
Epichloë typhina (Pers. ex Fr.) Tul.: Pihsien
Erysiphe graminis DC.: Chengtu
Phyllachora graminis (Pers. ex Fr.) Fckl.: Chengtu
Puccinia glumarum (Schw.) Erikss. & E. Henn.: Kwanhsien, Chengtu
AGROPYRON SEMICOSTATUM Nees
Claviceps purpurea (Fr.) Tul.: Omei
Erysiphe graminis DC.: Chengtu
Phyllachora graminis (Pers. ex Fr.) Fckl.: Chengtu
Puccinia glumarum (Schw.) Erikss. & E. Henn.: Chengtu
P. rubigo-vera (DC.) Wint.: Kwanhsien
Septoria sp.: Chengtu

ALANGIUM PLATANIFOLIUM Harms.
Cercospora sp.: Chengtu
Phyllactinia corylea Pers. ex Karst.: Kwanhsien, Chengtu
Septoria sp.: Chengtu

ALBIZZIA JULIBRISSIN Durazz
Ravenelia japonica Diet. & Syd.: Chengtu

ALEURITES FORDII Hemsl.
Botryosphaeria sp.: Chengtu
Cercospora aleuritidis Miyake: Wenkiang, Santai, Wanhsien, Kiangtsing
Uncinula miyabei (Salm.) Sacc. var. aleuritis Wei: Kwanhsien

ALLIUM FISTULOSUM L.
Alternaria porri (Ell.) Cif.: Chengtu
Botrytis sp.: Chengtu
Mycosphaerella schoenoprasi (Aud.) Schroet.: Chengtu
Peronospora destructor Berk.: Chengtu
ALLIUM ODORUM L.
Botrytis sp.: Chengtu
Colletotrichum circinans (Berk.) Vogl.: Santai
ALLIUM SCORODOPRASUM L.
Heterosporium allii Ell. & G. Martin: Kwanghan

ALNUS CREMASTOGENE Burk.
Melampsoridium alni (Thuem.) Diet.: Kwanhsien
Phyllactinia fraxini (DC.) Homma: Chengtu
Titaeospora sp.: Chengtu
Septoria sp.: Chengtu

ALOPECURUS JAPONICUS Steud.
Colletotrichum graminicolum (Ces.) G. W. Wils.: Chengtu
Uromyces alepecuri Seym.: Kwanhsien, Sintu, Chengtu

ALTERNANTHERA SESSILIS R. Br.
Albugo bliti (Biv.) O. Kuntze: Chengtu

ALTHAEA ROSEA Cav.
Cercospora althaeina Sacc.: Chengtu
Colletotrichum sp.: Chengtu
Discosporella phaeochlorina Wei & Cheo: Chengtu
Phyllosticta althaeina Sacc.: Chengtu

AMARANTHUS MANGOSTANUS L.
Albugo bliti (Biv.) O. Kuntze: Chengtu
AMARANTHUS TRICOLOR L.
Albugo bliti (Biv.) O. Kuntze: Chengtu
Discosporella phaeochlorina Wei & Cheo: Chengtu

AMARANTHUS PANICULATUS L.
Discosporella phaeochlorina Wei & Cheo: Chengtu

ANDROPOGON ANNULATUS Forsk.
Puccinia cesatii Schroet.: Chengtu

ANEMONE JAPONICA S. & J.
    Aecidium ranunculacearum DC.: Omei, Kwanhsien
    Erysiphe polygoni DC.: Wenchuan, Lifan
    Urocystis japonica (P. Henn.) Ling: Kwanhsien
ANEMONE NITIFOLIA Buch-Ham. var. ELEGANS Ham.
    Aecidium ranunculacearum DC.: Omei

ANTIRRHINUM MAJUS L.
    Phyllosticta antirrhini Syd.: Chengtu
    Septoria antirrhini Rob. & Desm.: Chengtu

APIUM GRAVEOLENS L.
    Cerospora apii Fres.: Chengtu
    Septoria apii (Brioei & Cav.) Chester: Santai, Chengtu

ARACHIS HYPOGAEA L.
    Cercospora personata (Berk. & Curt.) Ell.: Mienyang, Suining, Chengtu, Santai, Neikiang, Tzechung, Kienyang, Shehung

ARALIA CHINENSIS L.
    Aecidium sp.: Chengtu

ARTEMISIA ANNUA L.
    Peronospora artemisiae-annuae Ling & M. C. Tai: Chengtu
ARTEMISIA ARGYI Levl. & Van.
    Erysiphe cichoracearum DC.: Chengtu
ARTEMISIA JAPONICA Thbg.
    Puccinia ferruginosa Syd.: Chengtu
ARTEMISIA spp.
    Cercospora ferruginea Fckl.: Chengtu
    Peronospora sulfurea Gäum.: Chengtu
    Puccinia ferruginosa Syd.: Kwanhsien, Chengtu

ARTHRAXON HISPIDUS (Thbg.) Makino
    Bremia graminicola Naoum.: Tayi
    Puccinia arthraxonis (P. Henn.) Syd. & Butl.: Chengtu

ARUNDINELLA ANOMALA Steud.
    Phyllachora arundinellae Saw.: Chengtu
    Puccinia arundinellae-anomalae Diet.: Chengtu
    Sorosporium arundinellae Syd.: Chengtu
    Tilletia arundinellae Ling: Chengtu

ASTER INDICUS L.
    Coleosporium asterum (Diet.) Syd.: Chengtu
    Sclerotinia sclerotiorum (Lib.) D By.: Chengtu
    Septoria astericola Ell. & Ev.: Chengtu
    Uredo asteromoeae P. Henn.: Chengtu

ASTILBE CHINENSIS Franch. & Sav.
Sphaerotheca humuli (DC.) Burr.: Wenchuan

ASTRAGALUS MELILOTOIDES Pall.
Erysiphe polygoni DC.: Lifan, Maohsien
ASTRAGALUS SINICUS L.
Erysiphe pisi DC.: Chengtu
Tuberculina nomuraina Sacc.: Kwanhsien

AVENA SATIVA L.
Helminthosporium avenae-sativae (Briosi & Cav.) Lindau: Wenkiang, Kwanhsien, Chengtu
Puccinia lolii Niels.: Hokiang, Chengtu, Maohsien, Wenchuan
Ustilago avenae (Pers.) Rostr.: Shihfang, Chengtu
U. kolleri Wille: Changki, Wenkiang, Chengtu

BAMBUSA MULTIPLEX (Lour.) Raeusch.
Myriangium haraeanum Tai & Wei: Chengtu

BAMBUSA sp.
Puccinia kwanhsienensis Tai: Kwanhsien

BERBERIS DIAPHANA Maxim.
Microsphaera alni (Wallr.) Salm.: Lifan
BERBERIS HENRYANA Schn.
Puccinia graminis Pers.: Chengkow
BERBERIS GAGNEPAINII Schn.
Puccinia graminis Pers.: Kwanhsien
BERBERIS LEVIS Franch.
Puccinia graminis Pers.: Kwanhsien, Omei
BERBERIS SARGENTIANA Schn.
Puccinia sp.: Kwanhsien
BERBERIS SILVA-TAROUCANA Schn.
Puccinia graminis Pers.: Omei
BERBERIS WILSONAE Hemsl.
Puccinia graminis Pers.: Lifan

BETA VULGARIS L.
Cercospora beticola Sacc.: Kwanhan, Kingtan, Tungliang, Chengtu, Tzechung, Nanchung, Kienyang, Tehyang, Pihsien, Hokiang, Suining, Shihfang, Wenkiang, Sintu, Neikiang
Discosporella phaeochlorina Wei & Cheo: Chengtu
Phoma betae Frank: Suining, Chengtu
Sclerotinia sclerotiorum (Lib.) D By.: Chengtu

BIDENS BIPINNATA L.
Cercospora megalopotamica Speg.: Chengtu
Sphaerotheca fuliginea (Schlecht.) Poll.: Chengtu

BIDENS PILOSA L.
Cercospora megalopotamica Speg.: Chengtu

BISCHOFIA TRIFOLIATA Hook.
Uncinula ehretiae Kiessler: Chengtu

BOTHRIOCHLOA PERTUSA (L.) A. Camus
Claviceps purpurea (Fr.) Tul.: Chengtu
Puccinia duthiae Ell. & Tracy: Chengtu
Ustilago bothriochloae Ling: Chengtu

BOTHRIOSPERMUM KUSNEZOWII Bge.
Peronospora bothriospermi Saw.: Chengtu

BRASSICA CAMPESTRIS L.
Albugo candida (Pers. ex Chev.) O. Kuntze: Kiangpei, Pihsien, Chengtu
Erysiphe polygoni DC.: Lifan
Peronospora brassicae Gäum.: Kwanhan, Pihsien, Chengtu, Pahsien, Mienyang, Tzetung, Wenkiang, Shihfang
Phoma lingam (Tode ex Fr.) Desm.: Panhsien, Chengtu
Rhizoctonia solani Kuehn: Sintu
Sclerotinia sclerotiorum (Lib.) D By.: Chengtu
BRASSICA CAMPESTRIS L. var. PURPURARIA Bailey
Albugo candida (Pers. ex Chev.) O. Kuntze: Widely distributed
Alternaria brassicae (Berk.) Sacc.: Shihfang
Colletotrichum higginsianum Sacc.: Chengtu
Mycosphaerella brassicicola (Duby) Lindau: Chengtu
Peronospora brassicae Gäum.: Wenkiang, Sintu, Pihsien, Chengtu
Sclerotinia sclerotiorum (Lib.) D By.: Pihsien
BRASSICA CERNUA Thunb.
Albugo candida (Pers. ex Chev.) O. Kuntze: Chengtu
Peronospora brassicae Gäum.: Kiangpei, Kiangtsing, Tungnan, Lochih, Hochuan, Hokiang, Kienyang, Suining
Sclerotinia sclerotiorum (Lib.) D By.: Tungnan, Lochih, Hochuan, Suining, Chengtu
BRASSICA CHINENSIS L.
Albugo candida (Pers. ex Chev.) O. Kuntze: Widely distributed
Alternaria brassicae (Berk.) Sacc.: Sintu, Chengtu, Wenkiang, Tzechung
Mycosphaerella brassicicola (Duby) Lindau: Shihfang
Peronospora brassicae Gäum.: Pihsien, Chengtu
Sclerotinia sclerotiorum (Lib.) D By.: Wenkiang
BRASSICA JUNCEA L.
Albugo candida (Pers. ex Chev.) O. Kuntze: Tzechung, Sintu, Chengtu
Alternaria brassicae (Berk.) Sacc.: Yochih, Chengtu
Cercosporella albo-maculans (Ell. & Ev.) Sacc.: Tzechung
Colletotrichum higginsianum Sacc.: Chengtu
Peronospora brassicae Gäum.: Kienyang, Tzechung
Sclerotinia sclerotiorum (Lib.) D By.: Chengtu

BRASSICA NAPIFORMIS Bailey
  Albugo candida (Pers. ex Chev.) O. Kuntze: Chengtu
  Alternaria brassicae (Berk.) Sacc.: Tzechung, Chengtu
  Erysiphe polygoni DC.: Chengtu
  Peronospora brassicae Gäum.: Wenkiang, Chengtu
BRASSICA OLERACEA L.
  Albugo candida (Pers. ex Chev.) O. Kuntze: Chengtu
  Alternaria brassicae (Berk.) Sacc.: Widely distributed
  Peronospora brassicae Gäum.: Chengtu
  Phoma lingam (Tode ex Fr.) Desm.: Chengtu
  Sclerotinia sclerotiorum (Lib.) D By.: Wenkiang, Sintu, Chengtu

BROUSSONETIA PAPYRIFERA Vent
  Cercospora sp.: Chengtu
  Phyllactinia corylea Pers. ex Karst.: Kwanhsien

CALAMAGROSTIS sp.
  Puccinia coronata Cda.: Chengtu

CALENDULA ARVENSIS L.
  Sclerotinia sclerotiorum (Lib.) D By.: Chengtu

CALLISTEPHUS CHINENSIS Nees
  Septoria callistephi Gloyer: Chengtu

CALYSTEGIA HEDERACEA Wall.
  Puccinia convolvuli (Pers.) Cast.: Chengtu
  Septoria convolvuli Desm.: Chengtu

CAMELLIA JAPONICA L.
  Leptothyrium camelliae P. Henn.: Pihsien
  Pestalotia guepini Desm.: Chengtu
  Phyllosticta theae Spesch.: Chengtu

CAMPANULA MEDIUM L.
  Sclerotinia sclerotiorum (Lib.) D By.: Chengtu

CAMPTOTHECA ACUMINATA Decaisne
  Cercospora camptothecae Tai: Chengtu
  Phyllactinia corylea Pers. ex Karst.: Kwanhsien

CANARIUM ALBUM Raeusch
  Glomerella cingulata (Stonem.) Spauld. & Schrenk: Chengtu
  Macrophoma kuwatsukai Hara: Chengtu

CANNA INDICA L.
  [Macrosporium] bulbotrichum Cke.: Chengtu

CAPILLIPEDIUM PARVIFLORUM Stapf
Claviceps purpurea (Fr.) Tul.: Shehung, Jungchang, Chengtu
Phyllachora andropogonis-micranthi Saw.: Chengtu
Puccinia erythraeensis Pazschke: Kwanhan, Chengtu
Sphacelotheca capillipedii Ling: Chengtu

CAPSELLA BURSA-PASTORIS (L.) Medik.
Albugo candida (Pers. ex Chev.) O. Kuntze: Chengtu
Peronospora parasitica Pers. ex Fr.: Chengtu
Sclerotinia sclerotiorum (Lib.) D By.: Chengtu

CAPSICUM ANNUUM L.
Choanephora manshurica (Saito & Nag.) Tai: Chengtu
Colletotrichum capsici (Syd.) Butl. & Bisby: Chengtu
Colletotrichum nigrum Ell. & Halst.: Neikiang
Discosporella phaeochlorina Wei & Cheo: Chengtu
Leveillula taurica (Lév.) Arn.: Kienyang, Chengtu
Phoma destructiva Plowr.: Chengtu

CARAGANA MICROPHYLLA Lamb.
Microsphaera pseudolonicerae (Salm.) Blumer: Lifan

CARDAMINE FLEXUOSA With. subsp. DEBILIS (D. Don.) O. E. Schule
Peronospora dentariae Rab.: Chengtu
Sclerotinia sclerotiorum (Lib.) D By.: Chengtu

CAREX CARDIOLEPIS Nees
Thecaphora sp.: Kwanhsien
CAREX FILICINA Nees
Farysia subolivacea (P. Henn.) Cif.: Kwanhsien
Puccinia caricis (Schum.) Wint.: Kwanhsien
CAREX FLUVIATILIS Boot. var. UNISEXUALIS Kükenthal
Puccinia sp.: Chengtu
CAREX NEMASTACHYS Steud.
Farysia subolivacea (P. Henn.) Cif.: Kwanhsien
Ustilaginoidea sp.: Kwanhsien
CAREX RHYNCOPHORA Franch.
Farysia subolivacea (P. Henn.) Cif.: Kwanhsien

CARPESIUM CERNUUM L.
Coleosporium carpesii Sacc.: Omei, Chengtu
CARPESIUM sp.
Coleosporium carpesii Sacc.: Omei

CASTANEA MOLLISSIMA Bl.
Macrophoma kuwatsukai Hara: Chengtu
Phyllactinia corylea Pers. ex Karst.: Kwanhsien
Pucciniastrum castaneae Diet.: Chengtu

CASTANOPSIS sp.
    Erysiphe japonica (Ito & Hara) Wei: Kwanhsien

CEDRELLA MACROCARPA DC.
    Phyllactinia corylea Pers. ex Karst.: Kwanhsien

CELOSIA CRISTATA L.
    Cercospora celosiae Syd.: Chengtu
    Discosporella phaeochlorina Wei & Cheo: Chengtu

CELTIS BIONDII Pamp.
    Hendersonia sp.: Kwanhsien
    Uncinula clintoni Pk.: Chengtu

CELTIS SINENSIS Pers.
    Cercospora sp.: Chengtu
    Uncinulopsis polychaeta (Berk. & Curt.) Wei: Kwanhsien

CENTELLA ASIATICA (L.) Urban
    Septoria centellae Wint.: Chengtu

CERASTIUM sp.
    Melampsorella caryophyllacearum Schroet.: Omei

CHENOPODIUM ALBUM L.
    Cercospora chenopodii Fres.: Chengtu
    Peronospora variabilis Gäum.: Chengtu
    Phyllosticta sp.: Chengtu
    Sclerotinia sclerotiorum (Lib.) D By.: Chengtu

CHRYSANTHEMUM CORONARIUM L.
    Cercospora chrysanthemi Heald & Wolf: Chengtu
CHRYSANTHEMUM CINERARIIFOLIUM Bocc.
    Fusarium coeruleum (Lib.) Sacc.: Chengtu
    Hypochnus sasakii Shirai: Chengtu
    Septoria chrysanthemi Allesch.: Sintu, Pihsien
CHRYSANTHEMUM INDICUM L.
    Puccinia chrysanthemi Roze: Kwanhsien
    Sclerotinia sclerotiorum (Lib.) D By.: Chengtu
    Septoria chrysanthemi Allesch.: Chengtu

CINNAMOMUM sp.
    Puccinia cinnamomi Tai: Omei

CIRSIUM SEGETUM Bge.
    Albugo tragopogonis (Pers.) Gray: Chengtu
    Phyllosticta cirsii Desm.: Chengtu
    Puccinia obtegens (Lk.) Tul.: Chengtu
    Ramularia balcanica Bub. & Ranoj.: Chengtu

Septoria cirsii Niessl: Chengtu
Sphaerotheca fuliginea (Schlecht.) Poll.: Chengtu

CIRSIUM JAPONICUM DC.
Albugo tragopogonis (Pers.) Gray: Chengtu
Ramularia balcanica Bub, & Ranoj.: Chengtu

CITRULLUS VULGARIS Schrad.
Fusarium bulbigenum Cke. & Mass. var. niveum (E.F. Sm.) Wr.: Chengtu

CITRUS GRANDIS Osb.
Alternaria citri Pierce: Chengtu
Cercospora sp.: Chengtu
Colletotrichum gloeosporioides Penz.: Chengtu
Gloeosporium foliicolum Nish.: Chengtu
Penicillium digitatum Sacc.: Chengtu
Penicillium italicum Wehmer: Chengtu

CITRUS LIMONIA Osb.
Elsinoë fawcetti Bitan. & Jenkins: Chengtu

CITRUS MEDICA D.
Phomopsis citri Fawc.: Kintang

CITRUS MITIS Blanco
Penicillium italicum Wehmer: Chengtu

CITRUS NOBILIS Lour.
Alternaria citri Pierce: Chengtu
Colletotrichum gloeosporioides Penz.: Chengtu
Diplodia natalensis P. Evans: Chengtu
Elsinoë fawcetti Bitan. & Jenkins: Shihfang, Chengtu
Gloeosporium foliicolum Nish.: Chengtu
Macrophoma kuwatsukai Hara: Chengtu
Oospora citri-aurantii Sacc. & Syd.: Chengtu
Penicillium digitatum Sacc.: Chengtu
Penicillium italicum Wehmer: Chengtu
Phoma citricarpa McAlp.: Chengtu
Trichoderma viride Pers. ex Fr.: Chengtu

CITRUS SINENSIS Osb.
Alternaria citri Pierce: Chengtu
Botrytis cinerea Pers. ex Fr.: Kiangtsing
Colletotrichum gloeosporioides Penz.: Chengtu
Diplodia natalensis P. Evans: Chengtu
Macrophoma kuwatsukai Hara: Chengtu
Penicillium digitatum Sacc.: Chengtu
Penicillium fructigenum Takeuchi: Chengtu
Penicillium italicum Wehmer: Chengtu
Penicillium italicum Wehmer var. album Wei: Kiangtsing
Phoma citricarpa McAlp.: Chengtu
Phomopsis citri Fawc.: Chengtu
Phytophthora citrophthora (R.E. & E.H. Sm.) Leonian: Chengtu

P. parasitica Bost.: Nanchung
Sclerotinia sclerotiorum (Lib.) D By.: Chengtu
Trichoderma viride Pers. ex Fr.: Chengtu

CLEISTOGENES SEROTINA (L.) Keng
Puccinia diplachnicola Diet.: Chengtu

CLEMATIS MONTANA Buch.-Ham. ex DC.
Coleosporium clematidis Barcl.: Omei

COIX LACHRYMA-JOBI L.
Epicoccum hyalopes Miyake: Sintu
Ustilago coicis Bref.: Kwanhsien, Wenkiang

COLOCASIA ESCULENTA Schott.
Brachysporium sp.: Chengtu
Cladosporium colocasiae Saw.: Chengtu

CORIARIA SINICA Maxim.
Cercospora coriariae Tai: Chengtu
Pucciniastrum coriariae Diet.: Kwanhsien

CORYLUS HETEROPHYLLA Fisch.
Microsphaera coryli Homma: Maohsien

CRATAEGUS PINNATIFIDA Bge.
Gymnosporangium haraeanum Syd.: Chengtu
Macrophoma kuwatsukai Hara: Chengtu

CREPIS JAPONICUS Benth.
Bremia lactucae Regel f.ovata (Saw.) Ling & M.C. Tai: Chengtu
Protomyces inouyei P. Henn.: Chengtu
Puccinia crepidis-japonicae (Lindr.) Diet.: Chengtu
Sclerotinia sclerotiorum (Lib.) D By.: Chengtu
Septoria crepidis-japonicae Saw.: Chengtu
Sphaerotheca fuliginea (Schlecht.) Poll.: Wenchuan

CUCUMIS SATIVUS L.
Sphaerotheca fuliginea (Schlecht.) Poll.: Chengtu

CUCURBITA MOSCHATA Duch.
Choanephora manshurica (Saito & Nag.) Tai: Chengtu
Phyllosticta sp.: Chengtu
Sclerotinia sclerotiorum (Lib.) D By.: Chengtu
Sphaerotheca fuliginea (Schlecht.) Poll.: Chengtu

CUCURBITA PEPO L.
Sphaerotheca fuliginea (Schlecht.) Poll.: Tzechung, Chengtu

CUDRANIA TRICUSPIDATA Bur.
Uncinula miyabei (Salm.) Sacc. & Syd.: Kintang

CUNNINGHAMIA LANCEOLATA Hk.
Lophodermium uncinatum Darker: Omei
Phyllosticta sp.: Chengtu

CYCAS REVOLUTA Thbg.
Coniothyrium olivaceum Bon.: Chengtu

CYDONIA LAGENARIA Lois.
Gymnosporangium haraeanum Syd.: Chengtu
CYDONIA OBLONGA Mill.
Macrophoma kuwatsukai Hara: Chengtu

CUPRESSUS FUNEBRIS Endl.
Gymnosporangium cupressi-funebris Wei: Kwanhsien

CYMBIDIUM VIRESCENS Lindl.
Colletotrichum orchidearum Allesch. forma cymbidii Allesch.: Chengtu

CYNODON DACTYLON Pers.
Phyllachora cynodontis (Sacc.) Niessl: Chengtu
Puccinia cynodontis Desm.: Shehung, Kwanhsien, Chengtu
Uredo cynodontis-dactylis Tai: Chengtu
Ustilago cynodontis P. Henn.: Shehung, Kwanhsien, Chengtu

DAHLIA VARIABILIS Desf.
Cercospora grandissima Rangel: Chengtu
Sclerotinia sclerotiorum (Lib.) D By.: Chengtu

DATURA ALBA Nees
Cercospora daturicola Speg.: Chengtu
Colletotrichum sp.: Chengtu

DAUCUS CAROTA L
Cercospora carotae (Pass.) Sol.: Szechung, Chengtu
Sclerotinia sclerotiorum (Lib.) D By.: Chengtu

DIANTHUS CARYOPHYLLUS L.
Uromyces caryophyllinus (Schrank) Wint.: Chengtu
DIANTHUS CHINENSIS L.
Septoria dianthi Desm.: Szehung, Chengtu
Sclerotinia sclerotiorum (Lib.) D By.: Chengtu

DICHROCEPHALA LATIFOLIA DC.
Sphaerotheca fuliginea (Schlecht) Poll.: Chengtu

DIGITARIA SANGUINALIS (L.) Scop.
Colletotrichum graminicolum (Ces.) G. W. Wilson: Chengtu
Piricularia grisea (Cke.) Sacc.: Chengtu
Puccinia levis (Sacc. & Bizz.) Magn.: Kwanhan, Chengtu
Pythium aphanidermatum (Edson) Fitz.: Chengtu
Ustilago rabenhorstiana Kuehn: Pahsien, Shehung, Chengtu

DIOSPYROS KAKI L.
Cercospora kaki Ell. & Ev.: Chengtu

DISPORUM PULLUM Salisb.
Aecidium dispori Diet.: Kwanhsien

DOLICHOS LABLAB L.
Cercospora canescens Ell. & G. Martin: Chengtu
Choanephora manshurica (Saito & Nag.) Tai: Chengtu
Discosporella phaeochlorina Wei & Cheo: Chengtu
Erysiphe polygoni DC.: Kwanhsien

ECHINOCHLOA COLONA (L.) Link.
Helminthosporium monoceras Drechs.: Chengtu
Tolyposporium bullatum Schroet.: Kwanhan, Chengtu
Ustilago sphaerogena Burr.: Chengtu

ECHINOCHLOA CRUS-GALLI (L.) Beauv.
Tilletia sp.: Wenkiang
Tolyposporium bullatum Schroet.: Chengtu

ECLIPTA ALBA L.
Sclerotinia sclerotiorum (Lib.) D By.: Chengtu

EHRETIA MACROPHYLLA Wall.
Uredo ehretiae Barclay: Kwanhsien

ELAEAGNUS PUNGENS Thunb.
Aecidium elaeagni Diet.: Kwanhsien, Tzetung, Omei, Chengtu

ELEUSINE INDICA Gaertn.
Helminthosporium nodulosum Berk. & Curt.: Chengtu

ELSCHOLTZIA sp.
Erysiphe galeopsidis DC.: Kwanhsien

ENKIANTHUS CHINENSIS French.
Aecidium enkianthi Diet.: Omei

EPIMEDIUM PUBESCENS Max.
Puccinia epimedii (P. Henn. & Shir.) Miy. & Ito: Omei, Kwanhsien

ERAGROSTIS CILIANENSIS (All.) Link
    Ustilago spermophora Berk. & Curt.: Shehung
ERAGROSTIS FERRUGINEA (Thbg.) Beauv.
    Phyllachora graminis Pers. ex Fckl.: Chengtu
    Ustilago spermophora Berk. & Curt.: Shehung, Chengtu

ERIGERON LINIFOLIUS Willd.
    Sphaerotheca fuliginea (Schlecht.) Poll.: Chengtu
ERIGERON sp.
    Sphaerotheca fuliginea (Schlecht.) Poll.: Lifan

ERIOBOTRYA JAPONICA Lindl.
    Ascochyta eriobotryae Vogl.: Szechung
    Cercospora circumscissa Sacc.: Chengtu
    Cercospora eriobotryae (Enjoji.) Saw.: Pihsien, Chengtu, Kintang, Szechung
    Clasterosporium eriobotryae Hara: Chengtu
    Coleopuccinia simplex Diet.: Kwanhsien
    Pestalotia eriobotryae-japonicae Saw.: Chengtu
    Sclerotinia laxa (Ehrenb.) Aderh.: Chengtu
    Stilbum cinnabarina Mont.: Chengtu

EUPHORBIA sp.
    Cercospora euphorbiae Kell. & Swing.: Shehung

EVODIA OFFICINALIS Dode
    Coleosporium evodiae Diet.: Kiating, Loshan
EVODIA sp
    Coleosporium evodiae Diet.: Kwanhsien

EVONYMUS JAPONICUS Thbg.
    Cercospora destructiva Rav.: Chengtu
    Oidium evonymi-japonici (Arc.) Sacc.: Chengtu

FIRMIANA SIMPLEX Wight
    Phyllactinia corylea Pers. ex Karst.: Chengtu

FRAGARIA CHILOENSIS Duch
    Mycosphaerella fragariae (Tul.) Lindau: Chengtu
    Rhizopus nigricans Ehr.: Chengtu
FRAGARIA INDICA Andr.
    Septoria duchesneae Hemmi & Nito: Chengtu

FRAXINUS CHINENSIS Roxb.
    Aecidium fraxini-bungeanae Diet.: Omei, Chengtu
    Phyllactinia fraxini (DC.) Homma: Kwanhsien, Omei, Chengtu
    Uncinula fraxini Miy.: Kwanhsien

FRAXINUS RETUSA Champ.
Phyllactinia fraxini (DC.) Homma: Kwanhsien

GALIUM APARINE L.
Aecidium galii Alb. & Schw.: Kwanhsien
Peronospora aparines (D. By.) Gaüm.: Chengtu
Sclerotinia sclerotiorum (Lib.) D By.: Chengtu

GARDENIA ANGUSTA Merr.
Gloeosporium sp.: Chengtu

GINKGO BILOBA L.
Fusarium sp.: Chengtu
Metasphaeria sp.: Chengtu
Pestalotia ginkgo Hori: Chengtu
Valsaria sp.: Chengtu

GLEDITSCHIA SINENSIS Lam.
Phyllactinia corylea Pers. ex Karst.: Wenchuan

GLYCINE SOJA S. & Z.
Alternaria sp.: Chengtu
Ascochyta sojae Miura: Pihsien, Wenchuan, Lifan
Cercospora sojina Hara: Suining, Chengtu
Cercospora kikuchii (Matsum. & Tomoyasu) Saw.: Chengtu
Colletotrichum sp.: Chengtu
Diaporthe sojae Lehman: Chengtu
Fusarium bulbigenum Cke. & Mass. var. tracheiphilum (E. F. Sm.) Wr.: Chengtu
Fusarium solani (Mart.) Appel & Wr. var. martii (Appel & Wr.) Wr.: Chengtu
Glomerella glycines (Hori) Lehman & Wolf: Santai, Chengtu
Macrophoma mame Hara: Santai
Mycosphaerella sojae Hori: Chengtu
Ophionectria sojae Hara: Chengtu
Peronospora manshurica (Naum.) Syd.: Mohsien, Wenchuan, Chengtu
Phyllosticta sojaecola Massal.: Chengtu
Pleosphaerulina sojaecola (Massal.) Miura: Chengtu
Pythium sp.: Chengtu
Rhizoctonia solani Kuehn: Chengtu
Sclerotinia sclerotiorum (Lib.) Mass.: Chengtu
Sclerotium rolfsii Sacc.: Wenchuan, Chengtu
Phakopsora pachyrhizi Syd.: Chengtu

GLYCINE USSURIENSIS Regel & Maack.
Erysiphe polygoni DC.: Kwanhsien

GNAPHALIUM LUTEOALBUM L.
Albugo tragopogonis (Pers.) Gray: Chengtu

Sclerotinia sclerotiorum (Lib.) D By.: Chengtu

GOSSYPIUM ARBOREUM L.

Alternaria macrospora Zimm.: Chengtu, Kienyang, Suining, Santai, Lochih, Shehung, Kwanhan, Chungkiang
Alternaria tenuis Auct.: Chungkiang, Chengtu, Kienyang, Suining, Lochih, Tsingyüan, Shehung, Junghsien, Jenshow, Kintang, Tzeyang, Weiyuan
Cephalothecium roseum Cda.: Suining
Colletotrichum indicum Dast.: Suining, Chengtu
Diplodia gossypina Cke.: Chengtu, Kienyang, Lochih, Santai, Kwanhan, Shehung, Suining
Fusarium moniliforme Sheldon: Suining, Lochih, Kienyang, Chengtu, Shehung, Santai, Chungkiang, Kwanhan
Fusarium vasinfectum Atk.: Kienyang, Chungking, Jenshow, Suining, Tsingyüan, Weiyuan, Junghsien
Glomerella gossypii (Southworth) Edg.: Tsingyüan, Chengtu, Kienyang, Suining, Shehung, Pengki, Kintang, Santai, Chungkiang, Lochih, Kwanhan, Jenshow, Weiyuan, Tzeyang, Junghsien
Mycosphaerella areola Ehrlich & Wolf: Shehung, Santai, Chungkiang, Chengtu, Kienyang, Lochih, Suining, Kwanhan
Phyllosticta gossypina Ell. & G. Martin: Weiyuan, Suining, Chengtu
Rhizoctonia solani Kuehn: Chengtu, Kienyang, Lochih, Suining, Santai, Pengki, Tzeyang, Kintang, Jenshow, Shehung, Weiyuan, Junghsien, Tsingyuan
Sclerotium rolfsii Sacc.: Suining, Kienyang

GOSSYPIUM HIRSUTUM L.

Alternaria macrospora Zimm.: Suining
Alternaria tenuis Auct.: Suining, Shehung, Santai, Kienyang, Junghsien, Chungkiang
Aspergillus sp.: Suining, Shehung
Cephalothecium roseum Cda.: Suining, Shehung
Diplodia gossypina Cke.: Chungkiang, Chengtu, Suining, Pengki, Santai, Shehung, Kienyang
Discosporella phaeochlorina Wei & Cheo: Chengtu
Glomerella gossypii (Southworth) Edg.: Santai, Chengtu, Pengki, Suining, Shehung, Kwanhan, Chungkiang, Junghsien, Kienyang
Mycosphaerella areola Ehrlich & Wolf: Chungkiang
Mycosphaerella gossypina (Cke.) Atk.: Suining
Phyllosticta gossypina Ell. & G. Martin: Chengtu, Junghsien, Chungkiang, Suining, Kienyang, Pengki, Santai, Kwanhan, Shehung
Rhizoctonia solani Kuehn: Santai, Suining, Shehung, Chengtu, Junghsien, Chungkiang, Pengki, Kienyang
Sclerotium rolfsii Sacc.: Suining, Kienyang

HEDERA NAPALENSIS Koch var. SINICA Rehder

Phyllosticta hederacea (A) Allesch.: Kwanhsien

HELIANTHUS ANNUUS L.
Puccinia helianthi Schw.: Chengtu
Sphaerotheca fuliginea (Schlecht.) Poll.: Neikiang, Chengtu

HEMARTHRIA COMPRESSA (L.f.) R. Br.
Puccinia cacao McAlp.: Chengtu
(Darluca filum (Biv.) Cast.)
Sphacelotheca rottboelliae (Syd. & Butl.) Mund.: Chengtu

HETEROPOGON CONTORTUS (L.) Rosm. & Schultes
Claviceps purpurea (Fr.) Tul.: Chengtu
Puccinia filipodia Cumm.: Shehung, Chengtu
Sorosporium clintonii Zundel: Shehung
Sorosporium contortus Griff.: Shehung, Chengtu
Sphacelotheca andropogonis (Opiz) Bub.: Suining

HIBISCUS MUTABILIS L.
Sphaerotheca fuliginea (Schlecht.) Poll.: Kwanhsien, Chengtu

HORDEUM SATIVUM Jessen var. VULGARE Hack.
Epicoccum tritici P. Henn.: Chengtu
Erysiphe graminis DC.: Neikiang, Kwanhsien, Chengtu, Yochih, Kiangpei
Fusarium sp.: Chengtu
Gibberella saubinetii (Mont.) Sacc.: Chengtu, Pishan, Wenkiang, Chungking, Kiangtsing
Helminthosporium gramineum Rab.: Pengki, Pishan, Pihsien, Changshow, Kiangpei, Tzetung, Pahsien, Shihfang, Kintang, Kwanhan
Helminthosporium teres Sacc.: Tzechung, Tzeyang, Pishan, Chengtu
Puccinia glumarum (Schw.) Erikss. & E. Henn.: Chengtu
Puccinia hordei Otth: Kianko, Nanchung, Chengtu
Puccinia graminis Pers.: Chengtu
Pythium sp.: Chengtu
Ustilago hordei (Pers.) Lagh.: Widely distributed
Ustilago nuda (Jens.) Rostr.: Widely distributed

HOVENIA DULCIS Thbg.
Septobasidium pedicellatum (Schw.) Pat.: Chengtu

HUMULUS JAPONICUS Sieb. & Zucc.
Cercospora humuli Hori: Chengtu
Pseudoperonospora humuli (Miy. & Tak.) G. W. Wilson: Chengtu

HYPERICUM CHINENSE L.
Oidium sp.: Chengtu

IMPATIENS BALSAMINA L.
Cercospora fukushiana (Mats.) Yamamoto: Chengtu

Discosporella phaeochlorina Wei & Cheo: Chengtu
Sphaerotheca fuliginea (Schlecht.) Poll.: Chengtu

IMPATIENS NOLITANGERE L.
Plasmopara obducens Schroet.: Chengtu
Septoria noli-tangeris Gerard: Chengtu

IMPATIENS TEXTORI Miq.
Plasmopara obducens Schroet.: Kwanhsien

IMPERATA CYLINDRICA Beauv.
Puccinia rufipes Diet.: Chengtu

INDIGOFERA sp.
Parodiella periosporioides (Berk. & Curt.) Speg.: Kwanhsien
Uromyces sp.: Kwanhsien

IPOMOEA AQUATICA Forsk.
Albugo ipomoeae-aquaticae Saw.: Chengtu
Discosporella phaeochlorina Wei & Cheo: Chengtu
Mycosphaerella ipomoeaecola Hara: Chengtu

IPOMOEA BATATAS (L.) Poir.
Alternaria sp.: Chengtu
Botrytis cinerea Pers. ex Fr.: Chengtu
Cephlothecium roseum Cda.: Chengtu
Cercospora batatae Zimm.: Suining, Shehung, Chengtu
Diaporthe phaseolorum (Cke. & Ell.) Sacc. var batatatis (Harter & Field) Wehm.: Chengtu
Fusarium oxysporum Schlecht.: Chengtu
Mucor mucedo L. ex Fr.: Chengtu
Phyllosticta batatae Ell. & Hals.: Chengtu
Rhizopus nigricans Ehr.: Kienyang, Chengtu

IPOMOEA HEDERACEA Jacq.
Albugo ipomoeae-panduranae (Schw.) Swing.: Luhsien, Chengtu
Cercospora ipomoeae Wint.: Chengtu
Discosporella phaeochlorina Wei & Cheo: Chengtu

IRIS JAPONICUS Thbg.
Alternaria iridicolum (Ell. & Ev.) Elliott: Chengtu
Puccinia iridis (DC.) Wallr.: Kwanhsien, Chengtu
Vermicularia liliacearum West.: Chengtu

JUNIPERUS CHINENSIS L.
Gymnosporangium haraeanum Syd.: Chengtu
Gymnosporangium yamadae Miy.: Chengtu

JUSTICIA PROCUMBENS L.
Cercospora justiciae Tai: Chengtu
Plasmopara wildemaniana P. Henn. var. macrospora Saw.: Chengtu

JUSTICIA sp.
Cercospora justiciaecola Tai: Chengtu

KALOPANAX RICINIFOLIUS (S. & Z.) Miq.
    Phyllactinia corylea Pers. ex Karst.: Chengtu
KALOPANAX SEPTEMLOBUS Koidz.
    Phyllosticta acanthopanacis Syd.: Chengtu

KYLLINGA BREVIFOLIA Rottb. var. GRACILLIMA (Miq.) Kükenthal
    Puccinia kyllingae- brevifoliae (Diet.) Miura: Chengtu

LACTUCA CHINENSIS (Thbg.) Makino
    Bremia lactucae Regel f. chinensis Ling & M. C. Tai: Chengtu
    Protomyces sp.: Chengtu
    Puccinia lactucae-repentis Miy. & Miyake: Chengtu
    Septoria sp.: Chengtu
LACTUCA GRACILIFOLIA DC.
    Sclerotinia sclerotiorum (Lib.) D By.: Chengtu
LACTUCA INDICA L.
    Bremia lactucae Regel: Chengtu
    Cladosporium lactucae Saw.: Chengtu
    Puccinia minussensis Thuem.: Kwanhsien, Chengtu
LACTUCA SATIVA L.
    Ascochyta lactucae Rost.: Sintu, Chengtu
    Bremia lactucae Regel: Chengtu
    Sclerotinia sclerotiorum (Lib.) D By.: Pihsien, Suining, Chengtu
    Septoria lactucae Pass.: Kwanhan, Hochwan, Shihfang, Pengki, Shwanliu, Wenkiang, Neikiang, Kienyang, Chengtu

LAGERSTROEMIA INDICA L.
    Uncinula australiana McAlp.: Kwanhsien, Chengtu

LATHYRUS ODORATUS L.
    Erysiphe polygoni DC.: Chengtu

LEERSIA JAPONICA Makino
    Piricularia leersiae (Saw.) Ito: Chengtu
    Tolyposporium globuligerum (Berk. & Br.) Ricker: Chengtu

LEONURUS sp.
    Erysiphe galeopsidis DC.: Lifan

LEPIDIUM VIRGINICUM L.
    Erysiphe polygoni DC.: Lifan

LEUCAS MOLLISSIMA Wall var. CHINENSIS Benth.
    Oidium leucas-javanicae Saw.: Chengtu

LIGULARIA HODGSONI Hook.
    Sphaerotheca fuliginea (Schlecht) Poll.: Chengtu

LIGUSTRUM LUCIDUM Ait.
Cercospora ligustricola Tai: Chengtu

LINDERA sp.
Uncinula fraxini Miy.: Wenchuan

LINUM USITATISSIMUM L.
Fusarium lini Bolley: Lifan, Wenchuan
Melampsora lini (Ehr.) Lev.: Lifan, Wenchuan

LIRIOPE GRAMINIFOLIA Baker
Vermicularia ophiopogonis Pat.: Chengtu

LITSEA POPULIFOLIA Gamble
Aecidium sp.: Omei

LOTUS CORNICULATUS L. var. JAPONICUS Regel
Erysiphe polygoni DC.: Chengtu

LUFFA CYLINDRICA Roem.
Choanephora manshurica (Saito & Nagatomo) Tai: Chengtu
Rhizoctonia solani Kuehn: Chengtu
Sphaerotheca fuliginea (Schlecht.) Poll.: Chungking, Chengtu

LYCIUM CHINENSE Mill.
Cercospora chengtuensis Tai: Chengtu
Oidium sp.: Chengtu
Peronospora lycii Ling & M. C. Tai: Chengtu

LYCOPERSICUM ESCULENTUM Mill.
Alternaria solani (Ell. & G. Martin) Sor.: Chengtu
Alternaria tenuis Auct.: Chengtu
Ascochyta lycopersici Brun.: Chengtu
Colletotrichum capsici (Syd.) Butl. & Bisby: Chengtu
Colletotrichum lycopersici Ell. & Ev.: Chengtu
Discosporella phaeochlorina Wei & Cheo: Chengtu
Fusarium bulbigenum Cke. & Mass. var lycopersici (Brushi) Wr.: Chengtu
Gloeosporium fructigenum Berk.: Chengtu
Nematospora lycopersici Schneid.: Chengtu
Oospora lactis Fres. var. parasitica Pritchard: Chengtu
Phoma destructiva Plowr.: Chengtu
Phomopsis sp.: Chengtu
Phytophthora parasitica Dast.: Chengtu
Pythium aphanidermatum (Edson) Fitz.: Chengtu
Rhizoctonia solani Kuehn: Chengtu
Sclerotium rolfsii Sacc.: Chengtu
Septoria lycopersici (Speg.) Sacc.: Chengtu

LYSIMACHIA sp.
Puccinia dieteliana Syd.: Omei, Chengtu

MACHILUS sp.
Aecidium machili P. Henn.: Kwanhsien, Omei
Pestalotia sp.: Kwanhsien
Ustilago inouyei (P. Henn. & Shirai) Ito & Yoshinaga: Omei

MAHONIA FORTUNEI Mouill
Puccinia graminis Pers.: Omei

MALUS ASIATICA Nakai
Diplodia natalensis P. Evans.: Chengtu
Gloeosporium album Osterw.: Chengtu
Macrophoma kuwatsukai Hara: Chengtu

MALUS BACCATA Borkh.
Macrophoma kuwatsukai Hara: Chengtu

MALUS PUMILA Mill.
Alternaria mali Roberts: Chengtu
Aspergillus fumigatus Fres.: Chengtu
Aspergillus luchuensis Inui: Chengtu
Cephalothecium roseum Cda.: Chengtu
Gloeosporium album Osterw.: Chengtu
Gloeosporium sp.: Tzechung, Chengtu
Gymnosporangium yamadai Miy.: Chengtu
Macrophoma kuwatsukai Hara: Chengtu
Marssonina mali (P. Henn.) Magn.: Chengtu
Penicillium expansum Lk.: Chengtu
Pestalotia traverseta Sacc.: Chengtu
Phomopsis sp.: Chengtu
Phytophthora parasitica Dast.: Chengtu
Rhizopus nigricans Ehr.: Chengtu

MALVA SYLVESTRIS L.
Colletotrichum malvarum Southworth: Neikiang, Tzechung, Chengtu
Discosporella phaeochlorina Wei & Cheo: Chengtu
Pythium aphanidermatum (Edson) Fitz.: Chengtu
Sclerotinia sclerotiorum (Lib.) D By.: Sintu, Changshow

MAZUS STACHYDIFOLIUS (Turcz.) Maxim.
Aecidium foetidum Diet.: Chengtu
Sphaerotheca fuliginea (Schlecht.) Poll.: Chengtu
Sclerotinia sclerotiorum (Lib.) D By.: Chengtu

MEDICAGO DENTICULATA Willd.
Peronospora aestivalis Syd.: Chengtu
Phoma melaena (Fr.) Mont. & Dur.: Chengtu
Erysiphe polygoni DC.: Chengtu

MEDICAGO SATIVA L.
Alternaria sp.: Chengtu

MELIA AZEDARACH L.
Cercospora meliae Ell. & Ev.: Chengtu
Phyllactinia corylea Pers. ex Karst.: Kwanhsien

MELILOTUS INDICA All.
Erysiphe polygoni DC.: Chengtu
Peronospora meliloti Syd.: Chengtu
Uromyces baeumlerianus Bub.: Chengtu

MISCANTHUS SACCHARIFLORUS (Maxim.) Hack.
Sphacelotheca miscanthi Yen: Suining
MISCANTHUS SINENSIS Anders.
Balansia claviceps Speg.: Kwanhsien
Claviceps purpurea (Fr.) Tul.: Kwanhsien
Phyllachora miscanthi Syd.: Wenkiang
Puccinia eulaliae Barcl.: Chengtu

MOMORDICA CHARANTIA L.
Ascochyta sp.: Chengtu
Cercospora momordicae McRae.: Chengtu
Sphaerotheca fuliginea (Schlecht.) Poll.: Chengtu
(Cicinnobolus cesati D By.)

MORUS ACIDOSA Griff.
Phyllactinia moricola (P. Henn.) Homma: Wenchuan
MORUS ALBA L.
Aecidium mori (Barcl.) Diet.: Chengtu
Ascochyta moricola Perl.: Hochwan
Clasterosporium mori Syd.: Sintu, Chengtu
Helicobasidium mompa Tanaka: Nanchung
Microglossum shiraianum P. Henn.: Chungking
Phyllactinia moricola (P. Henn.) Homma: Kwanhsien, Chengtu, Wenchuan, Tzechung
Poria moricola Ling: Nanchung
Sclerotinia shiraiana P. Henn.: Kwanhsien, Chengtu
Septobasidium pedicellatum (Schw.) Pat.: Chengtu
Septogloeum mori Briosi & Cav.: Chengtu
Septoria kuwaecola Yendo: Nanchung, Sichung

MOSLA LANCEOLATA Maxim.
Coleosporium perillae Syd.: Chengtu

NARCISSUS TAZETTA L. var. CHINENSIS Roem.
Sclerotium ambiguum Duby: Chengtu

NICOTIANA TABACUM L.
- Alternaria longipes (Ell. & Ev.) Mason: Pihsien, Chengtu, Wenchuan, Maohsien, Lifan
- Ascochyta nicotianae Pass.: Shihfang, Hokiang
- Botrytis cinerea Pers. ex Fr.: Sintu, Pihsien, Shihfang, Pehsien, Chungking, Wenkiang, Mienchu, Kwanhsien, Chungning
- Cercospora nicotianae Ell. & Ev.: Chengtu
- Colletotrichum tabacum Böning: Shihfang, Sintu, Pihsien, Mienchu, Kwanhsien
- Erysiphe tabaci Saw.: Sintu, Pihsien, Chungking, Kwanhsien, Wenkiang, Mienchu, Chungning
- Phyllosticta nicotianae Ell. & Ev.: Sintu, Shihfang
- Phytophthora parasitica Dast.: Sintu, Shihfang, Pihsien, Kwanhsien, Wenkiang, Mienchu, Chungking, Chungning
- Pythium aphanidermatum (Edson) Fitz.: Chengtu
- Sclerotinia sclerotiorum (Lib.) D By.: Pihsien, Kwanhsien, Shihfang, Sintu, Wenkiang, Mienchu, Chungking, Chungning

OENANTHE STOLONIFERA DC.
- Puccinia oenanthes (Diet.) T. Miyake: Chengtu

OENOTHERA sp.
- Cercospora lingi Tai: Chengtu

OPLISMENUS UNDULATIFOLIUS Roem. & Schult.
- Puccinia sp.: Chengtu

ORYZA SATIVA L.
- Achlya prolifera (Nees) D By.: Chengtu
- Ascochyta leptospora (Trail) Hara: Kienyang
- Brachysporium oryzae Ito & Ishiyama: Chengtu
- Entyloma oryzae Syd.: Widely distributed
- Epicoccum neglectum Desm.: Chengtu
- Gibberella saubinetii (Mont.) Sacc.: Sintu, Shwanliu, Loshan, Chungking, Omei, Penghsien
- Gibberella fujikuroi (Saw.) Wr.: Widely distributed
- Helminthosporium oryzae Breda de Haan: Widely distributed
- Nigrospora oryzae (Berk, & Br.) Petch: Kienyang, Kwanhan, Shihfang
- Ophiobolus oryzae Miyake: Chengtu
- Phoma glumarum Ell. & Tracy: Chengtu
- Phyllosticta oryzae Hori: Chengtu
- Piricularia oryzae Briosi & Cav.: Widely distributed
- Pyrenochaeta oryzae Shirai: Widely distributed
- Rhizoctonia solani Kuehn: Widely distributed
- Sclerotium oryzae Catt.: Widely distributed
- Sclerotium sphaeroides Nakata: Kienyang
- Tilletia horrida Tak.: Widely distributed
- Ustilaginoidea virens (Cke.) Tak.: Widely distributed

ORYZOPSIS OBTUSA Stapf
    Uredo sp.: Chengtu

OSMANTHUS FRAGRANS Lour.
    Asterosporium sp.: Chengtu
    Coremium sp.: Chengtu
    Fusicladium sp.: Chengtu
    Leptothyrium sp.: Chengtu

OXALIS CORNICULATA L.
    Puccinia sorghi Schw.: Kwanhsien

PAEONIA ALBIFLORA Pallas
    Botrytis cinerea Pers. ex Fr.: Chengtu
PAEONIA SUFFRUTICOSA Andr.
    Cladosporium paeoniae Pass.: Chengtu
    Clasterosporium paeoniae Pass.: Chengtu
    Hendersonia paeoniae Allesch.: Chengtu
    Pestalotia sp.: Chengtu

PACHYRHIZUS TUBEROSUS Spreng.
    Colletotrichum pachyrrhizi Saw.: Chengtu
    Phakopsora pachyrrhizi Syd.: Kwanhsien

PALIURUS RAMOSISSIMUS Poir
    Phakopsora zizyphi-vulgaris Diet.: Chengtu
    Phyllosticta sp.: Chengtu

PASPALUM SCROBICULATUM L.
    Ephelis japonica P. Henn.: Chengtu

PAULOWNIA FARGESII Franch.
    Phyllactinia imperialis Miy.: Kintang, Chengtu

PENNISETUM ALOPECUROIDES (L.) Spreng.
    Claviceps purpurea (Fr.) Tul.: Kwanhsien
    Ephelis japonica P. Henn.: Chengtu
    Phyllachora pennisetina Syd.: Chengtu
    Sphacelotheca penniseti-japonici (P. Henn.) Ito: Pihsien
    Tilletia pennisetina Syd.: Shehung, Kwanhsien, Chengtu

PENNISETUM SINENSE Mez.
    Claviceps purpurea (Fr.) Tul.: Kwanhsien

PERILLA FRUTESCENS Brit.
    Coleosporium perillae Syd.: Chengtu
PERILLA NANKINENSIS Deone.
    Coleosporium perillae Syd.: Chengtu

PHAENOSPERMA GLOBOSA Munro
    Puccinia sp.: Chengtu

PHASEOLUS AUREUS Roxb.
    Sphaerotheca fuliginea (Schlecht.) Poll.: Chengtu
    Uromyces appendiculatus (Pers.) Lk.: Kwanhsien, Chengtu
PHASEOLUS MUNGO L.
    Cercospora canescens Ell. & G. Martin: Chengtu
    Sphaerotheca fuliginea (Schlecht.) Poll.: Chengtu
PHASEOLUS VULGARIS L.
    Alternaria brassicae (Berk.) Sacc. var. phaseoli Brun.: Chengtu
    Ascochyta phaseolorum Sacc.: Chengtu
    Cercospora canescens Ell. & G. Martin: Chengtu
    Cercospora cruenta Sacc.: Chengtu
    Colletotrichum truncatum (Schw.) Andrus & W. D. Moore: Chengtu
    Colletotrichum lindemuthianum (Sacc. & Magn.) Briosi & Cav.: Chengtu
    Phaeoisariopsis griseola (Sacc.) Ferr.: Chengtu
    Phyllosticta phaseolina Sacc.: Hochwan, Chengtu
    Pythium aphanidermatum (Edson) Fitz.: Chengtu
    Uromyces phaseoli (Pers.) Wint.: Chengtu

PHRAGMITES VULGARIS (Lam.) Trin.
    Coniosporium sphaerospermum (Pers.) Mason: Chengtu
    Puccinia phragmitis (Schum.) Koern.: Chengtu

PHYLLOSTACHYS sp.
    Coccodiella arundinariae Hara: Kwanhsien
    Myriangium haraeanum Tai & Wei: Chengtu
    Shiraia bambusicola P. Henn.: Chengtu
    Stereostratum corticioides (Berk. & Br.) Magn.: Chengtu

PILEA sp.
    Cercospora pileae Tai: Chengtu

PINUS MASSONIANA Lamb.
    Cronartium quercuum (Berk.) Miy.: Omei

PISUM SATIVUM.
    Ascochyta pisi Lib.: Kiangpei, Chengtu, Wenkiang, Sintu, Kiangtsing, Hochwan, Tungliang, Suining, Nanchung
    Botrytis cinerea Pers. ex Fr.: Chengtu
    Cercospora pisi-sativi Stevenson: Chengtu
    Cercospora szechuanensis Tai: Chengtu
    Erysiphe pisi DC.: Widely distributed
    Fusarium sp.: Neikiang, Chengtu
    Mycosphaerella pinodes (Berk. & Br.) Stone: Wenkiang, Chengtu, Sintu, Mienyang, Kwanhsien

Peronospora pisi Syd.: Sintu, Pihsien, Chengtu, Wenkiang, Kintang, Kiangtsing, Yungchwan
Sclerotinia sclerotiorum (Lib.) D By.: Sintu, Pihsien, Chengtu
Uromyces pisi (Pers.) Wint.: Sintu, Chengtu

PLANTAGO MAJOR L.
Erysiphe plantaginis (Lk.) Saw.: Chengtu
Peronospora alta Fckl.: Chengtu

PLECTRANTHUS AMYETHYSTOIDES Benth.
Plasmopara plectranthi Ling & M. C. Tai: Chengtu
PLECTRANTHUS NERVOSUS Hemsl.
Coleosporium plectranthi Barcl.: Chengtu

POA ANNUA L.
Puccinia poae-sudeticae (West.) Jørstad: Kwanhsien, Chengtu

POLYGONUM AVICULARE L.
Sclerotinia sclerotiorum (Lib.) D By.: Chengtu
Uromyces polygoni (Pers.) Fckl.: Lanchung, Chengtu
POLYGONUM CUSPIDATUM Sieb. & Zucc.
Puccinia polygoni-amphibii Pers.: Omei, Chengtu
POLYGONUM FAGOPYRUM L.
Botrytis cinerea Pers. ex Fr.: Chengtu
Rhizoctonia solani Kuehn: Chengtu
POLYGONUM HYDROPIPER L.
Ustilago cordai Liro: Chengtu
POLYGONUM JAPONICUM Meisn.
Ustilago filamenticola Ling: Chengtu
POLYGONUM LAPATHIFOLIUM L.
Erysiphe polygoni DC.: Chengtu
Melanopsichum austro-americanum (Speg.) Berk.: Chengtu
Ustilago reticulata Liro: Chengtu
POLYGONUM MULTIFLORA Thbg.
Alternaria tenuis Auct.: Chengtu
Ascochyta sp.: Sintu, Shihfang
Puccinia polygoni-amphibii Pers.: Pihsien, Kwanhsien, Chengtu, Shihfang
POLYGONUM NEPALENSE Meisn.
Puccinia polygonicola Tai: Kwanhsien
POLYGONUM sp.
Puccinia polygoni-amphibii Pers.: Chengtu

POLYPOGON LUTOSUS Hitch.
Colletotrichum graminicolum (Ces.) G. W. Wils.: Chengtu
Puccinia coronata Cda.: Chengtu

POPULUS TOMENTOSA Carr.
Phyllactinia corylea Pers. ex Karst.: Kwanhsien

PORTULACA OLERACEA L.
Albugo portulacae (DC.) O. Kuntze: Chengtu

PRUNUS ARMENIACA L.
Alternaria tenuis Auct.: Chengtu
Botrytis cinerea Pers. ex Fr.: Chengtu
Cladosporium carpophilum Thuem.: Chengtu
Gloeosporium serotinum Ell. & Ev.: Chengtu
Macrophoma kuwatsukai Hara: Chengtu
Phomopsis amygdalina Canonaco: Chengtu
Sclerotinia laxa (Ehr.) Aderh.: Chengtu

PRUNUS MUME S. & T.
Alternaria citri Pierce var. cerasi Poteb.: Chengtu
Alternaria tenuis Auct.: Chungking
Aspergillus luchuensis Inui: Chungking
Cercospora circumscissa Sacc.: Chengtu
Cladosporium carpophilum Thuem.: Chungking
Gliocladium mumicola Wei: Chungking
Cloeosporium amygdalinum Brizi: Chungking
Septobasidium pedicellatum (Schw.) Pat.: Chengtu

PRUNUS PERSICA Stokes
Alternaria tenuis Auct.: Chengtu
Aspergillus luchuensis Inui: Chengtu
Aspergillus versicolor Vuillemin: Chengtu
Cephalothecium roseum Cda.: Chengtu
Cercospora circumscissa Sacc.: Chengtu
Cladosporium carpophilum Thuem.: Chengtu
Gloeosporium serotinum Ell. & Ev.: Chengtu
Macrophoma kuwatsukai Hara: Chengtu
Mycosphaerella persicae (Sacc.) Higgins & Wolf: Chengtu
Phomopsis amygdalina Canonaco: Chengtu
Rhizopus nigricans Ehr.: Chengtu
Rhizopus artocarpi Rac.: Chengtu
Sclerotinia laxa (Ehr.) Aderh.: Kintang, Chengtu
Sclerotium rolfsii Sacc.: Chengtu
Taphrina deformans (Berk.) Tul.: Kwanhsien, Kiangtsing, Chengtu
Tranzschelia pruni-spinosae (Pers.) Diet.: Tzechung, Kwanhsien, Chengtu

PRUNUS PSEUDOCERASUS Lindl.
Podosphaera tridactyla (Wallr.) D By.: Chengtu

PRUNUS SALICINA Lindl.
Alternaria tenuis Auct.: Chengtu
Aspergillus luchuensis Inui: Chengtu
Gloeosporium serotinum Ell. & Ev.: Chengtu
Macrophoma kuwatsukai Hara: Chengtu
Penicillium chloro-leucon Biourge: Chengtu
Polystigma rubrum Pers. ex DC.: Omei, Kwanhsien
Tranzschelia pruni-spinosae (Pers.) Diet.: Kwanhsien

PUNICA GRANATUM L.
Aspergillus niger v. Tiegh.: Chengtu
Cercospora punicae P. Henn.: Chengtu

PULSATILLA CERNUA Spgr.
Tranzschelia suffusca (Holw.) Arth.: Chengtu

PTEROCARYA STENOPTERA DC.
Phyllactinia corylea Pers. ex Karst.: Kwanhsien, Chengtu

PYRACANTHA sp.
Phyllactinia corylea Pers. ex Karst.: Kwanhsien

PYRUS BRETSCHNEIDERI Rehd.
Macrophoma kuwatsukai Hara: Chengtu
PYRUS COMMUNIS L.
Macrophoma kuwatsukai Hara: Chengtu
PYRUS SEROTINA Rehd.
Alternaria tenuis Auct.: Chengtu
Diplodia natalensis P. Evans: Chengtu
Gloeosporium album Osterw.: Chengtu
Macrophoma kuwatsukai Hara: Chengtu
Mycosphaerella sentina Schroet.: Tzechung, Chengtu
Mycosphaerella sp.: Tzechung
Pestalotia traverseta Sacc.: Chengtu
Phomopsis sp.: Chengtu
Phyllactinia pyri. (Cast.) Homma: Chengtu
Phyllosticta pirina Sacc.: Chengtu
Rhizopus nigricans Ehr.: Chengtu
Venturia pyrina (Cke.) Aderh.: Chengtu
PYRUS USSURIENSIS Max.
Gymnosporangium haraeanum Syd.: Chengtu
Mycosphaerella sentina Schroet.: Tzechung, Kienyang, Chengtu
Phyllactinia pyri (Cast.) Homma: Chengtu

QUERCUS ACUTISSIMA Carr.
Microsphaera alni (Wallr.) Salm.: Kwanhsien
QUERCUS ALIENA Bl.
Erysiphe japonica (Ito & Hara) Wei: Kwanhsien
Microsphaera alni (Wallr.) Salm.: Chengtu
QUERCUS GLANDULIFERA Bl.
Cronartium quercuum (Berk.) Miy.: Chengtu
QUERCUS MYRSINAEFOLIA Blume
Taphrina sp.: Kwanhsien
QUERCUS SERRATA Thbg.
Leptothyrium quercinum (Lasch.) Sacc.: Kwanhsien
Marssonina martini (Sacc. & Ell.) Magn.: Kwanhsien
Microsphaera alni (Wallr.) Salm.: Kwanhsien
Sphaerotheca lanestris Harkn.: Maohsien

QUERCUS sp.
    Cronatium quercuum (Berk.) Miy. var, macrospora Wei: Chengtu

RANUNCULUS CANTONIENSIS DC.
    Aecidium ranunculacearum DC.: Chengtu
    Peronospora ranunculi Gäum.: Wenkiang, Chengtu
    Sclerotinia sclerotiorum (Lib.) D By.: Chengtu

RAPHANUS SATIVUS L.
    Albugo candida (Pers. ex Chev.) Kuntze: Tzechung, Pihsien, Shihfang, Chengtu
    Peronospora brassicae Gäum.: Shawnliu, Chengtu
    Sclerotinia sclerotiorum (Lib.) D By.: Wenkiang, Chengtu

RHAMNUS LEPTOPHYLLUS Schn.
    Puccinia coronata Cda.: Kwanhsien
    Septoria sp.: Kwanhsien

RHODODENDRON FABERI Hemsley
    Chrysomyxa rhododendri (DC.) D By.: Omei
RHODODENDRON ARGYROPHYLLUM Francht. var OMEIENSE Rehder & Wilson
    Pestalotia rhododendri (D. Sacc.) Cuba: Omei
RHODODENDRON WILSONII Hemsly & Wilson
    Exobasidium rhododendri Cramer: Omei

RHUS SEMILATA Murr.
    Phyllactinia corylea Pers. ex Karst.: Wenchuan, Kwanhsien
RHUS TRICHOCARPA Miq.
    Uncinula sinensis Tai & Wei: Wenchuan

RICINUS COMMUNIS L.
    Cercospora ricinella Sacc. & Berl.: Shehung, Chengtu
    Colletotrichum ricini Bub. & Frag.: Chengtu
    Discosporella phaeochlorina Wei & Cheo: Chengtu
    Alternaria ricini (Yoshii & Takimoto) Hansf.: Chengtu

ROBINIA PSEUDO-ACACIA L.
    Microsphaera baeumleri Magn.: Chengtu

RORIPPA MONTANA (Wall.) Small
    Sclerotinia sclerotiorum (Lib.) D By.: Chengtu

ROSA CHINENSIS Jacq.
    Mycosphaerella rosigena Ell. & Ev.: Tzechung
ROSA MICROCARPA Lindl.
    Phragmidium sp.: Kwanhsien
    Sphaerotheca humuli (DC.) Burr.: Kwanhsien, Chengtu
ROSA RUGOSA L.
    Sphaerotheca pannosa (Wallr.) Lév.: Chengtu

ROSA SEMPERVIRENS L. var. SCANDENS Nich.
    Phragmidium mucronatum (Fr.) Schlecht.: Lifan
ROSA sp.
    Phragmidium receptaculorum Wei: Lifan
    Phragmidium tuberculatum Mueller: Maohsien

RUBUS SETCHUENSIS Bur. et Franch.
    Gerwasia rubi Rac.: Kwanhsien
RUBUS SWINHOEI Hce. var. HUPEHENSIS Oliver
    Gerwasia rubi Rac.: Kwanhsien
RUBUS TRIANTHUS Focke
    Hamaspora sinica Tai & Cheo: Penghsien
RUBUS sp.
    Phragmidium pauciloculare (Diet.) Syd.: Shehung

RUMEX DENTATA Campd.
    Phyllosticta rumicicola M. Miura: Chengtu
    Ramularia decipiens Ell. & Ev.: Chengtu
    Sclerotinia sclerotiorum (Lib.) D By.: Chengtu
RUMEX CRISPUS L.
    Puccinia punctiformis Diet. & Holw.: Kwanhsien

SACCHARUM ARUNDINACEUM Retz.
    Phyllachora sacchari P. Henn.: Chengtu
    Puccinia kuehnii (Krueger) Butl.: Chengtu
    Sphacelotheca sacchari (Rab.) Cif.: Shehung, Chengtu
SACCHARUM NARENGA (Nees) Hack.
    Claviceps purpurea (Fr.) Tul.: Chengtu
SACCHARUM OFFICINARUM L.
    Cercospora vaginae Krueger: Neikiang
    Colletotrichum falcatum Went: Tzechung, Kienyang, Neikiang
    Leptosphaeria sacchari Breda de Haan: Neikiang
    Pleocyta sacchari (Mass.) Petr. & Syd.: Neikiang
SACCHARUM SINENSE Roxb.
    Leptosphaeria sacchari Breda de Haan: Neikiang
    Ustilago scitaminea Syd.: Suining

SAGITTARIA SAGITTIFOLIA L.
    Doassansiopsis sagittariae (P. Henn.) Shen: Chengtu

SALIX BABYLONICA L.
    Cercospora salicina Ell. & Ev.: Chengtu
    Melampsora coleosporioides Diet.: Kienyang, Chengtu
    Pleurotus ostreatus Jacq. ex Fr.: Chengtu
    Uncinula salicis (DC.) Wint.: Kintang
SALIX PHANERA Schneid.
    Uncinula salicis (DC.) Wint.: Wenchuan
SALIX sp.
    Melampsora salicis-albae Kleb.: Chengtu

Uncinula salicis (DC.) Wint.: Kwanhsien

SAMBUCUS CHINENSIS Lindl.
Erysiphe polygoni DC.: Lifan
Microsphaera grossulariae (Wallr.) Lév.: Kwanhsien
SAMBUCUS SIEBOLDIANA Bl.
Aecidium sp.: Omei

SAPINDUS MUKUROSIS Gaertn.
Cercospora sapindicola Tai: Chengtu
Ascochyta sp.: Chengtu
Leptosphaeria sp.: Chengtu
Phyllosticta sapindicola Saw.: Chengtu

SAUSSUREA AFFINIS Spreng.
Bremia saussureae Saw.: Chengtu

SCLERIA HEBECARPA Nees
Ustilaginoidea flavo-nigrescens (Berk. & Curt.) P. Henn.: Kwanhsien

SCHISANDRA SPHENANTHERA Rehd. & Wils.
Aecidium sp.: Chengtu

SECALE CEREALE L.
Puccinia dispersa Eriks.: Chengtu

SESAMUM ORIENTALE L.
Cercospora sesami Zimm.: Chengtu

SENECIO DENSIFLORUS Wallich
Coleosporium senecionis (Pers.) Fr.: Wenchuan

SETARIA FABERI Herrn.
Ustilaginoidea virens (Cke.) Tak.: Wenkiang
SETARIA ITALICA Beauv.
Piricularia setariae Nisikado: Suining, Chengtu
Sclerospora graminicola (Sacc.) Schroet.: Chengtu
Sclerotium rolfsii Sacc.: Chengtu
Uromyces setariae-italicae (Diet.) Yoshino: Chengtu
Ustilago crameri Koern.: Chengtu
SETARIA LUTESCENS (Wiegel) F. T. Hubb
Ephelis japonicus P. Henn.: Chengtu
Tilletia setariae Ling: Chengtu
Uromyces setariae-italicae (Diet.) Yoshino: Chengtu
Ustilago sp.: Kwanhsien
SETARIA PLICATA (Lam.) T. Cooke
Uredo sp.: Chengtu
SETARIA VIRIDIS Beauv.

Ephelis japonica P. Henn.: Chengtu
Piricularia grisea (Cke.) Sacc.: Chengtu

SINOCALAMUS AFFINIS (Rendle) MacClure
Fusarium bambusicola Hara: Chengtu
Melanconium shiraianum Syd.: Chengtu
Munkiella shiraiana Miyake & Hara: Wenkiang
Phoma arundinacea Sacc.: Chengtu
Phyllachora sinensis Sacc.: Chengtu
Phyllosticta take Miyake & Hara: Chengtu
Septoria sp.: Chengtu

SMILAX CHINA L.
Puccinia ferruginea Lév.: Kwanhsien, Penghsien, Suining
SMILAX HERBACEA L.
Epiccocum sp.: Chengtu
Phyllactinia corylea Pers. ex Karst.: Chengtu

SOLANUM MELONGENA L.
Alternaria solani (Ell. & G. Martin) Sor.: Chengtu
Ascochyta melongenae Takimoto: Chengtu
Cercospora melongenae Wells: Chengtu
Choanephora manshurica (Saito & Nagatomo) Tai: Chengtu
Colletotrichum capsici (Syd.) But. & Bisby: Chengtu
Colletotrichum sp.: Chengtu
Discosporella phaeochlorina Wei & Cheo: Chengtu
Gloeosporium melongenae Ell. & Halst.: Chengtu
Phomopsis vexans (Sacc. & Syd.) Harter: Maohsien, Wenchuan, Lifan, Tzechung, Chengtu
Phytophthora parasitica Dast.: Chengtu
Septoria melongenae Saw.: Chengtu
SOLANUM NIGRUM L.
Cercospora rigospora Atk.: Chengtu
SOLANUM TUBEROSUM L.
Actinomyces scabies (Thaxt.) Güssow: Pahsien
Alternaria solani (Ell. & G. Martin) Sor.: Lifan, Chengtu, Pahsien, Penghsien
Cercospora sp.: Chengtu
Phytophthora infestans D By.: Chungking, Lifan, Pahsien, Chengtu, Penghsien
Rhizopus nigricans Ehr.: Chengtu

SONCHUS OLERACEUS L.
Bremia lactucae Regel f. sonchicola (Schlecht.) Ling & M. C. Tai: Chengtu, Chungking

SOPHORA FLAVESCENS Ait.
Botrytis cinerea Pers. ex Fr.: Chengtu
Sclerotinia sclerotiorum (Lib.) D By.: Chengtu

SOPHORA JAPONICA L.
    Uromyces truncicola P. Henn. & Shirai: Chengtu

SORGHUM VULGARE Pers.
    Cercospora sorghi Ell. & Ev.: Chengtu
    Colletotrichum andropogonis Zimm.: Tzechung, Kienyang, Neikiang, Chengtu
    Phyllosticta sorghina Sacc.: Wenkiang
    Septoria obtusa Heald & Wolf: Chengtu
    Sphacelotheca reiliana (Kuehn)Clint.: Chengtu

SPINACIA OLERACEA L.
    Cercospora spinacicola Sacc.: Tzechung
    Peronospora spinaciae Laub.: Sintu, Shihfang, Pihsien, Kintang, Chengtu, Wenkiang, Kienyang, Kwanhan, Pahsien
    Phyllosticta chenopodii Sacc.: Sintu, Wenkiang, Pihsien, Chengtu

SPOROBOLUS INDICUS (L.) R. Br.
    Epichloë cinerea Berk. & Br.: Chengtu
    (Fusarium heterosporium Nees)
    Helminthosporium ravenelii Curtis: Neikiang, Kwanhsien, Chengtu
    Puccinia arundinellae-setosae Tai: Chengtu
    Uromyces tenuicutis MacAlp.: Chengtu
    Ustilago sporoboli-indici Ling: Chengtu

SPODIOPOGON COLUTIFER (Thbg.) Hack.
    Puccinia miyoshiana Diet.: Chengtu

STAUNTONIA sp.
    Aecidium sp.: Omei

STELLARIA MEDIA (L.) Cyrill.
    Peronospora media Gäum.: Chengtu
    Sclerotinia sclerotiorum (Lib.) D By.: Chengtu
STELLARIA ULIGINOSA L.
    Peronospora stellariae-uliginosae Saw.: Chengtu

TARAXACUM MONGOLICUM Hand-Mze.
    Bremia lactucae Regel f. taraxici (Ito & Tokunaga) Ling & M. C. Tai: Chengtu
    Phyllosticta sp.: Chengtu
    Protomyces pachydermus Thuem.: Chengtu

THEA SINENSIS L.
    Cercospora theae Breda de Haan: Chengtu
    Colletotrichum camelliae Mass.: Chengtu
    Pestalotia theae Saw.: Kwanhsien
    Phyllosticta theae Spesch.: Kwanhsien
    Phyllosticta theaefolia Hara: Kwanhsien

THEMEDA TRIANDRA Forsk.
- *Claviceps purpurea (Fr.) Tul.: Chengtu
- Sorosporium anthistiriae (Cobb) Ling: Shehung, Chengtu
- Sphacelotheca themedae Duke: Chengtu
- Uredo themedae Diet.: Chengtu

THUJA ORIENTALIS L.
- Cladosporium herbarum Lk. ex Fr.: Chengtu
- Microthyrium sp.: Chengtu

THYROCARPUS SAMPSONII Hance.
- Peronospora thyrocarpii Ling & M. C. Tai: Chengtu

TRACHYCARPUS EXCELSA Wendl.
- Leptosphaeria trachycarpi Hara: Chengtu
- Leptothyrium sp.: Chengtu

TRIFOLIUM sp.
- Brachysporium trifolii Kauff.: Pihsien, Shihfang

TRIGONOTIS PEDUNCULARIS (DC.) Benth.
- Peronospora trigonotidis Ito & Tak.: Chengtu

TRISETUM MACRANTHUM (Hack.) Keng
- Puccinia triseti Erikss.: Kwanhsien, Chengtu

TRITICUM AESTIVUM L.
- Botrytis cinerea Pers. ex Fr.: Changshow
- Epicoccum tritici P. Henn.: Widely distributed
- Erysiphe graminis DC.: Widely distributed
- Fusarium sp.: Kienyang, Tzechung, Chengtu
- Gibberella fujikuroi (Saw.) Wr.: Chengtu
- Gibberella saubinetii (Mont.) Sacc.: Chengtu
- Helminthosporium sativum Pam., King & Bakke: Meishan, Chengtu
- Metasphaeria sp.: Chengtu
- Puccinia glumarum (Schw.) Erikss. & E. Henn.: Widely distributed
- Puccinia graminis Pers.: Widely distributed
- Puccinia rubigo-vera (DC.) Wint.: Widely distributed
- Rhizoctonia solani Kuehn: Chengtu
- Septoria nodorum Berk.: Kiakiang, Chengtu
- Tilletia caries (DC.) Tul.: Wenchuan, Santai, Maohsien, Lifan
- Tilletia foetida (Wallr.) Liro: Kintang, Chungkiang, Santai, Maohsien, Lifan
- Urocystis tritici Koern.: Lanchung, Santai, Shehung, Chengtu, Nanpu, Sichung, Suining, Yochih
- Ustilago tritici (Pers.) Rostr.: Widely distributed

VERONICA ANAGALLIS L.
- Peronospora aquatica Gäum.: Chengtu

VERONICA sp.
    Ramularia veronicae Fckl.: Chengtu

VIBURNUM sp.
    Cercospora sp.: Chengtu

VICIA CRACCA L.
    Ascochyta viciae Lib.: Sintu, Chengtu, Shihfang, Wenkiang
    Microsphaera baeumleri Magn.: Chengtu
    Peronospora viciae (Berk.) Gäum.: Chengtu
    Sclerotinia sclerotiorum (Lib.) D By.: Sintu, Pihsien
    Uromyces viciae-craccae Const.: Chengtu
VICIA FABA L.
    Ascochyta viciae Lib.: Sintu, Kiangpei, Wenkiang, Kienyang, Kwanhan, Kintang, Chengtu
    Botrytis fabae Ikata: Wenkiang, Shihfang, Kiangtsing, Chengtu
    Cercospora fabae Fautr.: Sintu, Shihfang, Kintang, Pihsien, Chengtu
    Rhizoctonia solani Kuehn: Sintu, Wenkiang, Pishan, Changshow, Chengtu
    Sclerotinia minor Jagger: Chengtu
    Sclerotinia sclerotiorum (Lib.) D By.: Shwanliu, Shihfang, Sintu, Wenkiang, Chengtu
    Uromyces fabae (Pers.) D By.: Shwanliu, Shihfang, Pihsien, Kwanhan, Tungliang, Sintu, Chengtu, Kiangtsing, Wenkiang, Mienyang
VICIA HIRSUTA (L.) S. F. Gray
    Microsphaera baeumleri Magn.: Chengtu
    Peronospora viciae (Berk.) Gäum.: Chengtu
VICIA SATIVA L.
    Peronospora viciae-sativae Gäum.: Chengtu
VICIA TETRASPERMA L.
    Botrytis cinerea Pers. ex Fr.: Chengtu

VIGNA SINENSIS Endl.
    Cercospora vignicola Kawamura: Chengtu
    Phyllosticta phaseolina Sacc.: Chengtu
    Rhizoctonia solani Kuehn: Chengtu
    Sphaerotheca fuliginea (Schlecht.) Poll.: Chengtu
    Uromyces vignae Barcl.: Pihsien, Chengtu

VIOLA BETONICIFOLIA Berker
    Puccinia violae (Schum.) DC.: Kwanhsien, Omei
VIOLA GRYPTOCERAS A. Gray
    Puccinia violae (Schum.) DC.: Kwanhsien
VIOLA PATRINII DC.
    Puccinia violae (Schum.) DC.: Kwanhsien
VIOLA PHILLIPICA Cav.subsp. MALESICA W. Becker
    Cercospora granuliformis Ell. & Holw.: Chengtu

Cercospora violae Sacc.: Chengtu

VITIS BETULIFOLIA Diels & Gilg.
Phakopsora ampelopsidis Diet & Syd.: Chengtu
Plasmopara viticola (Berk. & Curt.) De T.: Chengtu
VITIS HETEROPHYLLA Thbg.
Plasmopara viticola (Berk. & Curt) De T.: Chengtu
VITIS THUNBERGII Sieb. & Zucc.
Cercospora truncata Ell. & Ev.: Chengtu
VITIS VINIFERA L.
Cercospora vitis (Lév.) Sacc.: Chengtu
Guignardia bidwellii (Ell.) Viala & Ravaz: Chengtu
Monochaetia uniseta (Tracy & Earle) Sacc.: Chengtu
Pestalotia uvicola Speg.: Chengtu
Plasmopara viticola (Berk. & Curt.) Berl. & De T.: Kwanhsien, Chengtu, Chungking

XYLOSMA RACEMOSUM Miq. var. PUBESCENS R. & W.
Pestalotia sp.: Chengtu

ZANTHOXYLUM SIMULANS Hance
Septobasidium pedicellatum (Schw.) Pat.: Chengtu

ZEA MAYS L.
Epicoccum neglectum Desm.: Nanchung
Helminthosporium maydis Nisikado: Suining, Maohsien, Lifan, Chengtu, Wenchuan
Helminthosporium turcicum Pass.: Chengtu
Physoderma zeae-maydis Shaw: Omei, Kwanhsien, Mienchu, Wenchuan
Puccinia sorghi Schw.: Lanchung, Omei, Kwanhsien, Chengtu, Lifan, Maohsien
Sphacelotheca reiliana (Kuehn.) Clint.: Maohsien, Lifan, Wenchuan, Chengtu
Ustilago maydis (DC.) Cda.: Omei, Kwanhsien, Neikiang, Chengtu
Ustilaginoidea virens (Cke.) Tak.: Omei

ZINNIA ELEGANS Jacq.
Cercospora zinnae Ell. & G. Martin: Chengtu

ZIZANIA LATIFOLIA Hance
Uromyces coronatus Miy. & Nish.: Sintu, Chengtu
Ustilago esculenta P. Henn.: Chengtu

ZIZYPHUS JUJUBE Mill.
Aspergillus niger v. Tiegh.: Chengtu
Macrophoma kuwatsukai Hara: Chengtu
Phakospora zizyphi-vulgaris Diet.: Chengtu
Rhizopus nigricans Ehr.: Chengtu
Trichoderma viride Pers. ex Fr.: Chengtu

THE PLANT DISEASE REPORTER

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THE PLANT DISEASE SURVEY

Division of Mycology and Disease Survey

BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING

AGRICULTURAL RESEARCH ADMINISTRATION

UNITED STATES DEPARTMENT OF AGRICULTURE

SUPPLEMENT 174

REPORT OF THE SPECIAL COMMITTEE ON THE COORDINATION OF FIELD TESTS WITH NEW FUNGICIDAL SPRAYS AND DUSTS, WITH REFERENCE TO RESULTS OBTAINED IN 1947

Supplement 174 March 1, 1948

P L A N T   D I S E A S E   R E P O R T E R   S U P P L E M E N T

Issued by

THE PLANT DISEASE SURVEY
DIVISION OF MYCOLOGY AND DISEASE SURVEY

Plant Industry Station   Beltsville, Maryland

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March 1, 1948

FOREWORD

This committee was authorized at the St. Louis meeting of the American Phytopathological Society in the spring of 1946 and was organized in the latter part of that year and early in 1947. The committee now consists of a general chairman (who is also a member of the General Fungicide Committee of the Society) and a number of sub-chairmen, each of whom is the chairman of a sub-committee responsible for tests conducted on a specific crop such as apples, potatoes, etc. In addition to these sub-chairmen in charge of specific crops, there are a number of advisory members upon whom the active members may call for advice and guidance. The complete membership of the committee is as follows:

Sub-chairmen in charge of crop divisions, --

Apples	J. M. Hamilton	Geneva, N. Y.
Carrots, celery, and onions	A. G. Newhall	Ithaca, N. Y.
Cucurbits	J. W. Heuberger	Newark, Del.
Ornamentals	A. W. Dimock	Ithaca, N. Y.
Potatoes	W. F. Buchholtz	Ames, Iowa
Stone and small fruits	H. F. Winter	Wooster, Ohio
Tomatoes	M. B. Linn	Urbana, Ill.

Advisory members, --

Agricultural Engineering	Frank Irons	USDA Eng. Lab., Toledo, Ohio
Chemistry	E. G. Witman	Sherwin-Williams Co. Cleveland, Ohio
Experiment Stations, U. S. D. A.	H. P. Barss	Office of Exp. Stations Washington, D. C.
Entomology	H. F. Dietz	DuPont Company Wilmington, Del.
Extension	O. C. Boyd	Agr. Exp. Station, Amherst, Mass.
Industry	L. G. Utter	Phelps Dodge Corp. New York, N. Y.
Plot design and data analysis	F. M. Wadley	Dept. Ent. & Pl. Quar. Washington, D. C.

General Chairman, -- J. D. Wilson, Wooster, Ohio

Cooperating members are listed under each crop division in the following report.

Individual cooperators on this committee were obtained as follows: -- A circular letter was sent to the chairmen or heads of the departments of biology, botany, or plant pathology, as the case might be, of each state agricultural experiment station, asking if they would be kind enough to furnish a list of pathologists in their respective departments according to the crop units or groups upon which they worked. These names were then assembled and sent to the various sub-chairmen in charge of the different crops or crop groups. They in turn contacted each crop specialist concerning his willingness to join the cooperative group in the testing of a selected group of new fungicides, to be applied as sprays or dusts, for the control of specific diseases on a specific crop or group of crops.

After the cooperators on a given crop were known, the sub-chairman gave each a chance to indicate his choice of treatments from a selected list of materials that contained all likely prospects, ranking them as first choice, second choice, etc. These preferences were then assembled and totaled. Under this system the material with the lowest score was first choice and the highest score indicated last choice on a group basis. Since it was apparent that these cooperative tests had the best chance to succeed if the number of materials to be compared was kept at a minimum, only five or six treatments were selected for use on each crop. Accepted plot designs with four to six replicates of each treatment were used wherever possible, and the collection and recording of data was standardized for the crop. Each cooperator could, within limits, select his own crop variety, cultural practice, plot size, and type of spray equipment. All spray or dust materials were supplied by the respective manufacturers from single batches of material.

Each cooperator also agreed to submit a copy of his data, in-so-far as it related to the standard experiment, to his sub-chairman shortly after it had been obtained, for use in a general report on the experiment, with the understanding that he was to receive full credit for his contribution. Otherwise he was at liberty to use his individual data as he saw fit. It was also understood that each cooperator should receive a copy of the assembled report and summary from his sub-chairman.

These crop reports and summaries have in turn been assembled and are here submitted as the yearly report of the committee as a whole.

J. D. Wilson, General Chairman

The Committee wishes to express its gratitude to the following individuals for their help during the progress of this cooperative effort, - J. G. Horsfall, Connecticut Agricultural Experiment Station, for separates entitled "An Improved Grading System for Measuring Plant Disease"; F. M. Wadley, Bureau of Entomology and Plant Quarantine, for separates entitled "Notes on Experimental Designs and Use of Randomized Blocks"; and H. E. Bruner, Monsanto Chemical Co.; G. M. Juredine, Harshaw Chemical Company; F. B. Maughan, Rohm and Haas Chemical Co.; G. L. McNew, Naugatuck Chemical Co., (now at Ames, Iowa); A. A. Nikitin, Tennessee Copper Co.; B. L. Richards, duPont de Nemours Co.; and any others who cooperated in the shipment of fungicidal materials to the various cooperators.

INDEX OF FUNGICIDES AND CROPS ON WHICH THEY WERE USED IN THE VARIOUS TESTS

Fungicides	Crops
Arasan	Ornamentals
Bioquin 1	Apples, Carrots, onions and celery, Tomatoes
Bioquin 100	Apples, Stone and Small fruits
Bismuth subsalicylate	Ornamentals
Bordeaux mixture	Apples, Carrots, onions, and celery, Cucurbits, Ornamentals, Potatoes, Stone and Small fruits, Tomatoes
Calogreen	Ornamentals
Ceresan	Ornamentals
CCC-S	Carrots, onions, and celery, Potatoes, Stone and Small fruits
Copper A	Cucurbits
Copper zinc chromate	Tomatoes
Cuprocide	Cucurbits, Tomatoes
Cupro K	Stone and Small fruits
Dithane	Carrots, onions, and celery, Cucurbits, Potatoes, Tomatoes
Dowicide 98	Ornamentals
Fermate	Apples, Cucurbits, Ornamentals, Stone and Small fruits, Tomatoes
Glyoxalidine (341 A,B,or C)	Apples, Stone and Small fruits
Lysol	Ornamentals
Mn. ethylene bis	Carrots, onions, and celery
Parzate	Apples, Carrots, onions and celery, Cucurbits, Ornamentals, Potatoes, Stone and Small fruits, Tomatoes
P.E.P.S.	Apples
Phygon	Apples, Carrots, onions, and celery, Ornamentals, Potatoes, Stone and Small fruits, Tomatoes
PMAS	Apples
Puratized	Apples, Ornamentals
Sulfurs -- various	Apples, Ornamentals, Stone and Small fruits
Tenn. 26	Apples, Stone and Small fruits
Tenn. 34	Cucurbits
Tribasic	Carrots, onions, and celery, Cucurbits, Stone and Small fruits, Tomatoes
Zerlate	Apples, Carrots, onions, and celery, Cucurbits, Potatoes, Stone and Small fruits, Tomatoes

REPORT OF THE SECTION ON FUNGICIDE TESTS FOR THE CONTROL OF APPLE DISEASES, 1947

J. M. Hamilton

There were twenty-one cooperators of which nineteen were able to complete field tests. The data presented on the control of apple scab were taken from the reports of eleven cooperators who tested the greater number of the "suggested materials" in a basically complete spray schedule. The remainder of the data did not lend itself to condensation. The data pertaining to diseases other than scab were limited and will not be presented at this time. A complete report was made to the cooperators.

The degree of disease control on the fruit was selected as the best basis on which to organize the data. Information other than the percentage scab control given was obtained but is not included to avoid confusion.

These are discrepancies not noted but it was felt that these would not materially affect the over-all picture as may be interpreted from the data presented and the summation. Omissions or misinterpretations are possible. Valuable information may have been omitted, but it was necessary to keep to the original intent of the project in order to have an abbreviated report.

	Cooperators
Delaware	J. W. Heuberger and Spencer H. Davis
Illinois	Dwight Powell
Indiana	J. R. Shay
Maine	M. T. Hilborn
Maryland	J. C. Dunegan, and M. C. Goldsworthy
Massachusetts	O. C. Boyd, and E. F. Guba
Minnesota	E. O. Mader, and A. C. Hodson
Missouri	H. G. Swartwout
New Hampshire	E. J. Rasmussen, and M. C. Richards
New Jersey	Robert H. Daines
New York	J. M. Hamilton, and D. H. Palmiter
North Carolina	C. N. Clayton, and Robert Aycock
Ohio	H. C. Young, and H. F. Winter
Pennsylvania	F. H. Lewis, H. W. Thurston, Jr., and W. B. Chandler
Rhode Island	F. L. Howard
Virginia	A. B. Groves
West Virginia	C. F. Taylor
Wisconsin	J. Duain Moore

Table 1. New materials for the control of apple scab, 1947.
(Figures given indicate percentage of scab on fruit)

Treatment	Shay (Ind.) Gallia Beauty	Young & Winter (Ohio) Red Rome	Lewis (Pa.) Stayman	Palmiter (N.Y.) McIntosh	Hamilton (N.Y.) McIntosh	Daines (N.J.) Rome Beauty	Hilborn (Me.) McIntosh	Heuberger & Davis (Del.) Delicious	Taylor (W. Va.) Delicious	Rasmussen & Richards (N. H.) McIntosh	Swartwout (Mo.) Rome Beauty (A)	Swartwout (Mo.) Rome Beauty (B)
Unsprayed	99	98	-	100	99	54	28	37	-	-	100	67
Fermate 1 1/2-100	6	7	9	2	T	3	*3	*2	4	3	-	-
Puratized 1 pt.	20	9	6	2	1	5	T	2	7	4	4	1
Phygon 1/2-100	8	*1	*1	*1	21	10	T	*8	*T	*1	33	3
341C 1 qt.	7	6	-	5	T	-	2	-	1	-	16	-
341B 3-100	-	-	11	-	T	5	3	-	-	-	31	4
Copper-8 1-100	3	-	-	-	0	3	2	2	1	-	-	-
P.E.P.S. 2 qt.	25	-	-	13	-	10	*10	-	6	-	73	30
806 1 pt.	-	-	-	1	1	-	1	2	-	-	-	-
Micronized 5 or 6-100	19	14	-	3	23	2	-	-	*T	7	*10	-
Magnetic "70" 7 or 8-100	9	*5	2	-	-	-	-	-	-	4	-	-

* A higher or range of concentrations was used
Missouri blocks A and B were in the same orchard.

Table 2. Summation of the data obtained with new materials for the control of apple scab in ten States, 1947

Treatment*	Percent range of scab on fruit 0-5	6-10	11-25	25+
Micronized (8)	3	2	3	0
Fermate (10)	7	3	0	0
Puratized (12)	8	3	1	0
Phygon (12)	7	3	1	1
341C (7)	4	2	1	0
341B (6)	4	1	1	0
P.E.P.S. (7)	0	3	2	2
Copper-8 (5)	5	0	0	0
806 (4)	4	0	0	0

*()=Number of blocks in which materials were tested.

Summary

Fermate. On a protective basis, all factors considered, Fermate was the best material. It gave better control of the scab on the fruit than on the foliage. Fermate broke down late in the season, allowing scab to build up on the underside of the foliage. Fermate gave good control of apple blotch and Brook's fruit spot. The carbamates gave the best control of black rot (foliage data).

Puratized. Puratized failed seriously in one out of twelve orchards. It was reported to remove leaves bearing scab lesions and may be found to be injurious to some varieties, particularly if poor drying conditions prevail at the time the spray is applied. It was not compatible with Good-rite P.E.P.S. The maturity of apples was delayed as much as two weeks by the application of Puratized.

Phygon. Phygon was rated as one of the more effective materials during the primary infection period, but allowed secondary infection to develop at harvest time, presumably due to lack of retention. Injury was a factor on both fruit and foliage that cannot be overlooked. In one instance, it was reported to result in the build-up of red mite. Toxicity to humans was reported by several cooperators. Phygon was comparatively ineffective against apple blotch, Brook's fruit spot, and black rot.

341C and 341B (Glyoxalidine). The 341C gave approximately the same control of scab as Fermate, but severe injury occurred in New York (Hudson Valley), Virginia, West Virginia, and Wisconsin. The 341B did not give the disease control of 341C but did not cause injury.

Copper-8 (Bioquin 1). Copper-8 did not receive the critical testing of the other materials, but all reports were favorable. It requires a sticker to be most effective, as does the Phygon. Injury may be a factor if lime is not added. It gave good control of apple blotch and Brook's fruit spot.

Good-rite P.E.P.S. P.E.P.S. was completely ineffective in controlling scab in most of the orchards. It appeared to be a good sticker for some organics but will reduce the amount of control if the concentration is too high. It did not control Brook's fruit spot.

NEW YORK STATE AGRICULTURAL EXPERIMENT STATION, GENEVA

SUMMARY OF DATA ON COOPERATIVE FUNGICIDE TESTS ON ONIONS, CARROTS, AND CELERY FOR 1947

A. G. Newhall by J. D. Wilson

Comparatively few cooperators were obtained for this group of crops, largely because the number of pathologists in the country who are specializing on disease control on onions, carrots, and celery is very limited. Also, all of those who signified a willingness to cooperate may not be listed here since Dr. Newhall is now in Central America on sabbatic leave and his correspondence on the matter is not available. A group of promising fungicides for testing purposes on each crop was selected by those interested in the cooperative plan.

Onion

Those cooperators in the onion spraying experiment were:

G. H. Godfrey
A. G. Newhall, Chairman
E. C. Tims
J. D. Wilson

and the materials to be compared were:

Bordeaux mixture	5-2 1/2-100
COC-S	4-100
Zerlate	2-100
Dithane Z-78	2-100
Phygon	1-100

Downy mildew appeared in the experimental plots at Baton Rouge where it became severe, but was not present at Canastota or McGuffey. *Macrosporium* appeared but was scarce at McGuffey. It became quite severe at Bay View, Texas. Blast was present, but also mild in both the New York and Ohio tests. Results obtained by spraying in these four experiments were rather inconclusive and consequently disappointing. The data obtained, together with a short discussion of each test are given below.

Texas.

White Bermuda onions were planted in September. Purple blotch appeared about January 15. Onions were sprayed on January 22, February 13, February 21, and on March 1, with a knapsack sprayer at about 100 gal. per acre. The leaf data in the accompanying table were taken on March 10. The most critical periods from control standpoint probably were missed because of inaccessibility of plots.

The fact that a significant reduction of leaf damage was shown by spraying indicates that properly timed applications may be an economic procedure in a blight year. Striking differences between sprayed and non-sprayed plots were obvious during the growing season. Differences between treatments were not significant, however. (Table 1).

Table 1. Control of Macrosporium blight on onions at Bay View, Texas, by various fungicides.

G. H. Godfrey

Treatments	Yield in pounds per plot	Foliage condition. Mean No. of leaves per 10 plants that were, -- Healthy	Intermediate	Dead	Percent of leaves living
1. Dithane + ZnSo4 + lime 2-1-1/2-100	102	106	132	125	50.6
2. Fermate 2-100	85	108	134	122	52.0
3. Bordeaux 10-6-100	98	109	132	106	55.3
4. Dithane Z-78 2-100	94	101	127	123	53.1
5. COC-S 4-100	93	99	125	126	49.8
6. No treatment	89	63	84	133	38.7
L.S.D. at 5% level	--	18	--	--	5.5

DDT-25W used with each treatment

New York.

Table 2. Spray test for the control of onion foliage diseases at Canastota, New York, in 1947.

A. G. Newhall

Treatments	Yields pounds per 30 feet of row	Foliage condition. Mean no. of leaves per 50 plants that were, Completely dead	One-half dead	Completely green
No treatment	11.6	264	17.6	1.0
Zerlate 2-100	9.2	250	37.6	3.4
Dithane Z 2-100	11.3	249	40.0	2.6
Phygon 1-100	9.5	249	44.2	5.8
COC-S 4-100	9.6	236	47.6	4.0
Bordeaux 5-2 1/2-100	11.7	249	40.8	5.6

There was no significant difference between treatments in their ability to keep leaves green, and no treatment gave any signficant increase in yield over the untreated check, or over any other treatment. Diseases were scarce or absent, except for a small amount of blast. Triton X-100 used with all sprays as a wetting agent. Four spray applications were made at approximately weekly intervals (Table 2).

Louisiana.

Table 3. Control of onion mildew by various fungicides at Baton Rouge, Louisiana, 1947. Counts were made on 50 plants in each plot about one month before plants were pulled.

E. C. Tims

Treatment	Foliage condition. Mean number of leaves per 50 plants that were,-- Completely dead	One-half dead
No treatment	54	59
Zerlate 2-100	47	45
Dithane Z 2-100	45	47
Phygon 1-100	52	45
COC-S 4-100	49	51
Bordeaux 5-2 1/2-50	46	49

This test was arranged to study the control of downy mildew (Peronospora) on onions being grown for bulbs. The disease was well established before the first spray was applied. The test was discontinued after 6 applications at 4- to 5-day intervals because there were no apparent differences between treatments and none were giving satisfactory control. Dupont Spreader-Sticker was used at 1/2-100 in all sprays (Table 3).

Ohio.

Table 4. Spray test for the control of foliage diseases of onion at McGuffey, Ohio, in 1947.

J. D. Wilson

Treatments*	Yield in bushels per acre	Percent of foliage still green on August 27
No treatment	419	10
Zerlate 2-100	469	50
Dithane 2-100	472	35
Phygon 1-100	403	41
COC-S	456	48
Bordeaux	443	39

* DDT 50-W was used with all fungicides at 1-100

Foliage diseases were absent or scarce in this experiment. There was a light infection of Macrosporium leaf spot. Thrips infestation became severe about 10 to 14 days before the natural maturity date and caused some damage. COC-S and Bordeaux caused some tip burning in one of the early applications but did not cause any marked yield reduction. Phygon caused a mild form of foliage injury which did reduce yield somewhat. The plots treated with Zerlate and with COC-S were greenest during the last few days before ripening set in. There was no significant difference in appearance or yield from plots treated with Zerlate, Dithane, COC-S, or Bordeaux. Five spray applications were made at 10-day intervals (Table 4).

Carrot

Only two cooperators were obtained for the carrot spraying test. They were A. G. Newhall and J. D. Wilson. The materials used were:

Bordeaux	6-6-100	Dithane Z-78	2-100
Zerlate	2-100	Phygon	1-100
Parzate	2-100	Bioquin 1	1-100

Yield data were not taken in the New York test since no foliage diseases (leaf spots) were present. The data on yield and foliage condition at McGuffey, Ohio, are given in the following table. No disease appeared during the first two-thirds of the growth period but Cercospora infection then occurred and became quite serious on the untreated check by harvest time. Bordeaux mixture gave the best control in a 10-day application schedule, followed in effectiveness by Zerlate. All treatments gave a significant increase in yield with the exception of Phygon, which caused a mild form of foliage injury (Table 5).

Table 5. Influence of various fungicides on the control of carrot leaf spots and on yield at McGuffey, Ohio, in 1947

Treatments	Yield in Bu/Ac	Percent foliage dead at harvest
No treatment	30.9	85
Bordeaux 6-6-100	37.6	56
Zerlate 2-100	34.0	72
Parzate 2-100	36.3	76
Dithane Z 2-100	36.1	80
Phygon 1-100	30.6	84
Bioquin 1 1-100	35.2	76

Celery

Celery was sprayed by only three cooperators, -- J. W. Heuberger, Delaware; A. G. Newhall, New York; and J. D. Wilson, Ohio.

The materials under test were:

Bordeaux	8-8-100	Dithane Z	2-100
Tribasic	4-100	Mn ethylene bis	2-100
Zerlate	2-100	Phygon	1-100
Parzate	2-100	Bioquin 1	1-100

No data were obtained from the plots in Delaware or New York. Blight was present in the Delaware test but it was not possible to obtain yield data. Disease was scarce in the New York experiment, and this circumstance, together with the fact that the grower on whose farm the test was located inadvertently dusted the whole area with copper-lime dust about 3 weeks before harvest, made it undesirable to obtain data on yield or disease control.

Leaf blights were also scarce in the celery plots at McGuffey, Ohio. No late blight (Septoria) was present and infection by early blight (Cercospora) did not occur until only 2 or 3 weeks before harvest, and even then its development was mild and scattered. The plots were harvested, however, and the data are given in the accompanying table (Table 6).

Table 6. Yield and foliage condition of celery grown at McGuffey, Ohio, in 1947. Septoria leaf spot absent. Only a mild infection of Cercospora (early blight) was present.

Treatments		Yield in Tons/Acre	Foliage condition 2 weeks before harvest Percent functional
No treatment		22.2	80
Bordeaux	8-8-100	25.8	96
Zerlate	2-100	26.6	94
Parzate	2-100	25.8	86
Phygon	1-100	16.6	75
Dithane Z	2-100	22.7	80
Mn ethylene bis	2-100	23.7	88
Tribasic	4-100	24.2	89
Bioquin 1	1-100	25.9	90

Yield variations were small for most of the treatments, as would be expected in the absence of disease, unless some of the treatments were either phytotoxic or stimulatory. Phygon was somewhat injurious and the yield was consequently low, even lower than the untreated plots. The foliage condition seemed best on the plots treated with Bordeaux mixture, but those that received Zerlate, Parzate, Bioquin 1, and Tribasic were also in an excellent growth condition throughout the season.

CORNELL UNIVERSITY, ITHACA, NEW YORK

NATIONAL CUCURBIT FUNGICIDE TEST-1947

J. W. Heuberger

Twenty-two plant pathologists were approached, ten agreed to cooperate, and reports were received from the following eight cooperators:

C. E. Cox, Maryland
W. M. Epps, South Carolina
D. E. Ellis, North Carolina
E. F. Guba, Massachusetts
J. W. Heuberger, Delaware
C. J. Nusbaum, South Carolina
L. H. Person, Michigan
J. D. Wilson, Ohio

The test fungicides are listed below. Several cooperators also reported on other materials:

Bordeaux (6-3-100)
Compound A (3 1/3-100)
Fermate (2-100)
Zerlate (2-100)
Dithane Z-78 (2-100)
Compound A (7% Cu)
Fermate (10%)
Zerlate (10%)
Dithane Z-78 (6%)

The results are presented below for four crops.

Cantaloupes

Detailed reports were received from C. E. Cox (Maryland), C. J. Nusbaum (South Carolina), and J. W. Heuberger (Delaware). The table below was prepared from these reports. D. E. Ellis reported that Fermate caused injury in North Carolina, but no yields were taken as dry weather caused a crop failure; Fermate was also injurious in Delaware; L. H. Person, Michigan, reported that Bordeaux and Compound A caused marginal chlorosis, but no yields were taken as disease did not develop (Table 1).

There are two interesting features in the data, namely: (1) that Zerlate performed very well in all three locations as regards yield, even though its control of downy mildew was not as good as that of Bordeaux mixture, and (2) that Bordeaux mixture gave the highest yield in Maryland, where the intervals between spray applications were longer than in South Carolina and Delaware.

Cucumbers

Complete reports on downy mildew disease control and yield were received from W. M. Epps (South Carolina), D. E. Ellis, (North Carolina), and J. W. Heuberger (Delaware). Complete data are presented in Table 2.

Table 1. Effect of fungicidal sprays on the control of downy mildew and on the yield of cantaloupes (Hales Best Variety). 1947.

Material[a]	Concentration (lbs/gallons)	Percent Disease S.C. 6/23	Percent Disease Md. 8/7	Percent Disease Del. 8/12	Yield per acre (number) of fruits[b] S.C.	Md. M.	Md. T.	Del.
Untreated		100	74	100	3,456	2,142	7,696	7,792
Bordeaux	6-3-100	10	16	25	4,032	3,521*	10,091*	8,034
Compound A	3 1/3-100	18	41	38	5,544**	2,759	3,966	7,938
Fermate	2-100	55	44	55	4,392	2,686	9,547*	9,341**
Zerlate	2-100	40	44	35	6,408**	2,940*	9,474*	9,293*
Dithane Z-78	2-100	50	41	35	4,608*	2,976*	9,438*	8,809
LSD at 5% Point					970	792	1,343	1,152
LSD at 1% Point					1,329	--	--	1,549

[a] Spray dates--S. C. May 26, June 2, 9, 17, 25. Md. July 9, 16, 29, Aug. 7, 18. Del. July 1, 8, 15, 22, 29, Aug. 4, 11.

[b] S.C.--Marketable yield
Md. --M = 4.5" and larger; T = Total number
Del.--Marketable yield (+5" and -5")

* = Significant at 5% Point
** = Significant at 1% Point

Table 2. Effect of fungicidal sprays and dusts on the control of downy mildew disease and on the yield of cucumbers, 1947.

Materials[a]	Concentration (lbs./gals) Del.	Concentration (dust) S.C.&N.C.	% Disease[b] S.C. (M)	S.C. (P)	N.C.	Del.	Marketable yield per acre[c] S. C. (Bu) (M)	S. C. (Bu) (P)	N.C. (lbs.) (A & C)	Del. (lbs.) (N.P.)
Untreated			63	--	83	88	0	--	10,032	8,263
Bordeaux	6-3-100	--	--	--	--	25	--	--	--	10,804
Compound A	3 1/3-100	7% Cu	21	20	40	40	29.0	150.0	13,428*	10,819
Cuprocide	--	6% Cu	27	15	--	--	30.3	154.9	--	--
Tribasic	3-100	5% Cu	--	--	40	35	--	--	13,152*	13,194**
Tribasic+Zn	--	5%Cu+3%Zn	--	--	43	--	--	--	13,928**	--
Fermate	2-100	10%	26	13	58	58	37.5	151.0	9,280	10,737
Zerlate	2-100	10%	25	10	60	40	39.9	198.4*	11,500	12,703*
Dithane Z-78	2-100	6%	31	30	54	40	20.6	124.9	12,356	14,125**
Parzate	2-100	6%	27	25	--	33	27.8	135.5	--	14,981**
LSD at 5% Point			9.6				NS	53.9	2,646	3,546
LSD at 1% Point			12.9						3,585	4,772

[a] Application dates: S. C. -- Aug. 21, 26, 30, Sept. 5, 10, 15, 20, 26, Oct. 2, 9
N. C. -- June 15, 23, 30, July 7, 14, 16
Del. -- July 1, 10, 18, 25, 31, Aug. 7

[b] N. C. data were given as percentage severity; the writer transferred them to percent disease to bring in line with other figures

[c] M = Marketer (mildew susceptible); P = Palmetto (mildew resistant); A & C = A & C variety; N. P. = National Pickling
Delaware data are for pickles.

Note for Table 2: Percentage of disease for Palmetto variety in South Carolina is due to a combination of mildew and fungicide injury. Copper compounds gave obvious injury. Most vigorous vines were from Zerlate. Dithane Z-78 dust "caked" in the humid climate of Charleston.

Bordeaux and Copper A gave obvious copper injury in Delaware; Tribasic was safer on the plants. Fermate caused some injury. Zerlate and Parzate gave the most vigorous vines in Delaware.

Table 3. Effect of fungicidal sprays on the control of downy mildew and anthracnose on Honeydew Melons, Blackville, South Carolina, 1947.[a]

Material	Concentration (lbs./gallons)	Percent diseased June 23	Percent defoliated June 26	July 2	July 7	July 12	Fruits infected with anthracnose July 7
Untreated		84	25	75	100	dead	96
Bordeaux	6-3-100	29	0	15	80	dead	44
Compound A	3 1/3-100	34	2	30	85	dead	60
Copper 34	4-100	44	2	35	90	dead	56
Fermate	2-100	23	0	20	70	90	16
Zerlate	2-100	18	0	20	75	90	10
Dithane Z-78	2-100	28	3	30	90	95	19

a Planted April 5. Spray dates: May 26, June 2, 9, 17, 25. One or two additional applications should have been put on in July but it is questionable as to whether or not further spraying would have checked the destruction of the vines by anthracnose long enough to mature a marketable crop. Both anthracnose and downy mildew acted to defoliate the vines but anthracnose was the more aggressive disease of the two. Only three mature, marketable fruits were harvested from the entire experiment. The copper sprays caused marginal chlorosis on the leaves, Bordeaux and Compound A severely and Copper 34 moderately.

Table 4. Effect of fungicidal sprays on control of black rot (*Mycosphaerella citrullina*) and on yield of butternut squash, Waltham Field Station, Massachusetts 1947.

Material	Concentration (lbs./gallons)	Total number fruit[a]	Percent infected
Untreated		451	30.9
Fermate	2-100	620	3.2
Zerlate	2-100	602	1.7
Parzate	2-100	605	2.8
Dithane Z-78	2-100	584	13.6
Bordeaux	6-3-100	558	6.2
Compound A	3 1/3-100	537	6.9

a The yield figures indicate the degree of control of blossom rot (*Choanephora cucurbitarum*). The higher the yield the better the control.

Note (Table 4): Powdery mildew (Erysiphe cichoracearum) was very prevalent on the foliage of the untreated, Zerlate, and Dithane Z-78 plots. The other treatments gave good control.

It is obvious from the data in Table 2 that the organic fungicides do not control downy mildew as well as Bordeaux and some other copper compounds. However, except for possibly Fermate, they are less injurious to the plants than the copper compounds. The yield data from State to State are too variable to be compared, but they show that Tribasic bears watching and that Fermate was less satisfactory than Zerlate, Parzate, and Dithane Z-78; Zerlate was the top treatment in South Carolina, good in Delaware, but only fair in North Carolina. Parzate and Dithane Z-78 were the top treatments in Delaware but the poorest in South Carolina.

J. D. Wilson (Ohio) also submitted a report containing the following information: Zerlate, Fermate, and Dithane were less injurious than the coppers -- Parzate gave some injury, but not as severe as the coppers; Zerlate gave the highest yield, perhaps significantly better than the coppers, but not much better than the other organics. Results were complicated by insecticide injury.

C. E. Cox (Maryland) reported the following data on percentage defoliation -- Untreated, 74 percent; Dithane Z-78, 67 percent; Zerlate, 41 percent; Tribasic, 33 percent. These data were not statistically significant.

Honeydew Melons

A test was conducted by C. J. Nusbaum (South Carolina). The data are presented in Table 3.

These data are of particular significance as they show clearly that the organics (Zerlate, Fermate, Dithane Z-78) are far superior to the coppers for anthracnose control.

Butternut Squash

A power-spray test was conducted by E. F. Guba (Massachusetts). Six applications were made from July 23 to September 17. Data are presented in Table 4.

General Summary

The data obtained during the 1947 tests are not sufficiently extensive to draw general conclusions. It appears, however, that Zerlate has a definite place in the cucurbit disease control program, and that Parzate and Dithane Z-78 should be further evaluated. Except in a few instances, the yield response of plants treated with the dithiocarbamates has been very good.

As regards the control of specific diseases, the data show the following: (1) that the copper fungicides are somewhat better than the dithiocarbamate fungicides for the control of downy mildew disease and powdery mildew disease; (2) that the dithiocarbamate fungicides are better than the copper fungicides for the control of anthracnose disease on honeydew melons and the black rot and blossom rot diseases of squash.

UNIVERSITY OF DELAWARE, NEWARK, DELAWARE

COOPERATIVE TESTS OF FUNGICIDES FOR CONTROL OF DISEASES OF ORNAMENTAL PLANTS

A. W. Dimock

Snapdragon Rust

Cooperators: W. D. McClellan, U.S.D.A., Beltsville, Maryland; J. L. Forsberg, Illinois Natural History Survey, Urbana, Illinois; K. F. Baker, University of California, Los Angeles, California; H. A. Runnels, Ohio Agricultural Experiment Station, Wooster, Ohio; A. W. Dimock, Cornell University, Ithaca, New York.

Materials tested: The materials used, as indicated in the table, were those which had been recommended for snapdragon rust control in one region or another or had shown promise in preliminary tests. No attempt was made to evaluate a large number of the newer fungicides.

Planting stock and plot layouts: All plants were of the variety Afterglow raised locally from seed distributed from a single seed lot. Planted in field in uniform randomized block layout, 4 replicates per treatment, 15 to 25 plants per replicate.

Rating: Plants arbitrarily classified as follows: 0 = Healthy or trace; 1 = light, up to 10 infections per plant; 2 = moderate infection; 3 = severe infection, leaves, branches, or plants dead.

Results: Sufficient rust for reliable comparisons did not develop at Beltsville and Urbana. Data from Los Angeles, Wooster and Ithaca in following table:

Treatment	Average treatment rating: Ohio	California	New York
Check	1.71	2.96	3.00
Parzate 2#/100 gals.	0.00	0.58	0.35
Rosin lime-sulfur 2%	0.64	0.93	0.82
Fermate 2#/100 gals.	0.03	1.52	1.00
Wettable sulfur 3#/100 gals.	1.37	2.42	1.86
Bordeaux 8-8-100	0.17	2.45	2.97
	(8 applications)	(12 applications)	(9-10 applications)

DuPont Spreader-Sticker (1/1000) with all except rosin-lime-sulfur.

General comments:

1. Parzate gave excellent control at all localities.
2. Wettable sulfur failed in all localities.
3. Rosin lime-sulfur gave excellent control but was injurious under humid conditions of Wooster and Ithaca.
4. Fermate only moderately effective and Bordeaux ineffective with high disease potential, both very effective with moderate disease potential.
5. Under moist conditions at Ithaca, Bordeaux, though failing to control rust, prevented injury by controlling secondary invaders; under dry conditions at Los Angeles, Bordeaux-sprayed plants severely injured by dessication.

Septoria Leafspot of Chrysanthemums

Cooperators: McClellan, Forsberg, Runnels, Dimock.

Materials: Same as for snapdragon rust, except that Phygon at 2 lbs./100 gals. substituted for wettable sulfur.

Results: Disease developed adequately only at Ithaca, where all materials gave good control. Slight injury from Bordeaux noted at Wooster and Ithaca; severe injury from rosin lime-sulfur at Beltsville, Wooster and Ithaca; slight injury from Phygon at Ithaca.

Gladiolus Corm Treatments

Cooperators: McClellan, Forsberg, Runnels, Dimock, Ray Nelson, Michigan State College, East Lansing, Michigan, C. J. Gould, Western Washington Agricultural Experiment Station, Puyallup, Washington.

Materials tested: New Improved Ceresan, 1 lb./50 gals., 15 min.; Lysol, 1 qt./50 gals., 6 hrs.; Calogreen, 6 lb./50 gal., 5 min.; Arasan SF, 6 lb./50 gal., 5 min.; Parzate, 6 lb./50 gal., 5 min.; bismuth subsalicylate, 2 lb./50 gal., 5 min.; Dowicide 9B, 4 lb./50 gal., 3 hrs.; Puratized Agricultural Spray, 1:10,000 active, 15 min.

Planting Stock: In all but one case, locally obtained #5 Picardy corms were used. A uniform randomized block layout was employed with 100 to 150 corms in each of 4 replicates for each treatment.

Results: While differences in results due to soil and climate were anticipated, the use of different planting stocks in each locality introduced a variable which made any comparison of results out of the question, and no general conclusions could be drawn. It was apparent that for tests of this type to be significant the planting stock should all come from a single collection. The data collected in this season's tests are being circulated to the different cooperators.

CORNELL UNIVERSITY, ITHACA, NEW YORK

SUMMARY OF DATA FROM NATIONAL COOPERATIVE POTATO SPRAY FUNGICIDE EXPERIMENT

W. F. Buchholtz

Contributors of data, by States:

Maine................	Reiner Bonde
Connecticut..........	Saul Rich
Rhode Island.........	John B. Rowell
New York.............	Robert C. Cetas
Pennsylvania.........	H. W. Thurston, Jr.
Ohio.................	J. D. Wilson
Delaware.............	J. W. Heuberger
New Jersey...........	John C. Campbell
Indiana..............	R. W. Samson
Michigan.............	J. H. Muncie
Iowa.................	W. J. Hooker
Minnesota............	Carl J. Eide
South Dakota.........	C. M. Nagel
North Dakota.........	Wm. G. Hoyman
Summary compiled by..	W. F. Buchholtz

PLAN OF THE EXPERIMENT

Spray Treatments

1. Check, no fungicide..........	
2. Bordeaux......................	8-8-100
3. Copper oxychloride sulphate..	4-100
4. Dithane D-14 + zinc sulphate + lime......................	4-1-1/2-100
5. Parzate.......................	2-100
6. Zerlate.......................	2-100
7. Phygon........................	1-100

DDT, 50%, 1 1/2 lb.-100, included in all fungicide sprays, and applied alone to all no fungicide check plots.

SPRAY MATERIALS were supplied by the manufacturer, to all cooperators from one batch of each material. All were used without added spreaders or stickers.

SPRAY EQUIPMENT was that available to individual experimenters. PRESSURES and DOSAGES were those effected by the equipment available.

PLOT SIZE varied; 50 feet of row was suggested. Four to six REPLICATIONS were most commonly used.

VARIETY and CULTURAL PRACTICES were those locally adapted and used.

DEFOLIATION PERCENTAGES were estimated after the method of Horsfall and Barratt. Total YIELDS were determined at harvest time.

Selection of spray materials and planning of the experiment were undertaken after all prospective cooperators had been consulted by correspondence.

The following major objectives and prerogatives of the experiment should be kept in mind:

1. The overall committee was charged with evaluating the "newer organic fungicides".

2. To determine locally adapted fungicide spray or dusting programs is a local problem, not a feasible immediate objective of such a cooperative effort.

3. To be accepted and successful, it was deemed necessary to keep the experiment relatively small.

RESULTS

Table 1 contains information descriptive of the 21 individual experiments in 14 States. Each experiment is listed by number, according to location and State. In all succeeding tables, numbers at tops of columns refer to experiment numbers so listed in table 1. Experiments 1 to 9, inclusive, are those in which late blight was present in considerable abundance. In experiment 10 to 21, inclusive, late blight was absent or present in amounts insufficient to affect the experiment. All succeeding tables are arranged according to this grouping of the experiments.

Tables 2 and 3 list mean total yields and percentages of defoliation, if submitted, by treatments for all experiments, those with late blight in table 2, those without late blight in table 3. Treatments are not listed in table 3, but treatment order is the same as in table 2. Minimum significant differences (M.S.D.) at the 5 percent level are listed for each experiment unless mean differences were not significant (N.S.)

Tables 4 and 5 list the yield ranks of treatments by experiments, those with late blight in table 4, those without late blight in table 5. Ranks of spray treatments which were lower in yield than the checks are underlined, except for the Michigan experiment (17), in which lack of spray wheel damage caused the checks to be highest in yield.

It is evident that in the 9 experiments with late blight, (table 4), Parzate, Dithane, CCCS and Bordeaux all ranked high in yield. In Maine, late blight was severe, but late; the Maine results tend to lower unduly the average yield rank of Bordeaux and perhaps similarly raise the yield rank of Zerlate.

Dithane, Parzate and Zerlate are high in yield rank in the 12 experiments without late blight (table 5).

Phygon is low in yield rank in both table 4 and table 5.

Tables 6 and 7 list the defoliation ranks of treatments, by experiments, those with late blight in table 6, those without late blight in table 7. Defoliation estimates were not submitted for some experiments; in some there was no defoliation. Average yield ranks for the experiments for which defoliation estimates were available are listed alongside average defoliation ranks. Also listed in tables 6 and 7 are average yield ranks for all experiments, as they appear in the right hand column of tables 4 and 5.

It is evident that average ranks of treatments by defoliation are similar to ranks by yields for the same treatments. A notable exception is Bordeaux in the experiments without late blight (table 7). Its average yield rank is low, comparable to that of the unsprayed check, whereas its average defoliation rank is considerably higher. While not so striking as in table 7, the same tendency for Bordeaux to rank lower in yield than in defoliation comparisons is evident in table 6, compiled from experiments in which late blight was present.

However, the copper-containing sprays, Bordeaux and COCS were ranked relatively better by both yield and defoliation comparisons in experiments with late blight present (table 6) than in experiments with late blight absent (table 7). Bordeaux was the only treatment which provided adequate control of the severe late blight which prevailed in three experiments in two States (New York, 4; Ohio, 7, 8).

Stimulation by the organics, particularly those containing zinc, was suggested by contributors of data in three States, Minnesota, North Dakota and New Jersey.

Brief statements concerning the various experiments, submitted by cooperators with their data, are presented, by States, after table 7.

Table 1. Location, diseases present, number and dates of sprays, variety, and planting and harvest dates for the 21 experiments in 14 States.

State, Location	Diseases Present: Late Blight	Early Blight	Others	Sprays: No.	Dates	Variety	Planting date	Harvest date
1. Maine, Presque Isle	heavy	+		7	7/14-9/11	Katahdin	5/25	9/27-29
2. Connecticut, Mt. Carmel	+	.		10	7/19-9/18	Katahdin	6/11	11/3
3. Rhode Island, Kingston	heavy	heavy		10	6/30-9/4	Green Mountain	4/24	10/9
4. New York, eastern	heavy	heavy	Botrytis blight	11	6/10-8/19	Green Mountain	3/23,24	9/3-18
5. Pennsylvania,	heavy	+		10	7/1-9/11	Katahdin	5/25	10/5,6
6. State College	heavy	+		10	7/1-9/11	Rural Russet	5/25	10/3,4
Ohio,								
7. Wooster	severe	tr		7	7/18-9/18	Katahdin	6/13	10/15
8. Wooster	severe	tr		7	7/18-9/19	Katahdin	6/15	10/16
9. McGuffey	abund.	severe		7	6/27-8/25	Cobbler	5/20	10/1,2
10. Wooster	moder.	severe		7	6/10-8/7	Cobbler	5/12	9/5
11. Marietta	tr.	+		6	6/10-7/30	Cobbler	5/1	8/24
12. Delaware, Georgetown	+	+		6	8/4-9/30	Dakota Red	6/20	10/19
13. New Jersey Cranbury	tr.	-		8	6/11-8/11	Katahdin	4/29	9/29,30

State, Location	Diseases Present			Sprays		Variety	Planting date	Harvest date
	Late blight	Early blight	Others	No.	Dates			
Indiana,								
14. Lafayette	-	tr		4	6/3-7/15	Cobbler	4/15	8/9
15. Newland	-	+		5	7/3-8/18	Katahdin	5/30	9/24
16. Newland	-	+		5	7/3-8/18	Chippewa	5/30	9/24
17. Michigan, Lake City	-	+		7	7/15-9/15	Menominee	6/10	9/30-10/3
18. Iowa, Crystal Lake	-	severe		4	7/15-8/30	Cobbler	5/14	9/25
19. Minnesota, Crookston	tr	tr		7	7/14-9/12	Chippewa	6/20	9/23
20. South Dakota, Brookings	-	+		3	8/12-9/12	Bliss Triumph	5/20	10/25
21. North Dakota, Grand Forks	-	+		6	7/15-9/4	Bliss Triumph	5/15	10/8

Table 2. Yields and percentages of defoliation in potato spray plots in 9 similar experiments in 6 northeastern States (late blight present in these experiments).

	1	2	3	4	5	6	7	8	9
	Maine	Connec-ticut	Rhode Island	New York	Pennsylvania		Ohio		
							Wooster	Wooster	McGuffey
Check	538	283	344	287	318	243	288	263	644
	Dead	10	100	96		95	69	90	82
Bordeaux	528	356	473	393	363	315	440	324	815
	44	4	34	48		3	49	32	61
COCS	582	364		341	381	321	415	314	777
	50	2 1/2		68		5 1/2	45	45	66
Dithane	593	362	528	342	352	341	393	311	854
	46	1	48	89		4	49	47	49
Parzate	599	348	560	360	374	339	419	340	856
	40	4	18	67		4	32	42	34
Zerlate	600	300	486	339	375	284	402	306	806
	55	3	77	97		90	49	57	42
Phygon	542	347	447	331	330	266	398	288	790
	52	3 1/2	57	58		58	42	52	56
M.S.D.	37	42	28	52	41	19	33	27	73

Table 3. Yields and percentages of defoliation in potato spray plots in 12 similar experiments in 9 eastern and midwestern States (late blight absent from these experiments).

10 Ohio Woos-ter	11 Ohio Mari-etta	12 Dela-ware	13 New Jersey	14 Indiana Lafay-ette	15 Indiana Newland	16 Indiana Newland	17 Mich-igan	18 Iowa	19 Minne-sota	21 South Dakota	22 North Dakota
354	365	52	403	162	372	402	248	121	119	197	257
98	86	100					36	65		95	94
445	491	77	405	160	339	417	192	112	121	209	269
54	50	53					3	33		95	81
438	466	79	385	160	322	379	204	127	122	239	273
75	52	70					12	44		92	88
465	540	91	464	161	398	406	217	141	127	246	289
51	39	58					4	26		82	72
461	452	104	433	170	348	361	233	140	131	241	279
51	62	23					6	24		81	75
459	545	77	431	172	384	397	203	122	124	250	284
54	39	60					7	31		86	72
470	460	52	404	163	324	357	201	114	125	218	272
80	72	80					12	54		85	84
50	52	28	33	9	N.S.	N.S.	N.S.	22	N.S.	35	24

Table 4. Rank of treatments, by yield, in 9 experiments in 6 northeastern States (late blight present in these experiments).

	1 Maine	2 Conn.	3 R. I.	4 N. Y.	5 Penn.	6 Penn.	7 Ohio	8 Ohio	9 Ohio	Ave.
Check	6	7	6	7	7	7	7	7	7	6.8
Bordeaux	7	3	4	1	4	4	1	2	3	3.2
COCS	4	1		4	1	3	3	3	6	3.1
Dithane	3	2	2	3	5	1	6	4	2	3.1
Parzate	2	4	1	2	3	2	2	1	1	2.0
Zerlate	1	6	3	5	2	5	4	5	4	3.9
Phygon	5	5	5	6	6	6	5	6	5	5.4

Table 5. Rank of treatments, by yield, in 12 experiments in 9 eastern and midwestern States (late blight absent from these experiments).

	10 Ohio	11 Ohio	12 Dela.	13 N.J.	14 Indiana	15 Indiana	16 Indiana	17 Mich.	18 Iowa	19 Minn.	20 S.D.	21 N.D.	Ave.
Check	7	7	6	6	4	3	3	1	5	7	7	7	5.3
Bordeaux	5	3	5	4	6	5	1	7	7	6	6	6	5.1
COCS	6	4	3	7	6	7	5	4	3	5	4	4	4.8
Dithane	2	2	2	1	5	1	2	3	1	2	2	1	2.0
Parzate	3	6	1	2	2	4	6	2	2	1	3	3	2.9
Zerlate	4	1	4	3	1	2	4	5	4	4	1	2	2.9
Phygon	1	5	6	5	3	6	7	6	6	3	5	5	4.8

Table 6. Rank of treatments, by percentage of defoliation, in 7 experiments in 6 northeastern States (late blight present in these experiments). Yield ranks in the same 7 experiments and in all 9 experiments are listed for comparison.

	1 Maine	2 Conn.	3 R.I.	4 N.Y.	6 Penn.	8 Ohio	9 Ohio	Ave.	Yield rank (7)	Yield rank (9)
Check	7	7	6	7	7	7	7	6.7	6.7	6.8
Bordeaux	2	5	2	3	1	1	5	2.7	3.4	3.2
COCS	4	2		6	4	3	6	4.2	3.0	3.1
Dithane	3	1	3	2	2	4	3	2.6	2.4	3.1
Parzate	1	5	1	5	2	2	1	2.4	1.9	2.0
Zerlate	6	3	5	1	6	6	2	4.1	4.1	3.9
Phygon	5	4	4	4	5	5	4	4.4	5.4	5.4

Table 7. Rank of treatments, by percentage of defoliation, in 7 experiments in 6 eastern and midwestern States (late blight absent from these experiments). Yield ranks in the same 7 experiments and in all 12 experiments are listed for comparison.

	10 Ohio	11 Ohio	12 Dela.	17 Mich.	18 Iowa	20 S.D.	21 N.D.	Ave.	Yield rank (7)	Yield rank (12)
Check	7	7	7	7	7	6	7	6.9	5.7	5.3
Bordeaux	3	3	2	1	4	6	4	3.3	5.6	5.1
COCS	5	4	5	5	5	5	6	5.0	4.0	4.8
Dithane	1	1	3	2	2	2	1	1.7	1.9	2.0
Parzate	1	5	1	3	1	1	3	2.1	3.0	2.9
Zerlate	3	1	4	4	3	4	1	2.9	3.0	2.9
Phygon	6	6	6	5	6	3	5	5.3	4.9	4.8

Brief statements by contributors of data:

MAINE - Crop very late; killing frost September 20 prevented greater differences between treatments. Late blight severe, but late.

CONNECTICUT - Late blight very light; stopped September 13. All spray treatments but Zerlate significantly above check in yield.

RHODE ISLAND - Late blight severe late July until August 28; then early blight severe. Parzate, Dithane high in yield; Parzate, Bordeaux best prevented defoliation. Bordeaux apparently suppressed yield through injury. Phygon controlled late blight, not early blight.

NEW YORK - Early and late blight severe after July 20. Bordeaux gave adequate control, Parzate promising. Dithane inadequate for severe late blight control when applied weekly. Phygon controlled late blight, but gave low yield. Zerlate failed to control late blight. COCS not equal to Bordeaux.

PENNSYLVANIA - Late blight first found July 21; no spread for 3 weeks; heavy by September 16. Alternaria present but never serious.

OHIO - Early blight only on early potatoes at Marietta and Wooster. Late blight on muck at McGuffey. Late blight was late but severe on late-planted Katahdins at Wooster. Bordeaux and Parzate slowed it down but in general a 10-day schedule of organics didn't hold late blight at Wooster.

DELAWARE - September 30 defoliation due entirely to early blight. Copper plots, particularily Bordeaux, had more frost damage than organic plots. No late blight present.

NEW JERSEY - Practically no disease present in check plots. Organic fungicides definitely superior to coppers in ability to increase yields. Insect populations during season similar in all plots. Looks like yield stimulation by organics. (Dithane, Parzate, Zerlate - W.F.B.)

INDIANA - Rainfall was very deficient. No late blight developed. Abundant early blight just before frost. No fungicide outstanding. Perhaps Bordeaux depressed yields slightly.

MICHIGAN - No late blight. Early blight increased rapidly after September 5. Killing frost September 24. Irrigated 4 times.

IOWA - Early blight abundant by August 20. Bordeaux, Dithane, Parzate and Zerlate seemed to control it; Phygon and COCS did not. Dithane and Parzate high in yield. Bordeaux low.

MINNESOTA - Only traces of late and early blight when vines killed by frost September 22. Increases in vine weight (September 18, 19) indicates zinc had stimulatory effect in absence of disease.

SOUTH DAKOTA - Disease this year was early blight; it appeared quite late. Defoliation and yield differences apparent but not striking.

NORTH DAKOTA - Dithane and Zerlate plots highest in yield and early blight control. Copper sprays or dusts not very effective in controlling early blight. Zinc seems beneficial in the Valley.

IOWA STATE COLLEGE, AMES

REPORT OF THE SECTION ON FUNGICIDE TESTS ON THE STONE AND SMALL FRUITS

H. F. Winter

Introduction

On the basis of answers to a questionnaire sent to interested workers in the field of fungicide testing on stone and small fruits, five funicide treatments were selected for use on each of three fruit crops, namely, peaches, cherries, and grapes. When the results came in at the close of the season, it was found that most of the cooperators could not adhere very closely to the five treatment program. Consequently, the data submitted did not lend itself well to the formation of any sort of summary table. This report therefore consists of individual reports by cooperators in their various States, and a brief summary statement for each of the three fruit crops involved. The data submitted are those of the cooperators named.

The cooperation and effort and good will extended by those taking part in this project are appreciated.

Contributors of Data, by States

Delaware	Spencer H. Davis
Michigan	Donald Cation, John Vaughn
Illinois	Dwight Powell
New York	J. M. Hamilton, Alvin J. Braun
New Hampshire	M. C. Richards
Oklahoma	G. J. Gray, W. R. Kays, W. W. Ray
Ohio	H. F. Winter, H. C. Young
West Virginia	C. F. Taylor
Wisconsin	G. W. Keitt, J. Duain Moore

Peach

Table 1. Cooperative fungicide test on peaches, Hale Haven Variety at Milton, Delaware. Spencer H. Davis -- 1947

Treatment (lbs per 100 gal.)	Percentage Brown Rot at harvest
Check	35.3
Sulforon - Zinc sulfate - Lime 6-8-8	18.4
Zerlate - Lime 2-3	22.7
Fermate 2	21.2
Parzate - lime 2-3	21.2
Parzate 50%, Zerlate 50% - Lime 2-3.	15.9
Parzate 50%, Fermate 50% 2	18.5
Zinc-8-Quinolinolate - Lime 1-2	30.8
Phygon - S S. 3/4 - 1 pt.	29.7
L.M.S.D. 5% point	19.24*

Spray dates: 5/21, 6/3, 6/16, 6/26, 7/7, 7/17, 7/28.
Fruit counts made 8/7. Harvest on 8/8.

Comments:
1. Arsenical injury observed on Fermate, Parzate-Fermate, Parzate, Zerlate, and Parzate-Zerlate plots.
2. Zinc-8-Quinolinolate impossible to get into complete suspension.

Table 2. Cooperative fungicide test on peaches in Michigan. -- Donald Cation and John Vaughn -- 1947

Treatment[a] (lbs. per 100 gals.)	Percentage Brown Rot (after storage)[b]
Magnetic "70" paste (2 applications) L.L.S. 1 qt. (last application)	55.5
Zerlate 1 1/2	68.0
Wettable sulfur (3M) 5	69.0
Phygon 1	75.0
Parzate 1 1/2	79.0
Zinc-8-Quinolinolate 1	87.0
Check (no fungicide)	89.5

[a] Trees sprayed three times beginning one month before harvest. Last spray applied 8 days before harvest.

[b] Fruits were picked in clean baskets and stored at low temperature for two days and at room temperature for 4 days before counting.

Table 3. Cooperative fungicide test on peaches[a], Southhaven Variety at Wooster, Ohio. -- H. F. Winter and H. C. Young -- 1947

Treatment[b] (lbs. per 100 gals.)	Brown Rot (at harvest) Percent	Angle
Micronized sulfur 6	10.94	18.72
Magnetic "70" paste[c]	8.56	16.60
Flotation paste 8[c]	12.94	20.38
Zerlate 2....................	5.76	13.48
Phygon 1/2...................	7.60	15.82
Zinc-8-Quinolinolate 1......	8.88	17.27
Zinc-8-Quinolinolate 1/2....	16.86	23.54
Magnetic "70" paste 8[d]......	7.30	14.94
Magnetic "70" paste 8[d]......	9.19	17.26
Check (No fungicide)........	21.28	27.15

L.S.M.D. 5% level = 5.490 angles
L.S.M.D. 1% level = 7.340 angles

[a] Single tree plots replicated 6 times.
[b] Sprays applied as follows: Shuck Fall 5/27, 1st cover 6/12, 2nd cover 7/28, 3rd cover 8/11, preharvest 8/23. Harvest started 8/27.
[c] In addition to above, a pink spray was applied.
[d] Fungicide omitted from shuck-fall application.

Table 4. Cooperative fungicide test on peaches in Illinois. -- Dwight Powell -- 1947

Treatment (lbs. per 100 gallons)	Percentage Brown Rot: At harvest, Georgia Bell	At harvest, Hale-haven	After storage, Georgia Bell	After storage, Hale-haven
Bioquin "100" 1........................	0.6	0.5	55.0	53.0
Bioquin "100" 3/4......................	1.4	1.7	70.0	86.0
Bioquin "100" 1/2......................	1.8	2.0	60.0	23.0
Bioquin "100" 1/4......................	4.0	0.7	48.0	62.0
Zerlate-Sulfur 1/4-3..................	1.7	0.3	42.0	14.0
Bioquin "100" 50%, Pyrax 50% 1.......	0.6	1.5	41.0	46.0
Bioquin "100" 50%, Bentonite 50% 1...	0.5	0.7	50.0	28.0
Bioquin "100" - Sulfur 1/4-3.........	1.5	0.9	54.0	32.0
Sulfur 6.............................	1.4	1.1	49.0	33.0
Bioquin "1" 1/4......................	1.0	0.4	32.0	62.0
Bioquin "1" - Sulfur 1/4-3...........	0.9	0.6	30.0	20.0
Bioquin "1" 50%, Florigel 50% 1......	1.5	0.1	25.0	34.0
Bioquin "1" 50%, Flo igel 50% 1/4....	1.0	0.2	28.0	33.0
Zerlate 1/2..........................	0.6	0.4	50.0	50.0
Zerlate 1/4..........................	1.0	0.4	52.0	22.0
Check (no fungicide).................	2.5	0.6	65.0	44.0

Summary Statement of Peach Fungicide Test.

The most striking single fact emerging from a study of the results of this cooperative test is that none of the materials tested really controlled brown rot (Monilinia fructicola] under the apparently widespread favorable conditions for disease development during 1947. This was particularly true when rot counts were made after a short storage period. It is interesting to note that in several cases harvest records indicated little damage from rot, but that in the same tests rot developed rapidly in storage. Apparently there is a particular need for better timing of fungicide application and perhaps better materials for the control of after-harvest rot.

While it was difficult to evaluate the materials from the results submitted, it seems fairly obvious that none of the new organic fungicides demonstrated their superiority over the best inorganic sulfur materials. However, from the results given, it appears that Zerlate and Bioquin "1" alone, and in combination with other materials, especially sulfur, are worthy of further trial.

Cherry

Table 5. Fungicide test for control of cherry leaf spot in West Virginia. -- C. F. Taylor -- 1947

Treatment (lbs. per 100 gal.)[a]	Leaves retained (%) 7/25	8/27	10/10
Tenn. "26" - lime 3-3	91.8	83.5	41.0
C.O.C.S. - lime 1 1/2-3	94.7	78.1	7.6
Bordeaux 1-3-100	92.5	81.1	21.3
Phygon 1[b]	56.9	21.9	0.4
341-C 1 qt. (1st 2 sprays)[b]	92.7		
341-B 1 1/2 lb. (last 3 sprays)		18.9	0.6
Check[c]	13.5	2.2	0.0
L.S.M.D. (5% level)[d]	6.07	15.4	16.01
L.S.M.D. (1% level)	8.46	21.21	22.04

[a] Treatments applied 5/7, 5/20/ 5/31, 6/18, 7/12.
[b] 3 lbs. lime added to sprays applied 5/20 and 5/31. 1/2 lb. lime added to 341-C spray 5/7.
[c] Sprayed with Phygon 6/18 and Ten "26" 7/12
[d] Check tree data omitted from statistical treatment of foliage data.

Comments:

Difference in size of fruit with different treatments was not significant.

Of the copper materials used Bordeaux 1-3-100 caused "copper ring" type injury to 26.0% of fruits, C.O.C.S.-lime 3-3 caused 22.2% and Tenn. "26"-lime 3-3 caused 16.6% injury. None of this type injury was evident when Phygon and 341 were used.

Table 6. Fungicide test for cherry leaf spot control at Stillwater, Oklahoma. G. F. Gray, W. R. Kays, and W. W. Ray -- 1947

Treatment (lbs. per 100 gal.)[a]	% Leaves retained Aug. 28 Large trees	Small trees
Bordeaux 1-2-100	97.87	77.22
Tenn. Tribasic (53%) - lime 1 1/2-5	98.43	98.44
Dodge Tribasic (53%) - lime 1 1/2-5	99.17	90.36
Fermate 1	97.94	93.05
Tenn. Tribasic 7% dust	--	73.99
Dodge " 7% dust	--	95.75
Fermate 10% dust	--	98.74
Check	94.41	74.27

[a] Dates of spray application: Petal fall 5/2, Shuck fall 5/9, Post harvest 6/24.

Table 7. Fungicide test for cherry leaf spot control at Egg Harbor, Wisconsin. J. Duain Moore -- 1947.

Treatment (lbs. per 100 gallons[a]	Leaves retained[b] %	Average no. lesions per leaf on foliage remaining	Increase or decrease in fruit size %
Bordeaux 6-8-100 (1) 3-4-100 (2,2A,3)	97.9	0.12	Standard
" 6-8-100 (1,2,3)	97.1	0.20	+5.3
Tenn. "26"-lime-orthex 3-3-1 pt. (1,2,2a) Bordeaux 3-4-100 (3)	98.1	0.31	+3.2
Tenn. "34"-lime-orthex 3-3-1 pt. (1,2,2A) Bordeaux 3-4-100 (3)	98.6	0.12	+3.9
Fermate-lime 1 1/2-1 1/2 (1,2,2A) Bordeaux 3-4-100 (3)	98.8	0.12	+5.0
Compound 341-B 3(1,2,2A) Bordeaux 3-4-100 (3)	98.2	0.36	+4.7
C.O.C.S.-lime 1 1/2-3 (1,2,2A) Bordeaux 3-4-100 (3)	98.0	0.25	+0.7
Phygon 1 (1,2,2A) Bordeaux 3-4-100 (3)	97.7	0.15	+8.5
Bordeaux 6-8-100 (1) Tenn. "34"-lime-Dowax 3-3-1 (2,2A) Bordeaux 3-4-100 (3)	98.1	0.35	+9.2
Check (No fungicide)	35.0	46.22	--

[a] Dates of spray application (1) June 12; (2) June 25; (2A) July 8; (3) Aug. 12. Lead arsenate added 2-100 in (1,2)

[b] Data taken on 300 leaves per tree.

Table 8. Cherry leaf spot fungicide test at Clyde, Ohio. H. C. Young and H. F. Winter -- 1947.

Materials in 100 gallon water (lbs.)	Leaves retained Sept. 25 Percent
Bordeaux 1 1/2-3-100	40.0
" 1-2-100	60.0
C.O.C.S. - Lime 1 1/2-3	95.0
Tenn. "26" - Lime 3-3-	95.0
Tenn. "26" - Lime 2-2 + liquid Orthex 1 pint	95.0
C.O.C.S. - Lime 1-2 + liquid Orthex 1 pint	95.0
Phygon 1 lb.	65.0
Compound 341 - "A" 2 1/2 lb. + Lime 3 lb.	20.0
" 341 - "B" 3 lb. + Lime 3 lb.	25.0
" 341 - "C" 1 qt. + Lime 3 lb.	85.0
Bioquin "1" 1/2 lb.	50.0

Spray dates -- May 28th, June 9th, June 24th, July 7th, and July 25th.

Comments:

1. Leaf loss in Bordeaux treatments due largely to injury.
2. Compound 341-C caused only trace of fruit injury.

Table 9. Fungicide test for cherry leaf spot control at Geneva, New York. J. M. Hamilton -- 1947.

Treatment (lbs. per 100 gallons)[a]	Percentage leaves retained Sept. 4	Oct. 3
C.O.C.S. - Lime 1 1/2-3	91.8	55.6
Fermate 1 1/2	96.1	61.3
Phygon - Lime 1-2	65.0	0.0
341-B - Lime 3-2	63.4	0.0
Micronized sulfur - Lime - Orthex 5-2-1 pt.	28.2	0.0
341-B - Lime 1-2	47.8	0.0
341-C - Lime 1 pt.-2	55.1	0.0
341-C - Lime 1 qt.-2	91.4	64.5
Cupro K - Lime 3-3	94.2	59.2
Cupro K - Lime - Orthex 3-3-1 pt.	94.3	82.2
Tenn. "26" - Lime 3-3	97.0	89.7
Bordeaux 1 1/2-6-100 + M.S. 1	98.2	96.0
C.O.C.S. - Lime - Orthex 1 1/2-3-1 pt.	97.5	80.5

a Spray dates 5/24, 6/2, 6/13, 6/27, 7/30. All treatments sprayed with Bordeaux 1-3-100 on May 24. Differential treatments started June 2.

Comments:

1. Fixed coppers apparently superior to organics and sulfur.
2. Fermate was excellent early, but did not hold through postharvest period. Breakdown suggested.
3. Tenn. "26" gave best control and has greater retention than C.O.C.S. or Cupro K.
4. Addition of Orthex improved retention of C.O.C.S. and Cupro-K.
5. 341-B apparently was lacking in retention.

Summary Statement of Cherry Fungicide Test.

The test herein reported concerns the cooperative testing of fungicides for the control of one disease, namely, cherry leaf spot [Coccomyces hiemalis]. Results have been submitted for tests conducted in five States. The original five-fungicide program again was not closely followed, but the reports are nevertheless interesting.

In general, the fixed copper materials with lime have controlled leaf spot better than the organics. Of the fixed coppers tested Tenn. "26" was better in two trials and equal to C.O.C.S. in two others. Bordeaux 1-2-100 and 1 1/2-3-100 were somewhat inferior to the fixed coppers. Phygon has apparently controlled leaf spot well in the early summer, but failed to hold the disease later in the season. Fermate is in somewhat the same category, but when a copper was used in post-harvest results were excellent. Compounds 341 A and 341 B have failed to satisfactorily control leaf spot. Compound 341 C proved superior to the other formulations of 341, but some fruit injury was reported.

Grape

Table 10. Fungicide test for grape black rot control in New York. Alvin J. Braun — 1947.

Treatment (lbs. per 100 gal.)	Berries rotted (percent) Branchport[d]	Tivoli[e]
Fermate[a] 1.........	1.0	1.3
Fermate[a] 2.........	0.1	0.2
Bordeaux[b] 4-4-100..	0.2 (S.I.)[c]	15.6 (S.I.)[c]
Bordeaux[b] 8-8-100..	0.2 (S.I.)[c]	10.2 (S.I.)[c]
Zerlate[a] 2.........	1.3 (S.I.)[c]	--
Check (No fungicide)	28.8	72.2
L.S.M.D. (5% level)	6.5	3.9
" (1% level)	9.1	5.5

Variety -- Concord

[a] Dupont spreader-sticker added -- 4 oz/100 gal. in pre-bloom, 8 oz/100 gal. in later sprays.
[b] Rosin fish oil soap added -- 1 lb/100 gal in pre-bloom, 2 lb/100 gal. in later sprays.
[c] S.I. -- Moderate to severe spray injury developed in August.
[d] Spray schedule -- Shoots 8-12 inches 6/7, immediately before bloom 6/23, after bloom 6/30, 7/10, and 7/21.
[e] Spray schedule -- Before bloom 6/12, after bloom 6/25, and 7/11.

Table 11. Grape black rot fungicide test at Avon, Ohio. H. F. Winter -- 1947.

Materials in 100 gallons water	Black Rot (Berries Rotted) Percent	Angles
Bordeaux 4-6-100 (1st 3 sprays)		
" 2-3-100 (4th spray)	7.94	16.28
Tenn. "26" 4 lb, lime 4 lbs. (1st 3 sprays)		
" "26" 2 lb, " 2 lbs. (4th spray)	11.54	19.68
C.O.C.S. 2 lbs, lime 4 lbs. (1st 3 sprays)		
" 1 lb., " 2 lbs. (4th spray)	14.12	21.70
Fermate 2 lbs	0.15	1.98
Zerlate 2 lbs	0.47	3.86
Fermate 2 lbs. (1st 3 sprays)		
Tenn. "26" 2 lb., lime 2 lbs. (4th spray)	1.04	5.16
Fermate 2 lbs., Goodrite P.E.P.S. 1/2 lb.	0.10	1.45
Phygon 1 lb. (1st 2 sprays)		
" 3/4 lb. (3rd spray)		
" 1/2 lb. (4th spray)	2.62	9.06
Check (no fungicide)	25.76	

Spray dates -- May 26th, June 10th, July 2nd, and July 23rd.
L.S.M.D. (In angles) -- .05 level = 3.1345
.01 level = 4.1939

Summary Statement of Grape Fungicide Test.

Data are submitted for fungicide trials for the control of grape black rot [Guignardia bidwellii] in two States, New York and Ohio. Very limited reports were received also from Oklahoma and New Hampshire, but were of such nature that tables of results could not well be devised.

In brief, Fermate demonstrated its superiority over Bordeaux and the fixed coppers for black rot control. This was also found to be true in the report submitted by M. C. Richards from New Hampshire. Zerlate controlled the disease well, but caused injury in the New York test. Phygon was inferior to Fermate for control and caused fruit spotting in Ohio.

Since Fermate controls black rot so well, but is ineffective against mildew, a split schedule of Fermate and copper is suggested for further trials.

OHIO AGRICULTURAL EXPERIMENT STATION, WOOSTER

SUMMARY OF 1947 COOPERATIVE TOMATO FUNGICIDE EXPERIMENTS

M. B. Linn and J. D. Wilson

The following states and cooperators submitted data in time for inclusion in this report:

Connecticut - Saul Rich
Delaware - J. W. Heuberger
Illinois - M. B. Linn
Iowa - W. F. Buchholtz
Maryland - C. E. Cox
Michigan - M. C. Strong
Minnesota - C. J. Eide
New Jersey (a) - B. H. Davis
New Jersey (b) - S. G. Younkin
New York - W. T. Schroeder
North Dakota - W. E. Brentzel
Ohio (4 tests) - J. D. Wilson
Pennsylvania (2 tests) - W. S. Beach
South Carolina - W. M. Epps[1]
South Dakota - C. M. Nagel

Experiments planned by R. W. Samson (Indiana), C. M. Tucker and R. A. Schroeder (Missouri) were ruined by early-season rainfall.

Five fungicides or treatments chosen by the cooperators were used in all tests. These materials -- numbered 1 to 5 below — and optional treatments (abbreviations in parentheses adopted for tabulation) are:

1. Phygon (Ph) 1-100
2. Dithane Z-78(78) 2-100
3. Tribasic copper sulfate (Tr) 4-100
4. Zerlate (Z) 2-100
5. Zerlate alternating with Tribasic (Z-T)
6. Untreated check (Ck)
7. Bordeaux mixture (Bo) 8-8-100
8. Parzate (Par) 2-100
9. Yellow Cuprocide (YC) 2.4-100
10. Bioquin 1 (Bio) 1-100
11. Zerlate (3 appl.) followed by Tribasic (2 appl.) ($Z-T_1$)
12. Zerlate-Parzate mixture at 1:1 (Z-P) 2-100 ?
13. Zerlate alternating with Bordeaux or Z-Z-B-Z-B (Z-B)
14. Same as No. 13 but Ortho K added to Zerlate at 1:400 ($Z-B_1$)
15. Copper zinc chromate 4-100
16. Carbon-Carbide #658 2-100
17. Dithane D-14+zinc sulfate+lime 2-1-1/2-100
18. Fermate dust

It was recommended that each cooperator use as a minimum 5 replicates of 10 plants for each treatment and that 5 applications be put on at 10-day intervals. The method of Horsfall and Barratt for estimating defoliation was to be followed where possible.

Observations submitted by the various cooperators at the end of the season were extremely valuable in determining the form to be used in

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[1] All materials in the South Carolina test with the exception of Dithane D-14 and Bordeaux mixture were applied as dusts.

setting up the data. Diseases were of no consequence in Iowa, North Dakota, South Dakota, and South Carolina. The data from these States covering only yields and culls are itemized separately, since any differences among treatments can be attributed more to phytotoxicity than to disease control. Late blight [Phytophthora infestans] did not develop to any extent except in the Pennsylvania and Ohio tests. where it obscured for the most part defoliation due to early blight [Alternaria solani]. A relatively slight amount of late-blight fruit rot developed in the New York and New Jersey (b) plots but since infection on untreated fruits did not exceed 6 percent, with no apparent significant differences among treatments, the data are not presented in this summary. Early blight was the primary reason for defoliation in all other experiments. Septoria leaf spot (S. lycopersici] became an additional factor in the Maryland planting about the middle of August. In some States, particularly Minnesota, Michigan, and Illinois, early blight did not develop to any extent until relatively late in the season.

The data have been assembled on the basis of yields in tons per acre and on percentage of culls, defoliation, anthracnose [Colletotrichum phomoides] and late-blight fruit rot. An evaluation based on yields should give a fairly good picture of over-all fungicidal efficiency, and that based on culls a measure of control of all fruit rots. No attempt has been made to subject the data to statistical analysis. Individual cooperators in some instances furnished differences necessary for significance (L.S.D.), which have been placed in the tables.

It was necessary to omit from the tables several fungicides that were used in only a very limited number of tests. Data covering these fungicides are given here so that they may be compared with other data in the tables. In the Connecticut test, defoliation (only data submitted) with Dithane D-14 was 79 percent. In South Carolina the yield from D-14 was 8.3 tons per acre. Copper zinc chromate in Michigan resulted in a yield of 4.6 tons per acre, defoliation of 53 percent and 9 percent culls; and in South Dakota, 20.8 tons per acre. Carbon-Carbide #658 was used only in New York, where plots sprayed with it give 16.1 tons, had 2.8 percent anthracnose, 55 percent defoliation and 16 percent culls. Yields from Compound A spray and Fermate dust in South Carolina were 7.7 and 9.2 tons per acre, respectively.

An efficiency rating (table 3) has been given each of the five treatments used in all tests by determining (1) number of times one treatment is better than another in each test, (2) number of times it is best of all, (3) total number, and (4) percentage of maximum possible efficiency on a comparative basis. Although this rough analysis may be somewhat better than averages in evaluating materials, comparisons within tests are even better where least significant differences are given.

Table 1. Yields per acre and percent culls -- 1947 cooperative tomato fungicide experiments.

State	Ph	78	Tr	Z	Z-T	Ck	Bo	Par	YC	Bio	$Z-T_1$	ZP	Z-B	$Z-B_1$	L.S.D.
YIELDS IN TONS PER ACRE (Nos. 1 and 2)															
Del.	12.4	14.6	13.6	13.0	12.7	12.2	11.4	14.5							n.s.
Ill.	--*	15.1	14.6	14.7	15.3	13.7			13.7						n.s.
Md.	12.6	14.3	12.5	13.5	11.9	10.1	12.6			13.7	13.8				2.30
Mich.	5.6	4.3	4.4	3.4	3.7	4.1	4.3	4.7	4.4	3.6					--
Minn.	14.0	13.2	14.0	13.5	13.4	13.2									n.s.
N.J. (1)	15.3	15.5	15.5	16.3	14.5	14.9									n.s.
N.J. (2)	18.1	18.3	18.3	19.8	20.7	14.3	20.5	17.9				19.5			1.96
N.Y.	15.8	17.4	16.3	16.3	17.1	14.3						17.1	18.1	18.4	--
Av.	13.4	14.1	13.6	13.8	13.7	12.1									
Iowa	1.8	2.2	2.6	1.9	2.7	2.1	1.4	2.5	2.5						n.s.
N.Dak.	14.3	13.9	15.7	16.4	14.4	15.1			14.7						--
S.Car.	8.0	7.8	8.4	8.4	8.8	8.7	8.1		8.4						--
S.Dak.	15.6	17.5	16.8	17.1	19.6	17.0		18.4	16.0	18.1					--
Av.	9.9	10.3	10.9	10.9	11.4	10.7			10.4						
Ohio (4)	11.9	12.6	13.4	12.8	13.7	7.8		13.0		12.0					
Pa. (2)	12.3	10.9	14.2	14.5	11.0	5.6	13.8	12.2			15.0				
PERCENT CULLS															
Del.	10.2	9.6	7.3	9.2	11.6	12.9	6.0	9.0							--
Ill.	--*	13.4	13.8	10.1	9.3	17.4			14.6						--
Md.	22.9	20.2	19.1	22.3	21.2	24.3	20.4			17.3	20.5				--
Mich.	7.0	8.0	3.0	9.0	10.0	15.0	2.0	7.0	4.0	12.0					--
Minn.	17.1	19.1	15.6	18.9	20.6	22.3									--
N.J. (1)	5.8	7.5	5.6	4.9	3.5	10.0									2.90
N.J. (2)	13.8	12.0	13.3	4.3	7.6	17.3	7.6	11.4				8.9			0.90
N.Y.	17.8	16.3	16.2	15.8	13.9	19.7						14.7	8.5	8.8	
Av.	13.5	13.3	11.7	11.8	12.2	17.4									
Ohio (4)	26.5	23.3	20.5	19.0	16.5	45.3		19.3		22.0					
Pa. (2)	32.2	29.6	21.3	41.6	33.9	52.4	18.4	32.9			22.1				

*Injury in these plots - records not completed.

Table 2. Defoliation and anthracnose - 1947 cooperative tomato fungicide experiments.

State	Ph	78	Tr	Z	Z-T	Ck	Bo	Par	YC	Bio	Z-T1	ZP	Z-B	Z-B1	L.S.D.
PERCENT DEFOLIATION															
Conn.	84.0	84.0	84.0	67.0	72.0	94.0	76.5	67.0	83.0						5.2
Del.	99.0	68.0	34.0	34.0	28.0	100.0	30.0	71.0							--
Ill.	--*	53.0	26.0	1.5	1.5	85.0			44.0						--
Md.	46.0	48.0	39.0	39.0	39.0	72.0	27.0			17.0	39.0				--
Mich.	51.0	55.0	43.0	55.0	57.0	65.0	39.0	55.0	40.0	56.0					--
Minn.	31.0	46.0	40.5	38.5	31.0	61.5									--
N.J. (2)	76.2	42.5	42.5	11.2	16.2	85.5	21.2	35.0				26.2			12.0
N.Y.	77.2	59.6	30.9	75.0	60.2	88.3						55.6	22.5	7.7	--
Pa.**	9	--	10	11	15	137									--
Av.	66.3	57.0	42.5	40.1	38.1	81.4									
PERCENT ANTHRACNOSE															
Del.	4.4	2.9	2.4	0.7	1.6	7.6	3.7	2.0							2.90
Ill.	--*	3.4	3.5	1.1	2.2	4.1			3.1						n.s.
N.J. (1)	3.2	5.7	4.6	1.7	1.6	7.5									2.40
N.J. (2)	34.6	33.6	34.9	16.3	24.7	45.7	27.9	32.3				27.8			8.00
N.Y.	7.3	8.7	10.2	4.1	4.1	11.7						8.2	2.0	0.8	--
Ohio (4)	6.5	5.3	7.8	1.7	4.1	8.4		6.1		3.6					--
Pa. (1)	11.4	8.2	11.4	5.9	4.3	20.0	4.6	2.5			5.8				5.28
Pa. (2)	12.7	12.1	11.3	4.9	6.1	24.2	10.7	14.5			7.8				4.80
Av.	11.4	9.9	10.3	4.5	6.1	16.1									
PERCENT LATE-BLIGHT FRUIT ROT															
Ohio (4)	8.3	7.4	1.8	8.0	4.5	35.1		4.6		8.8					
Pa. (2)	19.6	22.4	10.9	40.4	29.5	41.7	9.2	28.1			14.9				

* Injury in these plots - records not completed.

** Recorded as lesions (Alternaria) per leaf; not included in averages.

Table 3. Rating in descending order of first five treatments appearing in all tests.

Order	Yield: Treatment	Yield: %	Culls: Treatment	Culls: %	Defoliation: Treatment	Defoliation: %	Anthracnose: Treatment	Anthracnose: %	Late blight fruit rot: Treatment	Late blight fruit rot: %
1.	Z-78	61.9	Trib.	76.2	Z-T	64.3	Zerl.	91.7	Trib.	100.0
2.	Trib.	52.4	Zerl.	59.5	Zerl.	61.9	Z-T	80.5	Phyg.	66.6
3.	Zerl.	52.4	Z-T	52.4	Trib.	59.5	Z-78	41.7	Z-78	50.0
4.	Phyg.	45.2	Z-78	42.9	Phyg.	35.7	Phyg.	33.3	Z-T	41.7
5.	Z-T	38.1	Phyg.	35.7	Z-78	30.9	Trib.	30.5	Zerl.	8.3

The averages in table 1 and the efficiency ratings in table 3 indicate that Dithane Z-78, although inferior in disease control, resulted in somewhat higher yields than the other four materials appearing in all tests. It should be noted, however, that Z-78 did not give highest yields in Iowa, North Dakota, South Dakota and South Carolina where diseases were almost entirely absent. Among the more promising optional treatments are (1) three applications of Zerlate followed by two of Tribasic, (2) a combination of Zerlate and Parzate and (3) Zerlate alternating with Bordeaux mixture.

From the standpoint of reduction of culls, Tribasic was superior to the other four materials. However, in Illinois, New Jersey and New York it was exceeded by Zerlate alternating with Tribasic or by Zerlate alone. Among the optional treatments, Bordeaux mixture was best in Delaware and Michigan while Zerlate alternating with Bordeaux was superior in New York.

There was but little difference in control of defoliation (early blight) among Zerlate, Zerlate-Tribasic, Parzate and Bordeaux mixture where all of these fungicides were in the same test (table 2). Bioquin 1 appeared to be definitely suprior to all other fungicides in Maryland. Yellow Cuprocide was as effective as Bordeaux and Tribasic in Michigan. Zerlate (plus a sticking agent) alternating with Bordeaux was best in New York. In Illinois Zerlate and Zerlate-Tribasic were by far the best. In general (table 3), Zerlate-Tribasic, Zerlate alone and Tribasic alone of the fungicides appearing in all tests seemed to be about equally efficient in controlling early blight.

For control of anthracnose (tables 2 and 3), Zerlate and Zerlate-Tribasic excelled all other treatments although in individual tests Parzate and Zerlate-Bordeaux were close seconds.

Bordeaux mixture and Tribasic gave best control of late blight (tables 1, 2 and 3) whether measured in yields per acre or in percent culls and fruit rot. Three applications of Zerlate followed by two of Tribasic looked promising in Pennsylvania. Dithane Z-78 and Parzate were somewhat superior to Zerlate in controlling late-blight fruit rot.

Only a few reports are available regarding phytotoxicity. In Iowa the foliage of Bordeaux-sprayed plants was curled and leathery. Yields from plants sprayed with Phygon were noticeably low but there was no visible evidence of injury to foliage or fruit. In Illinois Phygon caused such severe fruit blotching and foliage burning that these plots were abandoned. Injury was attributed to temperatures of 99° and 90° F. at the time of second and third applications, respectively.

UNIVERSITY OF ILLINOIS, URBANA, AND OHIO AGRICULTURAL EXPERIMENT STATION, WOOSTER

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SUPPLEMENT 175

SUMMARY OF COOPERATIVE TESTS OF COTTON SEED TREATMENTS -- 1947

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DIVISION OF MYCOLOGY AND DISEASE SURVEY

Plant Industry Station Beltsville, Maryland

SUMMARY OF COOPERATIVE TESTS OF COTTON SEED TREATMENTS -- 1947

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Plant Disease Reporter
Supplement 175 May 1, 1948

This is a summary of the data on the survival of cotton seedlings in the regional cooperative plantings of 1947 and also of those from a special test that was planted in North Carolina and South Carolina in which Dow 9B and Seedox were compared at several dosages.

The treatments used were as follows:

1. Ceresan-M applied as dust at a rate of 3 gm./kg. of seed. This is designated as the dry treatment.

2. Slurry treatment. Ceresan-M was applied to fuzzy seed from a suspension that contained 2.3 lbs. per gal. of water at a rate of 46 cc. per 9 lbs. of seed. Calculations indicate that our rate of application was 3.13 gm./kg. seed. For application to reginned seed, 2.6 lbs. of Ceresan-M were added to 1 gal. of water; 46 cc. were added per 10 lbs. of seed which should have given a rate of application of 3.14 gm./kg. of seed.

3. Dow 9B. This dust contained 50 percent diluent and was applied at a rate of 3 gm./kg. in the regional test. This is the 3X dosage of the dosage test. The 2 gm. and 4 gm. per kg. dosages of the special test are indicated by 2X and 4X, respectively.

4. Dow 9B-Matted. Dow 9B was applied at a rate of 3 gm./kg., after which the seed were shipped to Midland, Michigan, for matting which 2 percent Methocel.

5. Dow 9B+Zerlate. Dow 9B was applied at a rate of 3 gm./kg., after which Zerlate was applied at a rate of 4 gm./kg. of seed.

6. Dow 9B+Spergon. Dow 9B was applied at a rate of 3 gm./kg., after which Spergon was applied at a rate of 4 gm./kg. of seed.

7. Seedox, a micronized dust containing 50 percent 2,4,5-trichlorophenyl acetate and 50 percent Pyrax ABB. The rates of application were 1 gm./kg. (1X), 2 gm./kg. (2X), 3 gm./kg. (3X).

Lots of Coker 100-WR seed naturally infested by Colletotrichum gossypii were used in the tests. The reginned and acid-delinted seed of the regional test were prepared from the same original lot. Relative to the mean for the fuzzy seeds, the mean weights of the reginned and delinted seeds were 92.4 percent and 84.3 percent, respectively. These relative weights, however, do not accurately indicate the mean loss of the individual seeds, since some trash and defective seeds were removed in both processes. The removal of defective seeds seems the logical explanation of the higher percentage of viable seeds in the reginned than in the fuzzy sub-lots of lot A of table 1. A similar difference was not apparent in the field plantings, table 2. Since the percentage of emergence of the delinted sub-lots is slightly below that of the corresponding fuzzy sub-lots, table 1, acid injury is suggested.

After treatment, seeds representative of most of the treated sub-lots were germinated in the laboratory in sand culture at 24°C. All treatments were about equally effective on fuzzy and reginned seeds, except the 1X dosage of Seedox. The 8 percent of seedlings for the fuzzy seed that were infected by the anthracnose fungus after treatment with Ceresan-M, suggests that an unusually large number of the viable seeds of this lot were internally infected by Colletotrichum gossypii. Since the emergence for the Ceresan-M treated fuzzy seed was greater than for Seedox and Dow 9B, there is a suggestion that these internally infected seeds did not develop into emerged seedlings when the seeds were treated by the latter two fungicides. The number of seeds germinated, 96, was not adequate to supply definite proof.

A brief consideration of the means for all plantings in the regional test, table 2, may be of some interest, although means of this type usually do not indicate the response to treatment in the plantings in which seed treatment gave the largest increases. The mean emergence for the three kinds of untreated seed is about the same, 36 to 38 percent. The best treatment for both fuzzy and reginned seed, as indicated by means of 59 and 55 percent, respectively, was the dry application of Ceresan-M. The slurry application gave slightly lower results by 4 and 3 percent, respectively, for both kinds of seed. The 2 gm./kg. dosage

Table 1. Results obtained when the two lots of cotton seed used in the plantings of 1947 were treated with Ceresan-M, Dow 9B, and Seedox; and the seeds were germinated in the laboratory in sand culture at 24°C. Data are based on the germination of 96 seeds.

Type of seed and Treatment	Lot A Emerged No.	Lot A Infected No.	Lot B Emerged No.	Lot B Infected No.
1. Fuzzy Seed				
a. Check	65	54	80	79
b. Ceresan-M	80	8	92	4
c. Dow 9B	71	C	84	4
d. Seedox-1X			85	17
e. Seedox-2X	74	6	91	1
f. Seedox-3X			84	3
2. Reginned Seed				
a. Check	84	77	80	30
b. Ceresan-M	80	1	83	0
c. Dow 9B	74	0	81	6
d. Seedox-1X			77	9
e. Seedox-2X	73	1	78	0
f. Seedox-3X			73	0
3. Delinted Seed				
a. Check	60	4	91	4
b. Ceresan-M	64	0	89	0
c. Dow 9B	65	0	87	0
d. Seedox-2X	68	1	86	0

of Seedox was the second in rank on fuzzy seed, but was 3 percent inferior to Dow 9B on reginned. The combination of matting with Dow 9B gave erratic results on both fuzzy and reginned seed; and on fuzzy seed the mean number of seedlings for the matted seed was 4 percent less than for the sub-lot treated with Dow 9B. The fuzzy matted seed gave especially poor results in the SC2 planting in which it was significantly lower than all other treatments of fuzzy seed, inclusive of the untreated. In this planting emergence was delayed by a lack of adequate soil moisture. Most of the other treatments gave a lower percentage of seedlings in the Tx2 planting than the dry treatment with Ceresan-M. These differences were associated with delayed seedling emergence as a result of frequent rains and low temperatures after planting--a mean of 15°C. for the first two weeks. Cotton seedlings grown in this soil from this field in the laboratory were copiously infected by *Rhizoctonia solani*.

Table 2. Cotton seed treatment -- 1947. Regional test. Data indicate the percentage of surviving seedlings at final seedling count as percent of seeds planted. (Concluded on opposite page)

Kind of Seed	Ark1	Ark2	Al	Ga1	Ga2	La1	La2	Ms	NC1	NC2	NC3
LSD-1%	13	9.3	9.4	16	8.2	19	12	8.5	8.6	8.7	7.1
A. Fuzzy											
Check	34	25	35	37	67	31	21	58	25	42	34
Ceresan-M											
Dry	41	42	60	55	75	64	59	70	50	66	52
Slurry	48	41	55	57	75	50	50	70	49	62	50
Dow 9B											
Regular	36	37	55	50	70	41	48	72	42	63	46
Matted	35	38	50	43	68	36	52	64	49	65	46
+Zerlate				50	70	57	42	65	41	63	48
+Spergon				43	73	57	45		39	59	46
Seedox 1X				48	72				44	64	51
Seedox 2X	47	47	56	55	76	54	46	73	43	63	48
B. Reginned											
Check	27	24	36	38	62	43	28	62	26	38	34
Ceresan-M											
Dry	49	46	50	50	67	45	50	72	47	68	52
Slurry	46	45	49	51	68	42	56	70	42	61	53
Dow 9B											
Regular	35	39	51	45	73	56	38	70	39	63	47
Matted	32	43	44	37	78	50	41	62	39	64	49
+Zerlate				46	71	58	46	63	44	60	49
+Spergon				48	70	57	41		41	60	48
Seedox 1X				43	73						
Seedox 2X	32	37	47	49	73	45	45	58	41	62	46
C. Delinted											
Check	27	28	42	23	42	35	18	52	34	45	43
Ceresan-M	24	34	54	48	66	48	55	60	47	61	55
Dow 9B						44	51		40	58	51
Seedox						55	48				

Data for the untreated seed were not included in the analyses from which LSD's (1 percent level) were derived. The inclusion of the checks in most instances would have changed the values only slightly.

Table 2 cont.

	Locations									
	Ok1	Ok2	SC1	SC2	SC3	Tn1	Tn2	Tx1	Tx2	Mx
LSD-1%	5.3	8.5	12	16	13	11	14	9	12	
Kind of Seed										
A. Fuzzy										
Check	56	77	40	39	31	34	10	18	47	38
Ceresan-M										
Dry	71	73	56	62	46	67	47	46	62	58
Slurry	71	77	59	57	43	61	38	37	47	55
Dow 9B										
Regular	66	75	58	44	48	61	46	39	53	53
Matted	56	78	62	19	37	56	40	33	52	49
+Zerlate			54	47						
+Spergon			64	46						
Seedox 1X										
Seedox 2X	66	75	64	59	45	63	43	34	56	56
B. Reginned										
Check	64	76	37	27	35	34	13	16	37	38
Ceresan-M										
Dry	70	83	57	46	51	60	43	38	54	55
Slurry	74	79	56	51	50	52	39	31	50	53
Dow 9B										
Regular	75	80	56	38	49	60	30	35	52	52
Matted	64	79	59	49	41	56	42	39	49	50
+Zerlate			58	45						
+Spergon			56	46						
Seedox 1X										
Seedox 2X	56	75	45	38	44	58	40	26	53	48
C. Delinted										
Check	44	75	41	32	37	39	13	17	42	36
Ceresan-M	64	76	45	39	58	50	32	27	51	50
Dow 9B			58	36				26	57	
Seedox			54	44				27	52	

Table 3. Cotton seed treatment -- 1947. Special dosage test to compare Ceresan-M, Dow 9B, and Seedox. Data indicate the percentage of surviving seedlings at final seedling count as percent of seeds planted.

	SC-1A	SC-1B	SC-2	NC-1A	NC-1B	NC2	Mx
LSD-1%	17	15	12	6.7	5.2	5.9	
<u>Treatments g./kg</u>							
Fuzzy Seed							
Check	28	42	50	39	44	66	45
Ceresan -M, 3g./kg	61	71	68	69	71	84	71
Dow 9B							
2X, 2 g./kg.	61	71	62	68	69	78	68
3X, 3 g./kg.	64	73	63	65	70	78	69
4X, 4 g./kg.	71	70	66	64	68	76	69
Seedox							
1X, 1 g./kg.	55	73	58	59	68	77	65
2X, 2 g./kg.	67	76	67	66	71	86	72
3X, 3 g./kg.	70	72	60	66	72	80	70
Reginned Seed							
Check	31	48	39	32	49	48	41
Ceresan-M, 3 g./kg.	60	68	58	52	65	80	64
Dow 9B							
2X, 2 g./kg.	55	64	49	47	59	71	58
3X, 3 g./kg.	47	68	54	50	58	71	58
4X, 4 g./kg.	52	62	51	49	55	71	57
Seedox							
1X, 1 g/kg.	43	61	46	46	61	69	54
2X, 2 g/kg.	55	60	50	47	58	68	56
3X, 3g/kg.	48	67	43	51	56	72	56
Delinted Seed							
Check	66	62	44				
Ceresan-M, 3 g./kg.	81	77	60				
Dow 9B, 3 g/kg.	78	74	56				
Seedox, 2 g/kg.	78	75	54				

In addition to the above, there were 8 instances for the fuzzy sub-lots in which the dry application of Ceresan-M was superior to the other treatments; viz., over matted in Ark1, La1, and Ok1, SC2, and Tx1; over the Dow 9B+Zerlate and the Dow 9B+Spergon combinations in NC1; over Seedox in Tx1 and over Ceresan-M applied by the slurry method in Tx2. The slurry treatment was also significantly better than Dow 9B-matted in Ok1.

The number of significant differences among the reginned sub-lots was greater than among the fuzzy sub-lots. The dry application of Ceresan was significantly higher than: (a) Seedox in the Ark1, Miss, Ok1, and Tx1 plantings; (b) Dow 9B in Ark1, and La2; (c) Dow 9B-matted in Ark1, Miss, and Ok1; (d) Dow 9B+Zerlate in Miss. Similarly, the slurry application was significantly better than: (a) Seedox in Ark1, Miss, and Ok1; (b) matted in Ark1 and Ok1; (c) Dow 9B and Dow 9B+Spergon in La2. There were also 3 instances in which Seedox was inferior to Dow 9B treatments; viz., Dow 9B in Ok1, Dow 9B+Zerlate in SC1, and Dow 9B-matted in Tx1.

There is no evidence to indicate any merit for the use of the slurry method in applying Ceresan-M to cotton seed, except for the reduction of the poisoning hazard. On fuzzy seed, it gave inferior emergence as compared to the dust application in the La1, La2, Tn1, Tn2, Tx1, and Tx2 plantings. The differences between the two methods of application was smallest for reginned seed. The slurry application was low on fuzzy seed in the NC2, Tn1, Tx1, and Tx2 plantings.

In North Carolina and South Carolina, a special test, table 3, was planted, in which the 3 gm./kg. dosage of Ceresan-M was compared with 3 dosages of Seedox and Dow 9B on fuzzy and reginned seed, and at one dosage on delinted seed (in South Carolina only). All treatments were about equally effective on fuzzy seed, although the 1X dosage of Seedox was low in SC1A. This and the high percentage of seedlings infected by <u>C. gossypii</u> in the laboratory test (table 1) would indicate that 1 gm./kg. is not an effective dosage of Seedox under conditions favorable for seedling infection by tha anthracnose fungus.

The emergence of the reginned seed in the field was about 10 percent less than that of the fuzzy in both the laboratory and field tests. Whether this represents a real effect for reginning is uncertain, since the bags of seed from which these two kinds of seed were derived were not mixed before reginning. They did, however, come from a larger lot of seed that was derived from the same picking of seed cotton from the same field. On reginned seed, Ceresan also tended to be a more effective treatment than the chlorinated organics, but was significantly better only in NC2. The latter compounds gave erratic results insofar as the effectiveness of the 3 dosages is concerned. The data would seem to favor the 3 gm. dosage of both Seedox and Dow 9B. All 3 fungicides were about equally effective on delinted seed.

Yields are available for 3 plantings of the regional rest and 3 of th special dosage test. There were no significant differences in the dosage test planting, SC1A, SC1B, and SC2. In the SC2 planting of the regional test, the yield for Dow 9B-matted seed was significantly lower than the yields for the other treatments and also for the mean yield of the planting. The smaller number of plants per 50-ft. row for this treatment as compared to some of the other treatments suggests that the small number of plants was not the only factor responsible for the low yields, since rows with a comparable number of plants in rows planted to seeds with another treatment produced much larger yields.

In the Tx1 planting, the seed treated with the slurry Ceresan-M was the only sub-lot of seed to give a significantly higher yield than another sub-lot; and its yield was significantly higher than those for the untreated sub-lots of fuzzy, reginned, and delinted seed.

The results for the 1947 plantings may be summarized briefly as follows: Treatment of the seed with Ceresan-M generally results in a slightly greater number of seedlings than did treatment with Seedox or Dow 9B. Dow 9B and Seedox gave comparable results. However, since no fungicide was consistently better than the other two and few differences among them were significant and large enough to be reflected in yields, superiority for none of the three chemicals has been demonstrated for all kinds of cotton seed under all field conditions.

COTTON SEEDLING DISEASE COMMITTEE

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1947 FUNGICIDE TESTS: A SUMMATION OF NATION-WIDE RESULTS WITH NEWER FUNGICIDES

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The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

P L A N T D I S E A S E R E P O R T E R S U P P L E M E N T

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THE PLANT DISEASE SURVEY
DIVISION OF MYCOLOGY AND DISEASE SURVEY

Plant Industry Station Beltsville, Maryland

1947 FUNGICIDE TESTS:
A SUMMATION OF NATION-WIDE RESULTS WITH NEWER FUNGICIDES

Compiled by
The Fungicide Committee of the American Phytopathological Society:
Sub-committee on "Summation of the Performance of Newer Fungicides"[1]

Plant Disease Reporter
Supplement 176 May 15, 1948

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REPORT OF SUB-COMMITTEE ON SUMMATION OF THE PERFORMANCE OF NEWER FUNGICIDES

A widespread and generous response was again received from Federal and State plant pathologists in the United States and Canada to the request of the special committee of the Potomac Division, American Phytopathological Society to secure information on the performance of newer fungicides applied experimentally in different ways to various crops through the 1947 season. Information was received from about 145 professional workers located in 47 States and Provinces. The reports included more than 130 different fungicides used on soils or on some 57 different kinds of plants, seeds, or planting stock.

Thanks are due to all who cooperated and to all who expressed interest and gave encouragement to this effort.

This summary does not in any way represent final conclusions or imply recommendations of any sort. It is necessarily incomplete in scope as it covers only results of experiments in 1947 that were submitted to the committee by cooperators. It has been prepared solely for the information of professional people concerned with plant disease control to give a broad, rough picture of the experimental progress being made.

This digest probably gives a fair indication of the current trend of results with new fungicides and also brings out some of the variations in performance met with by different workers. In many cases it is difficult to explain these variations. Their occurrence, however, points to the existence of important factors influencing the effectiveness or safety of the different materials. These factors must be uncovered and evaluated before the profession can advise growers with assurance how to make best use of these newer materials under different circumstances.

The committee would appreciate constructive criticisms of this report and helpful suggestions that may serve as a guide in the improvement of any future efforts along this line.

LIST OF COOPERATORS

State or Province	Cooperators	Place[2]
ALABAMA	Coyt Wilson	Auburn
	A. L. Smith	Tallassee
ALBERTA (Canada)	L. E. Tyner	Edmonton
ARKANSAS	H. R. Rosen	Fayetteville
	V. H. Young	Fayetteville
CALIFORNIA	C. E. Yarwood	Berkeley
	E. E. Wilson	Davis
	K. F. Baker	Los Angeles
	L. J. Klotz	Riverside
	G. Zentmeyer	Riverside
COLORADO	H. P. H. Johnson	Fort Collins
	W. D. Thomas	Fort Collins
CONNECTICUT	S. Rich	Mt. Carmel
	J. G. Horsfall	New Haven
	P. J. Anderson	Windsor
DELAWARE	S. H. Davis	Bridgeville
	J. W. Heuberger	Bridgeville
	J. C. Dunegan	Dover
	M. C. Goldsworthy	Dover
	R. A. Wilson	Dover
	L. P. Nichols	Newark
FLORIDA	A. A. Foster	Apopka-Sanford
	J. M. Walter	Bradenton
	A. H. Eddins	Hastings
	R. F. Suit	Lake Alfred
	G. K. Parris	Leesburg
	R. R. Kincaid	Quincy
	J. R. Christie	Sanford
	J. C. Russell	Sanford
GEORGIA	B. S. Hawkins	Experiment
	J. G. Gaines	Tifton

[2] In most cases, place where work was done.

State or Province	Cooperators	Place
HAWAII	J. W. Hendrix	Poamoho
	J. A. Lyle	Poamoho
ILLINOIS	J. L. Forsberg	Kankakee
	J. C. Carter	Urbana
	Benjamin Koehler	Urbana
	M. B. Linn	Urbana
	D. Powell	Urbana
INDIANA	R. M. Caldwell	Lafayette
	L. E. Compton	Lafayette
	R. R. Mulvey	Lafayette
	Eric G. Sharvelle	Lafayette
	A. J. Ullstrup	Lafayette
	J. R. Shay	Lake Cicott
IOWA	W. F. Buchholtz	Ames
	D. E. Hardy	Ames
	W. J. Hooker	Ames
	C. S. Reddy	Ames
KANSAS	E. Abmeyer	Doniphan
	E. D. Hansing	Manhattan
	C. L. King	Manhattan
	L. A. Schafer	Manhattan
	W. W. Willis	Manhattan
LOUISIANA	D. C. Neal	Baton Rouge
	E. C. Tims	Baton Rouge
	R. S. Woodward	Calhoun
	J. G. Atkins	Hammond
	A. G. Plakidas	Hammond
MAINE	M. T. Hilborn	Monmouth
MANITOBA (Canada)	J. E. Machacek	Winnipeg
MARYLAND	C. L. Lefebvre	Beltsville
	R. W. Leukel	Beltsville
	W. D. McClellan	Beltsville
	Helen Sherwin	Beltsville
	R. A. Jehle	College Park
	C. E. Cox	Salisbury
	W. F. Jeffers	Salisbury

Place or Province	Cooperators	Places
MASSACHUSETTS	O. C. Boyd	Amherst
	E. F. Guba	Amherst
MICHIGAN	J. H. Muncie	College Farm
	L. H. Person	College Farm
	D. Cation	East Lansing
	J. Vaughan	East Lansing
	W. F. Morofsky	Lake City
	R. Nelson	Parma
MINNESOTA	A. C. Hodson	Rochester
	E. O. Mader	Rochester
	M. B. Moore	St. Paul
MISSISSIPPI	D. C. Bain	Crystal Springs
	O. A. Leonard	State College
	John C. Presley	State College
MISSOURI	H. G. Swartwout	Columbia
NEBRASKA	R. H. Moore	Lincoln
NEW HAMPSHIRE	E. Rasmussen	Durham
	M. C. Richards	Durham
NEW JERSEY	R. B. Wilcox	Pemberton
	B. H. Davis	Smithburg
	R. H. Daines	Vincentown
NEW MEXICO	P. J. Leyendecker	State College
NEW YORK	A. M. French	East Aurora
	A. J. Braun	Geneva
	J. M. Hamilton	Geneva
	A. W. Dimock	Ithaca
	D. H. Palmiter	Poughkeepsie
NORTH CAROLINA	G. B. Lucas	Oxford
	R. S. Cox	Raleigh
	D. E. Ellis	Raleigh
	F. A. Todd	Raleigh
	S. G. Lehman	Rocky Mount
	R. Aycock	Wilkesboro
	C. N. Clayton	Wilkesboro

State or Province	Cooperators	Place
NORTH DAKOTA	W. E. Brentzel	Fargo
	W. G. Hoyman	Grand Forks
NOVA SCOTIA (Canada)	K. A. Harrison	Kentville
	J. F. Hockey	Kentville
OHIO	O. S. Cannon	Bowling Green
	H. F. Winter	Clyde
	H. A. Runnels	Wooster
	J. P. Sleesman	Wooster
	H. C. Young	Wooster
	J. D. Wilson	Wooster
OKLAHOMA	C. F. Grays	Stillwater
	W. R. Kays	Stillwater
	J. H. McLaughlin	Stillwater
	W. W. Ray	Stillwater
	A. J. Vlitos	Stillwater
ONTARIO (Canada)	G. C. Chamberlain	St. Catherines
	J. K. Richardson	St. Catherines
OREGON	P. W. Miller	Corvallis
	J. R. Kienholz	Hood River
PENNSYLVANIA	F. H. Lewis	Arendtsville
	W. S. Beach	State College
	W. B. Chandler	State College
	H. W. Thurston, Jr.	State College
PRINCE EDWARD ISLAND (Canada)	L. C. Callbeck	Charlottetown
RHODE ISLAND	F. L. Howard	Kingston
	J. B. Rowell	Kingston
SASKATCHEWAN (Canada)	R. C. Russell	Saskatoon
SOUTH CAROLINA	W. M. Epps	Charleston
	C. H. Arndt	Clemson
	Cotton Seed Treatment Committee	Clemson
	T. W. Graham	Florence

State or Province	Cooperators	Place
TENNESSEE	J. M. Epps	Jackson
	C. D. Sherbakoff	Jackson
	D. M. Simpson	Knoxville
TEXAS	L. M. Blank	College Station
	P. A. Young	Jacksonville
	E. W. Lyle	Tyler
UTAH	Gerald Thorne	Salt Lake City
VIRGINIA	A. B. Groves	Winchester
WEST VIRGINIA	F. W. Craig	Charleston
	J. G. Leach	Huttonsville
	W. Yount	Huttonsville
	C. F. Taylor	Kearneysville
WISCONSIN	J. D. Moore	Egg Harbor
WYOMING	W. L. Quayle	Laramie

FUNGICIDES USED DURING 1947[3]

Trade Name	Active Principle	Source
Arasan	Tetramethyl thiuram disulfide	Du Pont
Arasan S. F.	Tetramethyl thiuram disulfide	Du Pont
Barbak C	Phenyl mercuric cyanamide	Amer. Cyanamid & Chem. Corp.
Basicop	Copper basic sulfates	Sherwin-Williams Co.
Benzyl salicylate	Benzyl salicylate	---
Bioquin (Copper 8)	Copper 8-quinolinolate	Monsanto Chem. Co.
Bioquin 1	Copper 8-hydroxyquinolinolate	Monsanto Chem. Co.
Bioquin 100	---	---
Bioquin 850	8-hydroxyquinoline sulfate	Monsanto Chem. Co.
Bismuth subsalicylate	Bismuth subsalicylate	Mallinckrodt Chem. Co.
Bordeaux mixture	Copper basic sulfates	Various
Bordow	Copper magnesium basic sulfates	Dow Chem. Co.
Burgundy mixture	Copper carbonate	Home made
Calcium cyanamid	Calcium cyanamid	Amer. Cyanamid & Chem. Corp.
Calogreen	Mercuric chloride	Mallinckrodt Chem. Co.
Camden paste	Flotation sulfur paste	---
Carbon + carbide	---	---
Ceresan	Ethyl mercuric chloride	Du Pont
Ceresan M	Ethyl mercury p-toluene sulfonanilide	Du Pont
Ceresan, New Improved	Ethyl mercuric phosphate	Du Pont
Ceresan, 2%	---	---
Chromate 169	Chromate complex	Carbide & Carbon Chem. Corp.

[3]The materials are listed under the names used by cooperators. It is realized that in some instances the same preparation is listed under more than one name.

Trade Name	Active Principle	Source
Chromate 519		---
Chromate 531	Chromate complex	Carbide & Carbon
Chromate 578		---
Chromate 658	Chromate complex	Carbide & Carbon
Chromate 698	Chromate complex	Carbide & Carbon
Compound A	Copper oxychloride	Du Pont
Compound 169	---	---
Compound 308	---	---
Compound 337	Glyoxalidine compound	Carbide & Carbon
Compound 629	---	---
Copotex Dust	Copper-lime-calcium arsenate	Niagara Sprayer & Chem. Co.
Copper A Compound	Copper oxychloride	Du Pont
Copper-8	Copper 8-hydroxyquinolinolate	Monsanto
Copper carbonate	Copper carbonate	Various
Copper oxychloride	Copper oxychloride	Various
C. O. C. S.	Copper oxychloride-sulfate	Harshaw Chem. Co.
Copper tribasic sulfate	Copper tribasic sulfate	Tennessee Copper Co.
Copro-50	Copper oxychloride-sulfate	Los Angeles Chem. Co.
Cupro K	Copper oxychloride	Rohm & Haas
Cuprocide (Yellow)	Cuprous oxide	Rohm & Haas
D-D	Dichloro propene and propane	Shell Chem. Co.
Delmo-Z	Zinc hydroxide stabilized	California Spray Chem. Co.
Dithane D-14	Sodium ethylene bis dithiocarbamate	Rohm & Haas
Dithane Z-78	Zinc ethylene bis dithiocarbamate	Rohm & Haas
Dodge Tribasic	---	---
Dow 5	Chloranil	Dow
Dow 9B	Zinc trichlorophenate	Dow
Dow 289	Dinitro compound	Dow
Dow 296	Dinitro compound	Dow

Trade Name	Active Principle	Source
Dow 606	---	Dow
Dow 612	---	Dow
Dowfume G	Methyl bromide	Dow
Dowfume N	Dichloro propene and propane	Dow
Dowfume W-1C	Ethylene dibromide 10%	Dow
Dowfume W-4C	Ethylene dibromide 20%	Dow
Dowicide B	Sodium salt of 2,4,5-trichlorophenol	Dow
Dowicide G	Sodium pentachlorophenate	Dow
Dry lime sulfur	Calcium polysulfides	Sherwin-Williams
Du Pont 1451 GGG	Ethyl mercury p-toluene sulfoanilide	Du Pont
Du Pont 1452 F	Ethyl mercury p-toluene sulfoanilide	Du Pont
Elgetol	Sodium dinitro cresolate	Standard Agr. Chem. Co.
Everett Paste	By-product sulfur	---
Fermate	Ferric dimethyl dithiocarbamate	Du Pont
Fermate Rose Dust	Ferric dimethyl dithiocarbamate + sulfur	Du Pont
Flotation sulfur paste	By-product sulfur	Various
Formaldehyde	Formaldehyde	Various
Fruit thinner III	Zinc dimethyl dithiocarbamate cyclohexylamine complex	B. F. Goodrich Chem. Co.
Fungorex	Copper aluminum complex	Westwell Chem. Co.
Glyoxalidine A, dry	Heptadecyl imidazoline	Carbide & Carbon
Glyoxalidine B, dry	Heptadecyl imidazoline	Carbide & Carbon
Glyoxalidine C, paste	Heptadecyl imidazoline	Carbide & Carbon
Glyoxalidine HCl	---	---
Glyoxalidine 337, paste	Hydroxyethyl heptadecyl imidazoline	Carbide & Carbon
Glyoxalidine 341	---	---
Glyoxalidine 341B	---	---
Good Rite p.e.p.s.	Polyethylene polysulfides	Goodrich
H.E. 178	Zinc ethylene bis dithiocarbamate	Rohm & Haas
Hytox Sulfur	Wettable sulfur	Miller Chem. & Fert. Co.

Trade Name	Active Principle	Source
Iscobrome	Methyl bromide	Innis-Speiden & Co.
Iscobrome D	Ethylene dibromide	Innis-Speiden
Iscobrome No. 1	Methyl bromide	Innis-Speiden
Isothan Q 15	Lauryl isoquinolinium bromide	Onyx Oil & Chem. Co.
Karbam (Black)	Ferric dimethyl dithiocarbamate	Sherwin-Williams
Karbam (White)	Zinc dimethyl dithiocarbamate	Sherwin-Williams
Kolodust	Sulfur dust	Niagara
Kolofog	Bentonite sulfur	Niagara
Kolospray	Wettable sulfur	Niagara
Larvacide	Chloropicrin	Innis-Speiden
Leytosan	Phenyl mercuric urea	F. W. Berk. & Co.
Lime sulfur	Calcium polysulfides	Various
Lunasan	Ethyl mercuric thiourea	Berk
Lysol	50% tar acids (xylenols) + soaps	Lehn & Fink
Magnetic "70" Paste	Wettable sulfur paste	Stauffer Chem. Co.
Manganese ethylene bis dithiocarbamate	Manganese ethylene bis dithiocarbamate	Du Pont
Mercunol	Mercury compound	---
Mercuric chloride	Mercuric chloride	Various
Mersolite A	---	---
Mersolite 8	Phenyl mercuric acetate	Berk
Methasan	Zinc dimethyl dithiocarbamate	Monsanto
Microgel	Tribasic copper sulfate	Tennessee Copper Co.
Micronized sulfur	Wettable sulfur	Various
Mike Sulfur	Micronized wettable sulfur	Dow
Mulsoid Sulfur	Wettable sulfur	Sherwin-Williams
Mycotox	50%, 2,4,5-trichlorophenylacetate + 50% inert Pyrax	Givaudan Delawana, Inc.
Mycotox 1	---	---
National Research Council Formula	Phenyl mercuric bromide and chloride	Canadian Research Council

Trade Name	Active Principle	Source
Omilite	Polyethylene polysulfides	Goodrich
Parson's Seed Saver Dust	Organic and inorganic mercury combination	Parsons Chem. Works
Parzate	Zinc ethylene bis dithiocarbamate	Du Pont
P.E.P.S.	Polyethylene polysulfide	Goodrich
Perenox	Copper oxychloride	Canadian Industries Ltd.
Phenyl mercuric acetate	Phenyl mercuric acetate	Berk
Phenyl mercuric fixtan	Phenyl mercuric hydroxide + formaldehyde	---
Phygon	Dichloronaphthoquinone	U. S. Rubber Co.
Phygon Rose Dust	Dichloronaphthoquinone + sulfur	U. S. Rubber Co.
P.M.A.S.	Phenyl mercuric acetate	Berk
P.M.A.S.-AA	---	---
Puratized	Phenyl mercuric triethanol ammonium lactate	---
Puratized Agricultural Spray	Phenyl mercury triethanol ammonium lactate	Niagara
Puratized N 5 E	Phenyl mercury triethanol ammonium lactacte	Gallowhur Chem. Corp.
Puratized 177	Phenyl amino cadmium lactate	Gallowhur
Puratized 306	Phenyl mercury formamide	Gallowhur
Puratized 641	Phenyl mercury compound	Gallowhur
Puraturf	Phenyl mercury triethanol ammonium lactate	Niagara
R 118 A	Ethyl mercuric isothiocarbamate	---
R 1078 x 67	---	---
Roccal	Benzyl trialkonium chloride	Winthrop Chem. Co.
Rosin lime sulfur	Calcium polysulfides	Home made
Semesan Jr.	Ethyl mercury phosphate	Du Pont
Silver nitrate-lime	---	---
Spergon	Tetrachlorobenzoquinone	U. S. Rubber Co.
Spergon W	---	
Sulfur	Wettable sulfur	Various
Sulfuron	Wettable sulfur	Du Pont
Tennessee 26	Copper basic sulfates	Tennessee Copper Co.
Tennessee 34	Copper basic sulfates	Tennessee Copper Co.

Trade Name	Active Principle	Source
Tennessee Copper Dust	Copper basic sulfates	Tennessee Copper Co.
Tennessee Tribasic	Copper basic sulfates	Tennessee Copper Co.
Tersan	Tetramethyl thiuram disulfide	Du Pont
Thiourea	Thiourea	Various
Vitron D copper dust	Copper basic sulfates	---
White Diamond No. 63 dust	---	---
Z 78	Zinc ethylene bis dithiocarbamate	Rohm & Haas
Zac	Zinc dimethyl dithiocarbamate-cyclohexylamine	Goodrich
Zerlate	Zinc dimethyl dithiocarbamate	Du Pont
Zinc nitro dithioacetate	Zinc nitro dithioacetate	Kienholz
Zinc sulfate lime	Zinc basic sulfates	Home made
Zinc 8-hydroxyquinolinolate	Zinc 8-hydroxyquinolinolate	---
Zinc 8-quinolinolate	Zinc 8-quinolinolate	Monsanto
629 + 632	Zinc nitrodithioacetate-copper nitro acetate	General Chem. Co.
No. 666	---	---

RESULTS WITH FRUIT DISEASES

APPLES

Reports were received from Delaware, Kansas, Illinois, Indiana, Maine, Massachusetts, Minnesota, Missouri, Nebraska, New Jersey, New York, New Hampshire, North Carolina, Nova Scotia, Ohio, Ontario, Pennsylvania, Rhode Island, Virginia, West Virginia, and Wisconsin.

SCAB:

Fermate, Puratized Agricultural Spray, Phygon, Bioquin 1, Glyoxalidine B and C, wettable sulfur, micronized sulfur, flotation sulfur pastes, lime-sulfur, Magnetic "70" sulfur paste, and Mike sulfur were used most frequently in the schedules for comparison. Zerlate, Parzate, Z 78, Glyoxalidine A, dry lime-sulfur, Kolospray, Kolofog, Mulsoid sulfur, Hytox sulfur, Isothan Q 15, manganese ethylene bis dithiocarbamate, phenyl mercuric formamide, and phenyl mercuric acetate were used occasionally.

Combinations of Fermate + sulfur, Puratized + bordeaux, Puratized + Isothan Q 15, Puratized + tribasic copper, Puratized + sulfurs, Fermate + polyethylene polysulfides, and Puratized + lime were occasionally used.

Puratized Agricultural Spray was generally used only in the bloom applications and at calyx, and other materials (usually sulfurs and Fermate) were used for the cover sprays. Since Puratized Agricultural Spray contains mercury, it is doubtful whether it will be used in the cover sprays at any time. Combining the material with Fermate and copper and sulfur compounds at the bloom stage does not appear logical, since all of these materials may cause the specific agent (mercury) to combine in other forms to interfere with its performance.

As to relative fungicidal performance of the various materials, the data submitted in 1947 indicated that of the compounds used most, such as Phygon, Fermate, Puratized Agricultural Spray, Bioquin 1, Glyoxalidines, Flotation sulfurs, wettable sulfurs, and lime-sulfur, Phygon was consistently the best. There was little to choose between the various sulfurs, Puratized Agricultural Spray, and Fermate. The 1947 scab prevalence was generally low and the performance of some of the weaker fungicides was enhanced because of it. The performance of Puratized Agricultural Spray was erratic. In some cases it rated last, and no doubt this reflects its inability to act in a residual manner. In some areas ascospore discharge was relatively late, coming after bloom, and the eradicating effect of this chemical, used in the bloom period, no doubt was lost, due to its being replaced in the cover sprays by weaker materials.

Bioquin 1 (copper 8-hydroxyquinolinolate) was used in eight schedules submitted, and in general its performance was high enough to warrant further tests. Very little injury was observed from this copper compound and this, indeed, was surprising. The Glyoxalidine compounds were used in a few of the tests and for the most part their control performance appeared satisfactory. The B and C compounds appeared to possess the best fungicidal activity. The C compound appeared to be injurious in several tests, causing bronzing and hardening of leaf tissues and russetting of fruits. The Flotation and sulfur pastes all gave very good performances, as did the various micronized sulfurs and lime sulfur, without causing any serious injuries. Phygon, while the most effective of those used as a fungicide (and some considered it as acting like an eradicant), was not particularly favored when it came to injury. Fruit finish of some varieties invariably suffered when this compound was used; occasionally the leaves were found to be mottled and sometimes burned. Dermatitis was frequently suffered by the operators when the material was used. Fermate appeared to be consistently effective in 1947 and very few observers found the material causing any type of injury. Puratized Agricultural Spray appeared to cause a yellowing of the older leaves in some cases. When combined with sulfurs and bordeaux mixture it caused considerable fruit russet, indicating that these are not compatible mixtures. Zinc ethylene bis dithiocarbamate (Parzate and Z-78) was used in two tests without being very effective as a fungicide. Zinc dimethyl dithiocarbamate (Zerlate) was used by one cooperator, but ranked fairly low in control. Isothan Q-15 was used by one operator in combination with sulfur and with Puratized Agricultural Spray, but the results were not satisfactory. Phenyl mercuric acetate was used by one operator with good results. Manganese ethylene bis dithiocarbamate was not outstanding in one test as a fungicide, but it was noted by the observer that no injury developed from its use.

For apple scab, in general, the Flotation sulfur pastes, micronized sulfurs, and lime-sulfur proved to be just as effective as Fermate, Glyoxalidines, and Bioquin 1. Puratized Agricultural Spray proved somewhat better than the above when timed properly with ascospore discharge, and Phygon proved to be the best fungicide of all, but lacking in safety to the trees and to the operators.

RUST:

Virginia reported experiments to control rust on the York variety. In this test Fermate, Phygon, Puratized Agricultural Spray, Glyoxalidine A and B, and Bioquin 1 were compared. Fermate was best, followed closely by Phygon. Puratized and the Glyoxalidines did a very good job, but Bioquin 1 was a distinct failure in controlling the disease through the bloom and first cover. None caused any injury.

BROOKS FRUIT SPOT:

New Jersey reported on the control of fruit spot on Golden Delicious. Bordeaux mixture, Fermate, Tennessee 26, Bioquin 1, zinc 8-hydroxyquinolinolate, Phygon, Glyoxalidine B, and Omilite were compared. The copper materials and Fermate ranked about equal, and were best. Zinc 8-hydroxyquinolinolate, Phygon, Glyoxalidine, and Omilite were distinctly inferior to these, but much better than the untreated. These materials were used 30 to 40 days after the calyx application in two sprays 10 days apart, and at that time bordeaux mixture caused a severe russet. Some slight russeting was evident where Fermate, Tennessee 26, Bioquin 1, Phygon, and Glyoxalidine B were used.

BLOTCH:

Delaware reported one test against this disease on Duchess. Bordeaux mixture, Bioquin 1, Phygon, and Fermate were compared. Fermate proved to be the best material for this disease, followed closely by Bioquin 1. Bordeaux mixture was also very effective, but its phytotoxic qualities reject its use. Phygon was a distinct failure. In Missouri Fermate proved to be better than anything else used to date. Bordeaux mixture, at delayed dormant, curtained initial blotch infections.

BLACK ROT:

Northwestern Greenings were sprayed in Delaware with bordeaux mixture, Parzate, Parzate-Fermate, Zerlate, Parzate-Zerlate, Fermate, Bioquin 1, zinc 8-quinolinolate, and Phygon for black rot control. Leaf spot control was best with bordeaux mixture, but leaf fall from copper injury was severe. Fair control was experienced with all materials except Phygon, which failed to prevent the development of the disease.

PEARS

SCAB: An experiment on this disease was described from Oregon. Fermate, Zerlate, Glyoxalidine 341, Sulfuron, Dithane D-14, and zinc nitro dithioacetate were compared. Fermate, Zerlate, and Glyoxalidine 341 controlled the disease about equally, but 341 caused fruit russet. Dithane D-14, Sulfuron, and zinc nitro dithioacetate were inferior to Fermate and Zerlate and caused appreciable russet to fruit.

CHERRIES

Reports were received from Nebraska, New York, Ohio, Oklahoma, Ontario, Pennsylvania, Virginia, West Virginia, and Wisconsin.

LEAF SPOT:

Fermate, Phygon, Glyoxalidine A, B, C, and HCl, Bioquin 1, Zerlate, zinc 8-hydroxyquinolinolate, bordeaux mixture, copper oxychloride sulfate, Tennessee 26, Tennessee Tribasic, lime-sulfur, Cupro K, Bordow, Copper A Compound, Basicop, and Dodge Tribasic were used in the tests.

In general, the best leaf-spot control was secured with the various copper compounds. In some States these materials caused ring spot of the fruit and in some regions leaf bronzing and spotting were evident. Of the various Glyoxalidine materials used, the HCl compound was the best fungicide and the A and B compounds proved to be the safest. Glyoxalidine C proved to be injurious to both fruit and leaves. Fermate and Phygon proved to be suitable for the bloom and preharvest applications if followed by a copper material which served to keep the leaves on the trees until late in the season. Such combinations as this appear to be the most promising; an organic such as Fermate, Phygon, or Glyoxalidine B before harvest and a copper material, no matter which, following harvest. This prevents build-up of objectionable residues before picking and prevents leaf fall following harvest. One operator reported that disking of leaves and trash on the orchard floor during bloom cut infection down to about half of that developing on the untreated plots.

BROWN ROT:

Oregon reported one experiment in which brown rot was the important disease. Phygon, Glyoxalidine C, Zerlate, Fermate, and Sulfuron were compared for control. None of the materials proved to be effective, due to the advent of hail injury, which caused all the fruit to become generally diseased. None were reported as causing any damage to leaves or fruits.

PEACHES

Reports were received from Delaware, Illinois, Michigan, New Jersey, Ohio and Virginia.

BACTERIAL SPOT:

In New Jersey two experiments were reported. Zinc lime, Zerlate, zinc 8-hydroxyquinolinolate, Phygon, Tennessee 26, and sulfurs were used for comparison in the control of the disease. Zinc lime and Tennessee 26 were the most effective materials used, while Phygon, Zerlate, and zinc 8-hydroxyquinolinolate proved inferior. The copper material Tennessee 26 caused some leaf injury. None of the materials used were particularly effective against the leaf phase of the disease.

BROWN ROT:

Reports were received from Delaware, Illinois, Michigan, New Jersey, and Ohio. Phygon, Bioquin 1 and 100, Fermate, Parzate, Zerlate, Fermate, Parzate-Zerlate, Parzate-Fermate, magnetic sulfur paste, liquid lime sulfur, wettable sulfurs, micronized sulfur, and Flotation paste were used for comparison. In one Delaware test where the blossom phase was treated Phygon appeared the best material to use. In the other tests where the materials were applied to the growing and mature fruit, Phygon was not so effective as sulfur or the dithiocarbamates. Zinc 8-hydroxyquinolinolate appeared not to be very effective. The data submitted, in general, on control of brown rot (fruit phase) were not representative and no real conclusions were possible.

LEAF CURL:

One test was reported from Virginia. Glyoxalidine 337 and 341B, Dithane Z 78, Phygon, Karbam black, Compounds 308 and 629, Puratized Agricultural Spray, and Bioquin 1 were compared. All of the above materials, except 308, 629, and Dithane Z 78, proved satisfactory in controlling the disease.

GRAPES

BLACK ROT:

Reports were received from Florida, Missouri, New Hampshire, New York, and Ohio.

Dithane-zinc lime, Glyoxalidine A, Compound 169, bordeaux mixture, Fermate, Phygon, Methasan, Puratized Agricultural Spray, copper oxychloride-sulfate, Tennessee 26, and Zerlate were used in the experiments.

For black-rot control Fermate proved to be the best material used, provided downy mildew and powdery mildew were absent. Combination sprays of Fermate and Puratized Agricultural Spray and Fermate and Zerlate were not so effective as Fermate alone. Phygon, while effective, was found to cause too much injury. In a few cases the insoluble coppers proved very good. None of the other materials proved as good as the dithiocarbamates, but Zerlate and Methasan caused injury.

DOWNY MILDEW:

One test was reported from Ontario. Fermate, bordeaux mixture, and Basicop were compared. Bordeaux mixture proved to be the best and far superior to Basicop. Fermate proved to be the poorest, but much better than the untreated.

CRANBERRIES

FRUIT ROTS:

One test was reported on from New Jersey. Bordeaux mixture, Dithane D 14 plus zinc-lime, Fermate, Karbam black, and Karbam white were used for comparison.

Karbam white proved to be the best material used, followed by Fermate and Karbam black. Bordeaux mixture and Dithane D-14 plus zinc-lime proved inferior. Fermate in oil did not prove to be satisfactory for the control of the rots. Increasing the dosage of Fermate from 2 pounds to 3 pounds per 100 gallons of spray did not prove effective in increasing the control of the diseases.

CITRUS

MELANOSE:

One test was reported on grapefruit from Florida. Chromate 169 and 53, copper Compound A, bordeaux mixture, manganese ethylene bis dithiocarbamate, zinc ethylene bis dithiocarbamate, and Glyoxalidine A were used for comparison. The chromate 169 compound, copper compound A, and bordeaux mixture proved to be the best and proved to be very effective materials in the control of the disease. The dithiocarbamates were inferior to the above, and the control with Glyoxalidine A was no better than that shown in the untreated plots. None of the materials caused injury to the fruit. Apparently the disease is controlled by copper compounds and not by organic materials.

BROWN ROT, SEPTORIA SPOT, BLAST, AND BOTRYTIS:

One test was reported from California, listing these four diseases. Chromate 519 and 578, Bioquin 1, Copper aluminum iron Fungorex, zinc-copper-lime, bordeaux mixture, Copper aluminum Fungorex, zinc dimethyl dithiocarbamate-cyclohexylamine complex, silver nitrate-lime, Copro 50, Parzate, and manganese ethylene bis dithiocarbamate were used for comparison.

The copper compounds were found to possess the best fungicidal action against all diseases, followed by the silver-lime mixture. The dithiocarbamates proved to be the poorest, and possibly this was due to their poor adhesiveness.

WALNUTS

BACTERIOSIS: Two experiments were reported on from Oregon. In one the material used was sodium pentachlorophenate (Dowicide G) and the application was made at the delayed dormant stage of growth. No control of the disease on subsequent growth was observed.

In the other test the materials were applied to growing tissue. The chemicals used were bordeaux mixture, copper oxychloride-sulfate (C.O.C.S.) Yellow Cuprocide, and Phygon. The best control of the disease occurred when bordeaux mixture was used. The insoluble copper compounds, while not so effective as bordeaux mixture, were superior because of their lack of injuriousness. Phygon was distinctly inferior to the copper compounds.

PECANS

SCAB: One test was reported on from Oklahoma. Bordeaux mixture, Tennessee Tribasic, and Zerlate were compared for disease control. The bordeaux mixture sprays were applied at different time intervals and spanned the whole schedule. Some plots received two sprays, some three, and one four. The best control was experienced in the Zerlate plots, sprayed throughout the season, followed by the bordeaux plot, receiving the first three applications. The bordeaux plot receiving only the first two applications was the poorest of all the plots in control, and comparable with the plot sprayed with the insoluble copper compound.

AVOCADOS

DOTHIORELLA ROT: One test was reported on from California. Bioquin 1, Parzate, Omilite, Fermate, lime sulfur, and Dithane D-14 were compared in controlling the disease. In one plot Bioquin 1 spray (1-100) was compared with a Dithane D-14 fog (20% solution) and a Bioquin 1 dust (10%). Considerable reduction in the disease followed the use of the Bioquin 1 spray and the Dithane D-14 fog. In another plot Parzate, Omilite, and Fermate sprays were compared with Parzate (15%) dust. Parzate spray was quite effective, but Parzate dust and Fermate spray were not. In plot 3 lime sulfur was not very effective in controlling the disease. Omilite was observed to cause a delayed ripening.

RASPBERRIES

ANTHRACNOSE.

One test was reported on from New York. Lime-sulfur, Elgetol, Dow 289 (dinitro), and Dow 296 (dinitro) were applied at delayed dormant and lime-sulfur was applied as a cover spray also in one plot. The best control of cane lesions followed the use of lime-sulfur in delayed dormant and in the cover spray. The dinitro compounds proved effective, but poorer than lime-sulfur.

LEAF DISEASES.

One test was reported on from Tennessee. A dormant spray of lime-sulfur was used in one plot and compared with three applications of Fermate, as cover sprays, in another plot. Fermate gave excellent results and was much better than lime sulfur, in the dormant spray.

RESULTS WITH VEGETABLE DISEASES

Wherever possible, results have been presented by placing the compounds in groups of approximately equal control or yield. Of the newer compounds used, two were considered by the cooperators not to warrant further testing. No brand-new organic compound was reported. The dithiocarbamates, particularly Parzate and Dithane Z-78, were more widely used than in 1946. Of particular interest was the fact that several cooperators reported on the use of combinations of dithiocarbamates (e.g., Zerlate-Parzate) and of combinations of dithiocarbamates and coppers (e.g., Zerlate-Tribasic, tank-mixed). Another interesting new dithiocarbamate combination was Zac (zinc dimethyl dithiocarbamate-cyclohexylamine). The chromates appeared promising.

POTATOES

NO DISEASE:

NEW HAMPSHIRE: Used Bordeaux, Phygon, Parzate, and C.O.C.S. with DDT. All reduced yields slightly below DDT used alone.

MARYLAND (Pocomoke): DDT alone gave higher yields than Bordeaux + DDT, Dithane Z-78 + DDT, and Calcium Arsenate used alone.

NOVA SCOTIA: Tests for two years, comparing copper and organic compounds, have been barren of results as diseases have not been a factor.

LATE BLIGHT:

Tests were reported from Prince Edward Island, Pennsylvania (2), Connecticut, New York (3), and Maryland.

PRINCE EDWARD ISLAND: Based on control of tuber rot, the preferred materials were Bordeaux 10-5-100 and 10-10-100, Tribasic, and Perenox; Zerlate, Karbam, and Dithane D-14 are not satisfactory.

PENNSYLVANIA (2): Descending order of control was (1) Bordeaux and Dithane D-14; (2) Parzate and Tribasic; (3) Chromate 658 and C.O.C.S.; (4) Zerlate and Phygon. Descending order of yield in one test was (1) Dithane D-14 and Parzate; (2) Chromate 658, Tribasic, C.O.C.S., and Bordeaux; and (3) Zerlate and Phygon (much lower yields). In a second test the order was (1) Chromate 658; (2) Tribasic, C.O.C.S., Dithane D-14, Zerlate, and Bordeaux; and (3) Parzate and Phygon.

In CONNECTICUT, where disease incidence was light, the preferred materials were (1) Dithane D-14 and C.O.C.S.; (2) Bordeaux, and (3) Dithane Z-78 and Phygon; (Zerlate was very poor).

NEW YORK: In two spray tests all materials used gave perfect control of late blight; Parzate and Dithane D-14 gave deeper green foliage than fixed copper compounds (Copper A, Tribasic, C.O.C.S.) and Bordeaux; Parzate outyielded all the copper compounds (Dithane D-14 was second best). Yields of Bordeaux alone and with DDT were not significantly different. In a dust test, descending order of control was (1) Copper A and Tribasic; (2) Cuprocide and Dithane Z-78; and (3) Copper-lime. Copper-lime gave the best yields and Dithane Z-78 the poorest.

In the MARYLAND (Oakland) test, Dithane Z-78 + DDT outyielded Bordeaux + DDT by 127 bu./acre. Late blight was not severe. Maryland also reported that Bordeaux + DDT gave more potatoes than DDT alone, except on early-maturing varieties.

EARLY BLIGHT:

Tests were reported from North Dakota, Ohio, Iowa, Michigan, and Delaware.

In NORTH DAKOTA all materials used gave approximately equal control but descending order of yield was (1) Dithane D-14 and Zerlate (significant over untreated); (2) Parzate and Dithane Z-78; and (3) C.O.C.S., Phygon, zinc sulfate-lime, and Bordeaux. (Notes appended state that copper sprays and dusts are not good for controlling early blight; copper fungicides do not stimulate plants whereas zinc-containing fungicides gave highest yields even when early blight was absent; and C.O.C.S. and Phygon are not worth further testing for early blight control.)

OHIO: Reported descending order of control (1) Chromate 169; (2) Zerlate, Parzate, Dithane D-14 and Tribasic; (3) Bioquin and C.O.C.S.; and (4) Phygon. Yields followed the same order except for Bioquin which was equal to Zerlate. Chromate 169 gave by far the best yield. (Note appended states that alternating schedules of Zerlate with either Parzate or C.O.C.S. were excellent.)

IOWA reported descending control order (1) Parzate and Dithane D-14; (2) Zerlate and Bordeaux; (3) C.O.C.S.; and (4) Phygon. Descending yield order was (1) Parzate and Dithane D-14; and (2) C.O.C.S. and Zerlate. Phygon and Bordeaux reduced yield below untreated.

MICHIGAN reported that no material used was significantly the best as early blight was not severe. Highest yields were obtained from a combination of zinc nitro dithioacetate and copper nitro acetate plus DDT. Comparing Bordeaux, C. O. C. S., Dithane D-14, Parzate, Zerlate and Phygon, all used with DDT, the highest yield was given by Parzate and the next by Dithane D-14.

DELAWARE reported descending order of control (1) Parzate and Bordeaux;

(2) Zerlate-Parzate (1-1 ratio), Dithane Z-78, and Dithane D-14; (3) Copper A and Zerlate; (4) Tribasic, Yellow Cuprocide, C.O.C.S., and Zerlate-Parzate (3-1 ratio); and (5) Phygon. Yield in descending order was (1) Parzate and Zerlate-Parzate (1-1); (2) Zerlate-Parzate (3-1); (3) Dithane D-14 and Copper A; (4) Bordeaux, C.O.C.S., Tribasic, Yellow Cuprocide, Zerlate; and (5) Phygon.

EARLY BLIGHT AND LATE BLIGHT:

Tests were reported from Rhode Island, West Virginia, and Ohio (2).

OHIO reported descending control order, (1) Chromate 169 and Parzate; Dithane D-14 and Zerlate; (3) Tribasic, Bioquin, C.O.C.S., and Phygon. Descending order of yield in one test was (1) Chromate 169; (2) Tribasic; (3) Dithane D-14 and Phygon; (4) Parzate and Zerlate; and (5) C.O.C.S. and Bioquin. In the second test, the order was (1) Parzate and Dithane D-14; (2) Zerlate and Chromate 169; (3) Tribasic and Phygon; and (4) C.O.C.S. (Appended note stated that Zerlate alternating with either Parzate or C.O.C.S., or tank-mixed, gave excellent yields.)

In RHODE ISLAND, late blight was severe from mid-July to mid-August and early blight was severe for the remainder of the season. Under these conditions, the descending control order was (1) Parzate; (2) Bordeaux; (3) Tribasic and Dithane D-14; (4) Phygon; and (5) Zerlate. (Mycotox 1 was no better than untreated.) Bordeaux, Phygon, and Mycotox 1 caused leaf injury. Descending order of yield was (1) Parzate; (2) Tribasic and Dithane D-14; (3) Zerlate and Bordeaux; and (4) Phygon. (Mycotox 1 yielded less than untreated.)

WEST VIRGINIA reported descending control order, (1) Chromates; (2) Bordeaux; (3) Tribasic; (4) Dithane Z-78; (5) Dithane D-14; and (6) Phygon. Order of yield was (1) Chromates; (2) Dithane Z-78; (3) Bordeaux; (4) Tribasic; (5) Dithane D-14; and (6) Phygon. (Appended note stated that Tribasic was the most practical material from all viewpoints, and that certain Chromates and Dithane D-14 were promising.) Bordeaux caused slight injury.

TOMATOES

NO SERIOUS DISEASES:

In tests in Iowa, North Dakota, and South Carolina, disease was not a factor. Under these conditions, no fungicide used increased yields significantly and none decreased yields significantly.

ANTHRACNOSE:

In a spray test in NEW JERSEY, the descending order of control was (1) Zerlate (3 applications) followed by Tribasic (2 applications), and the Zerlate-Tribasic-Zerlate-Tribasic-Tribasic schedule; (2) Tribasic and Cuprocide; and (3) Dithane Z-78 and Dithane D-14. The yield followed the same order. No injury was observed.

EARLY BLIGHT:

In spray tests in Connecticut, Delaware, Illinois, New Hampshire, and Ohio, the only disease of consequence was early blight. The descending order of control was as follows:

CONNECTICUT: (1) Parzate; (2) Zerlate and Bordeaux; (3) alternating Zerlate and Tribasic, Chromate 169, Tribasic, and Phygon; and (4) Dithane D-14 and Dithane Z-78
ILLINOIS: (1) Zerlate , and alternating Zerlate and Tribasic; (2) Tribasic; (3) Yellow Cuprocide; and (4) Dithane Z-78.
NEW HAMPSHIRE: (1) Phygon; (2) Zerlate-Parzate, and Parzate; (3) Zerlate-Fermate and Manganese ethylene bisdithiocarbamate; and (4) Bordeaux, Copper oxide, and C. O. C. S. were poorer than the checks.
OHIO: (1) Tribasic; (2) Zerlate and Dithane Z-78; and (3) Phygon.
DELAWARE: (1) alternating Zerlate and Tribasic, Bordeaux, Zerlate and Tribasic; (2) Copper A and alternating Parzate and Tribasic; (3) Dithane Z-78 and Parzate; and (4) Phygon.

No yield data were taken in CONNECTICUT. In OHIO, the four materials used were equal in yield. In NEW HAMPSHIRE all materials gave lower yields than the checks, Bordeaux and Parzate being the poorest. In ILLINOIS, the alternating schedule of Zerlate and Tribasic, and Dithane Z-78, gave the highest yields; Zerlate and Tribasic were next best, and Yellow Cuprocide was the same as the checks. In DELAWARE, Parzate and Dithane Z-78 gave the highest yields, followed by Tribasic, alternating Zerlate and Tribasic, and Zerlate.

In ILLINOIS, Phygon was so injurious that the plots were abandoned.

LATE BLIGHT, EARLY BLIGHT, AND ANTHRACNOSE:

In one spray test in Pennsylvania and four in Ohio these three diseases were a factor.

PENNSYLVANIA: The descending order of control was Z-Z-Z-T-T, Dithane Z-78, Phygon, Parzate, Z-T-Z-T-Z, Chromate 169, and Zerlate (Z = Zerlate; T = Tribasic). Phygon caused slight injury. Descending order of yield was (1) Z-Z-Z-T-T; (2) Phygon and Parzate; (3) Dithane Z-78 and Z-T-Z-T-Z; and (4) Zerlate and Chromate 169.

OHIO: Six fungicides were common to all four tests, namely Tribasic, Zerlate, Parzate, Dithane Z-78, Bioquin, and Phygon. WHERE late blight was not serious, Zerlate, Tribasic, and Parzate were the three preferred materials; WHERE late blight was serious, Parzate, Tribasic, and Dithane Z-78 were the three preferred materials. Bioquin and Phygon were inferior and caused injury. Where used, Chromate 169 gave good control of defoliation, caused some chlorosis, and an intermediate yield response. C. O. C. S. and Copper A were somewhat inferior to Tribasic. A new material, Zac, used in one test gave good control, was slightly injurious to foliage, and gave yields below those of seven other materials in the test. Alternating schedules of Zerlate and Tribasic or Bordeaux, and half-and-half mixtures of Zerlate-Tribasic and Zerlate-Parzate, were reported to be better than most single treatments in some of the tests.

EARLY BLIGHT, LATE BLIGHT, AND GRAY LEAF SPOT:

In a test in HAWAII, these three diseases were serious. The descending order of control was Zerlate, Fermate, Dithane D-14, Tribasic, Yellow Cuprocide, Isothan Q15, and Phygon. The last two materials were very phytotoxic and reduced yields below that of the untreated plants. Zerlate gave best yields, Tribasic was second, and Fermate, Yellow Cuprocide, and Dithane D-14 were next best.

GRAY LEAF SPOT:

In a test at Bradenton, FLORIDA, this disease was severe. Dithane D-14 gave good control, Parzate fair control, and Copper A poor control.

SEPTORIA AND EARLY BLIGHT:

These were the major diseases in tests in Texas, Ontario, and Maryland. In the Ontario and Maryland tests, comparisons were made of various copper and organic fungicides. In both places the copper compounds gave better control of defoliation than the organics (Ed. Note --J.W.H.--presumably because of Septoria). Phygon was reported injurious in Maryland.

In Maryland the descending order of yield of materials statistically better than the untreated was (1) Dithane Z-78; (2) Z-Z-Z-T-T, Copper 8 (Bioquin), and Zerlate; and (3) Bordeaux, Phygon, and Tribasic.

No yields were reported from Canada, but the following remarks were appended: Neutral coppers were best and were all about equal; Dithane D-14 was best of the organics; P.E.P.S. was ineffective.

Maryland appended a note stating that Copper 8 (Bioquin) was very promising.

In Texas, where nailhead rust was also present, Zerlate, Dithane Z-78, and Phygon failed to control it. The fixed coppers (Copper A, Basicop, Tribasic, C.O.C.S. and Spraycop) were all preferred, either as dusts or sprays, because of their control of nailhead rust.

CUCUMBERS

DOWNY MILDEW:

Dust tests were conducted in South Carolina and North Carolina, a combined spray and dust test in Louisiana, and a spray test in Delaware. Materials used most frequently were Zerlate, Fermate, Dithane Z-78, Parzate, Copper A, Tribasic and Bordeaux. Each of the following materials appeared in one test: Tribasic + zinc sulfate, Yellow Cuprocide, Phygon, and Zerlate-Parzate (1-1 ratio).

In NORTH CAROLINA, the copper dusts (Tribasic, Copper A, and Tribasic + zinc sulfate) gave better control and higher yields than the organic dusts (Dithane Z-78, Zerlate, and Fermate). In SOUTH CAROLINA, all materials used gave about equal control but Zerlate gave by far the highest yield; it was noted that Zerlate seemed to stimulate the plants. In LOUISIANA, the copper sprays and dusts, except for Bordeaux, gave poorer control than Parzate, Dithane Z-78, Zerlate, and Fermate sprays and dusts. Dithane Z-78 dust gave the best control, followed by Fermate (sprays) and Bordeaux (spray). No yield data were obtained because of hurricane damage. In DELAWARE, the coppers and the dithiocarbamates gave approximately equal control. The only materials to give a significant increase in yield over the checks were as follows, in descending order: Parzate, Dithane Z-78, Zerlate-Parzate (1-1 ratio), Tribasic, and Zerlate.

All the copper materials, except Tribasic in North Carolina, caused injury, Bordeaux causing the most. Phygon, used in South Carolina, was extremely injurious. The dithiocarbamates were non-injurious except for Fermate, which caused injury in Delaware and North Carolina.

CANTALOUPS

DOWNY MILDEW:

A spray test was conducted in Maryland and a joint spray and dust test in Delaware. Materials common to both tests were Bordeaux, Compound A, Dithane Z-78, Fermate, and Zerlate. Delaware also used Yellow Cuprocide, Parzate, and Dithane D-14. A comparison of similar materials in both tests shows that Bordeaux gave the best control in Maryland whereas the coppers and the dithiocarbamates gave approximately equal control in Delaware.

In MARYLAND, the descending order of yield was Bordeaux, Fermate, Zerlate, Dithane Z-78, and Copper A. In DELAWARE, the order was Fermate, Zerlate, Dithane Z-78, Bordeaux, and Compound A. (Maryland sprayed on a 10-day schedule; Delaware on a 7-day schedule.) Bordeaux and Compound A were injurious in both States; Dithane Z-78 was slightly injurious in Maryland; and Fermate was injurious in Delaware.

In Delaware, Copper A, Zerlate, Dithane Z-78, and Parzate were compared as sprays and dusts. In each case, the dusts gave poorer disease control but slightly higher yields. Highest yielding treatments were Dithane Z-78 (dust) and Zerlate (dust).

WATERMELONS

DOWNY MILDEW AND ANTHRACNOSE: A dust test was conducted at Leesburg, FLORIDA. The descending order of control against anthracnose was (1) Dithane Z-78, Tribasic, and Copper-Zinc-Lime; (2) Zerlate, Fermate, and Zerlate-Fermate; and (3) Copper A. The order against downy mildew was (1) Dithane Z-78 and Tribasic; (2) Copper-Zinc-Lime; (3) Zerlate; (4) Fermate; (5) Copper A; and (6) Zerlate-Fermate. No yield or injury data were presented.

BUTTERNUT SQUASH

BLACK ROT: In a spray test in MASSACHUSETTS, descending order of control was (1) Zerlate; (2) Parzate and Fermate; (3) Bordeaux and Copper A; and (4) Dithane Z-78. Bordeaux caused injury.

BLOSSOM-END ROT: In the same test as above, the descending order of control, based on number of fruits, was (1) Fermate, Parzate, and Zerlate; (2) Dithane Z-78; and (3) Bordeaux and Copper A.

POWDERY MILDEW: In the same test, Zerlate and Dithane Z-78 failed to control powdery mildew.

LIMA BEANS
(Henderson Bush)

STEM ANTHRACNOSE: One test was conducted in NORTH CAROLINA. Phygon and Fermate were used as sprays. Dusts used were Phygon, Fermate, Zerlate, Tribasic, and Dithane Z-78. Control data showed that both Phygon and Fermate sprays gave excellent control, Phygon being slightly the better of the two. In the dust series, descending order of control was Phygon, Dithane Z-78, Tribasic, Fermate, and Zerlate. Injury was caused only by Phygon and Tribasic. Yield data showed that sprays produced higher yields than dusts. Phygon produced the highest yield, both as a spray and as a dust. In the dust series, the descending order of yield was Phygon, Dithane Z-78, Zerlate, Tribasic, Check, and Fermate.

STRING BEANS

ANTHRACNOSE: In one test in CONNECTICUT descending order of disease control was Phygon, Dithane Z-78, Fermate, and Yellow Cuprocide. Slight chlorosis was caused by Phygon. Highest yield was produced by Fermate, Phygon and Yellow Cuprocide were second, and Dithane Z-78 was last. (Compare this test with that on Henderson Bush lima beans above.)

CELERY

CERCOSPORA BLIGHT:

At St. Catherines, ONTARIO, descending order of control for 14 materials was (1) Bordeaux and Burgundy mixture; (2) Basicop; (3) Copper A and C.O.C.S.; (4) Dithane D-14; (5) Phygon; (6) P.E.P.S. + Basicop, and Mulsoid Sulfur + Basicop; (7) Perenox, Zerlate, and Fermate; (8) Dithane Z-78; and (9) P.E.P.S. No material caused injury. No yield data were given. Preferred materials are (1) Burgundy mixture; (2) Bordeaux; (3) Neutral Coppers; (4) Dithane D-14; (5) other organics.

At Sanford, FLORIDA, descending order of control was (1) Fermate + Zerlate; (2) Fermate, Zerlate, Copper A, Parzate, Bordeaux + Sulfur; (3) C.O.C.S; (4) Tribasic and Phygon; and (5) Dithane Z-78. No injury or yield data were presented.

SPINACH

DOWNY MILDEW:

At Milpitas, CALIFORNIA, descending order of control was (1) Zinc ethylene bis dithiocarbamate; (2) Spergon-Sulfur dust, Bismuth Subsalicylate, Bordeaux + Spreader; (3) Bordeaux + SEC oil, Rosin lime sulfur; and (4) Phygon, Zerlate (dust), Sulfur (dust), and Lime sulfur + zinc sulfate.

Injury was caused by Bordeaux + Spreader, and Phygon.

Descending order of yield was Zinc ethylene bis dithiocarbamate, Sulfur (dust), Spergon-Sulfur (dust), Zerlate (dust), Bismuth Subsalicylate, and Bordeaux + SEC oil. Yield was decreased by Bordeaux + Spreader, Lime sulfur + zinc sulfate, Rosin lime sulfur, and Phygon.

Preferred materials are Zinc ethylene bis dithiocarbamate and Spergon-Sulfur (dust).

BEETS

DOWNY MILDEW: In a test at Milpitas, CALIFORNIA, the same materials were used on beets as on spinach (see data under spinach above). Zinc ethylene bis dithiocarbamate and Spergon-Sulfur (dust) were the best preferred materials.

CABBAGE

DOWNY MILDEW:

At Hastings, FLORIDA, descending order of control was (1) Spergon; (2) Spergon (dust); (3) Phygon (dust); (4) Dithane and Karbam; and (5) Parzate (dust) and Phygon. No injury or yield data were presented.

ALTERNARIA LEAF SPOT:

At Hastings, FLORIDA, descending order of control was (1) Karbam white; (2) Parzate; (3) Fermate; (4) Spergon, Tersan; (5) Tribasic; (6) Copper A and C.O.C.S.; and (7) Cr 1639 (very poor control). Phygon injured seedlings severely. No yield data were presented.

At Apopka, Florida, in a dust test, the descending order of control was (1) Zerlate; (2) Dithane Z-78; (3) Tersan, Fermate, and Spergon; and (4) Sulfur, Fermate, and Phygon. No injury or yield data were presented.

ONIONS

DOWNY MILDEW:

In a combined spray and dust test at Parma, MICHIGAN, the descending order of yields was (1) Dithane Z-78 (dust); (2) Cuprocide-Sulfur (dust); (3) Dithane Z-78; (4) Dow 612; (5) Bordeaux; (6) Lime-sulfur-rosin, P.E.P.S., Wettable Sulfur; and (7) Dow 606 and Cuprocide. Tip-burning was caused by Bordeaux and chlorosis was caused by Cuprocide, P.E.P.S., and Lime-sulfur-rosin. It was noted that P.E.P.S., Wettable Sulfur, Cuprocide, and Bordeaux were not worth further trial. Dusts were more effective than sprays.

At Baton Rouge, LOUISIANA, all materials when used as sprays (Bordeaux, C.O.C.S., Dithane Z-78, Zerlate, and Phygon), failed to give control. In a dusting demonstration, Tennessee Copper Dust A (7% metallic Cu + 2% mineral oil) resulted in 12 percent disease as compared with 45 percent in the check.

USEFULNESS OF SOME OF THE NEWER ORGANIC FUNGICIDES FOR VEGETABLE DISEASE CONTROL

This listing is necessarily incomplete and tentative. It is based entirely on information given in this report on results with vegetable diseases.

BIOQUIN (COPPER-8) may be promising on tomatoes and potatoes. It requires further testing.

CHROMATES (not organic compounds). Some (e.g., 169) look promising on potatoes and possibly on tomatoes.

DITHANE D-14. This material, when used with zinc sulfate-lime, should no longer be considered a new material. Its usefulness on certain crops has been established.

DITHANE Z-78 is promising on potatoes and tomatoes for control of early and late blights; on beans for anthracnose; on celery for *Cercospora*; on spinach, onions, and beets for downy mildew; on cucurbits for downy mildew and anthracnose; and on cabbage for *Alternaria*. It is not promising for the control of powdery mildews, nor, possibly, for *Septoria* on tomatoes.

FERMATE. This is no longer a new material. Its usefulness for the control of anthracnose types of disease has been well established. It is also useful on cucurbits for the control of downy mildew and other diseases. Its limitations for the control of early and late blights on tomatoes and potatoes are well known.

KARBAM (BLACK). See FERMATE above (same active chemical ingredient).

KARBAM (WHITE). See ZERLATE below (same active chemical ingredient).

MANGANESE ETHYLENE BIS DITHIOCARBAMATE appears promising but more widespread tests are required.

PARZATE. See DITHANE Z-78 above (same active chemical ingredient).

P.E.P.S. does not seem promising as a vegetable fungicide.

PHYGON. This material has good disease-controlling powers against many vegetable diseases, but it is often injurious, sometimes seriously so, to many vegetable crops.

SPERGON is good for the control of spinach and cabbage downy mildew, but appears ineffective against most other vegetable diseases.

ZERLATE. This should not be considered new any longer. Its major weakness appears to be its ineffectiveness against tomato and potato late blight and against powdery mildew diseases. It is excellent for control of early blight of potato and tomato, for cucurbit downy mildew, and for anthracnose diseases. It appears to be a "specific" for rusts.

ZAC. Only one test, on tomatoes, was reported with this material. It should be more widely evaluated in 1948.

NOTE: Several cooperators reported excellent results from the use of combinations of dithiocarbamates, e. g., Zerlate-Parzate, on potatoes, tomatoes, and cucurbits. Tests with such combinations should be extended in 1948.

RESULTS WITH DISEASES OF ORNAMENTAL CROPS INCLUDING SHADE TREES AND TURF

Reports were received from 11 cooperators in 10 States. Included were reports on chrysanthemum, daffodils, gladiolus, rose, snapdragon, twelve shade trees, and turf.

CHRYSANTHEMUM

SEPTORIA LEAF SPOT: Good control was obtained at Ithaca, New York, with Fermate, Bordeaux, Parzate, and Phygon. Lime-sulfur caused severe, and Phygon moderate, injury. Bordeaux-sprayed plants were slightly dwarfed. Growth was slightly better in Fermate- than in Parzate-sprayed plots.

DAFFODIL

FUSARIUM BASAL ROT: At Beltsville, Maryland, control was in the following descending order: Mersolite 8, New Improved Ceresan, Arasan, 2% Ceresan, Puratized Agricultural Spray, Copper 8, Thiourea, Dowicide B, Roccal, and 341. Flower injury was obtained with New Improved Ceresan, 2% Ceresan, Dowicide B, Copper 8, and 341. Bulb yields were best with Arasan, New Improved Ceresan, and Mersolite 8.

GLADIOLUS

Fifteen materials were included in tests in Illinois and Kansas for the control of Fusarium yellows and Fusarium brown rot.

FUSARIUM YELLOWS:

Control obtained in Illinois was in the following descending order: New Improved Ceresan, DuPont 1452-F, DuPont 1451-GGG, Arasan, Dow 9B, Lysol, Mercurnol, Puratized 177, Puratized Agricultural Spray, 8-hydroxyquinoline sulfate, Bismuth subsalicylate, and Mercuric chloride. In overall preference New Improved Ceresan was rated first, followed by DuPont 1451-GGG (Ceresan M), Lysol, Arasan dust, and Dow 9B. Mercuric chloride caused a dry core rot, smaller corms, and extreme reduction in cormel production. Mercurnol, though less severe, caused the same types of injury.

Of three materials tested in Kansas, New Improved Ceresan was considered best, followed by Fermate and Dithane D-14.

FUSARIUM BROWN ROT:

In two tests in Illinois, New Improved Ceresan gave best control, followed by Lysol. Dow 9B, Arasan, and Arasan S. F. were third. Fair control was obtained with DuPont 1451-GCG and 1452-F and Mercunol in one test. Control was poor with Puratized Agricultural Spray, Mercuric chloride, 8-hydroxyquinoline sulfate, Bismuth subsalicylate, Puratized 177, and Calogreen. Plants treated with Mercuric chloride or Calogreen were weaker and more spindly. The overall preference was in the following descending order: New Improved Ceresan, Lysol, Arasan dust, Ceresan M, and Dow 9B.

ROSE

BLACKSPOT:

No significant difference in control was obtained in Arkansas with Phygon Rose Dust, Fermate Rose Dust, or Sulfur dust, but all were much better than untreated. The Phygon Rose Dust caused some foliage injury.

In Texas each of the following combination dusts gave about the same blackspot control as measured by increased weight per plant:-- Sulfur:Tennessee Copper 34 (90:10); Tennessee Copper 34:Pyrax:Oil (10: 90 + 2% oil); Tennessee Copper 34:Dresinate XXX:Sulfur (10:5:85); and Tennessee Copper 34:Sulfur:Flour (10:70:20). Sulfur:Dithane Z-78 (95: 5) was not so effective, and 5% Phygon caused skin irritation and was discontinued.

SNAPDRAGON

RUST:

Parzate, Fermate, Wettable sulfur, Rosin-lime-sulfur, and Bordeaux were compared in California, Ohio, and New York. Best control was obtained with Parzate, followed by Rosin-lime-sulfur, Fermate, and Wettable sulfur, in that order. Bordeaux was not effective where the inoculum potential was high. Parzate was non-injurious; Fermate caused slight dwarfing; Bordeaux caused slight marginal leaf injury as did Wettable sulfur; Rosin-lime-sulfur caused severe injury in New York and Ohio where the humidity was high but did not cause injury in California where the humidity was low. In California the addition of DuPont Spreader-Sticker did not improve the effectiveness of Parzate, but reduced the residue. Also, an increase in the concentration of Parzate did not increase control but resulted in slight marginal leaf discoloration.

ANTHRACNOSE (*Colletotrichum antirrhini*):

Parzate, Fermate, Bordeaux, Lime-sulfur, and Wettable sulfur all controlled anthracnose in New York. Parzate was rated best because of its dual value for anthracnose and rust.

SHADE TREES

AUSTRIAN PINE

TIP BLIGHT (*Sphaeropsis ellisii*): In Pennsylvania trees sprayed with Bordeaux, Zerlate, Fermate, Parzate, or Puratized were not injured. Control results were too variable to permit conclusions.

BLACK WALNUT

MARSSONINA LEAF SPOT: In Illinois Puratized Agricultural Spray has been the most effective of 13 fungicides tested during the past five years. In 1947 the average number of spots per leaf and the percentage defoliation was much less on trees sprayed with this material than on trees sprayed with Bordeaux + Soybean flour, Fruit Thinner III, 169, 531, or with Puratized 177.

DOGWOOD

TWIG BLIGHT (*Myxosporium* sp.): In Pennsylvania Puratized delayed fall-coloration, but none of the materials tested -- Bordeaux, Zerlate, Fermate, Parzate, or Puratized -- gave conclusive disease control.

ENGLISH HAWTHORN

LEAF BLIGHT (*Entomosporium thuemenii*): In Pennsylvania Bordeaux caused roughened and necrotic spotted leaves and petioles, although it prevented defoliation by the disease. Puratized did not injure the foliage and prevented defoliation early in the season but by October the trees were completely defoliated.

HICKORY

LEAF SPOT (*Gnomonia ovata*): Zerlate, Parzate, and Puratized gave complete or almost complete control, whereas Fermate gave practically no control, in Pennsylvania. None of the materials injured the foliage.

HORSECHESTNUT

LEAF BLOTCH (*Guignardia aesculi*): Zerlate and Parzate gave good control, Bordeaux fair control, and Fermate and Puratized poor control, in Pennsylvania. Bordeaux caused slight foliage and petiole injury.

JUNIPER

QUINCE RUST (Gymnosporangium clavipes): No control or injury was obtained with Puratized in Pennsylvania.

NORWAY MAPLE

ANTHRACNOSE (Gloeosporium apocryptum): Fermate gave moderate control in mid-summer, but by fall sprayed trees had as much disease as the unsprayed, in Delaware.

RED OAK

TWIG BLIGHT (Sphaeropsis sp.). Control was obtained with Puratized and with Bordeaux in Pennsylvania. Bordeaux caused a roughening, crinkling, and necrosis of the foliage.

SASSAFRAS

ANTHRACNOSE (Gloeosporium fructigenum): Fermate gave good control with no injury in Delaware.

SOUR GUM

TWIG BLIGHT (Phomopsis sp. ?): Bordeaux and Puratized gave fair control in Pennsylvania, whereas Fermate, Zerlate, and Parzate did not. However, both Bordeaux and Puratized caused foliage injury.

SYCAMORE

ANTHRACNOSE: In Illinois Puratized Agricultural Spray gave good, Puratized 177 fair, and Good-rite p.e.p.s. poor, control. None of these materials injured the foliage. Of 8 materials tested during the past three years, Puratized Agricultural Spray has been the most effective.

BENT TURF

DOLLAR SPOT, COPPER SPOT, AND PINK PATCH:

In Rhode Island P-177 (Puratized 177?), P-641, PMAS, PMAS-AA, CC 531, and Puraturf gave good control of Dollar Spot, whereas Spergon W, Mersolite A, and Dithane Z-78 did not. Pink Patch was controlled with P-177, P-641, and CC 531, but not with Mersolite A or with Dithane Z-78. Some control was obtained with PMAS, PMAS-AA, Puraturf, and Spergon W. Control of Copper Spot was obtained with Puraturf, and PMAS, and fair control with P-177, P-641, and with PMAS-AA. Mersolite A, PMAS, PMAS-AA, and P-641 all caused slight burning but none of the other materials caused injury.

RESULTS WITH PLANT BED DISEASES

TOBACCO

BLUE MOLD: Results were reported from Florida, Georgia, South Caroline, North Carolina and Maryland. Dithane Z-78 and Parzate gave as good blue mold control as Fermate, and at slightly lower concentrations. Both as a spray and a dust Dithane and Parzate were effective at about 3/4 the Fermate rate. Successful blue mold control was obtained in Georgia with a combination of 1 lb. Fermate, 4 oz. salicylic acid, 1 oz. Vatsol-K or Dreft, 100 gallons of water. This mixture is being prepared commercially and sold as Dimole.

CABBAGE

DOWNY MILDEW: Tests in Mississippi showed that wettable Spergon as a spray (4 lb/100 gal) and a dust (6 and 10%) gave satisfactory control. Considering effectiveness of control and freedom from plant injury the 6% dust was preferred.

RESULTS WITH SOIL STERILIZATION AND FUMIGATION

TOBACCO

ROOT KNOT AND MEADOW NEMATODE: Tests were conducted in Florida with shade tobacco. Iscobrome D, Dowfume W-10 (30 gallons per acre), D-D and Dowfume N (20 g.p.a.) were applied 2 1/2 months before transplanting. All gave marked nematode control. The treatments increased the yields of cured leaf 200-250 lbs. per acre and had no unfavorable effect on quality. A large acreage of shade tobacco in north Florida was treated commercially this year. In Connecticut tests were also conducted with shade tobacco. Various treatments with Iscobrome, Dowfume W-40 and D-D all gave effective root knot control.

In Georgia, South Carolina and North Carolina similar experiments were conducted with flue-cured tobacco. The North Carolina tests showed good nematode control with Dowfume W-40 (20 g.p.a.) and D-D (200 lbs p.a.). Yields of cured leaf were increased 325 to 400 lbs. per acre, but the cured tobacco from the treated plots was lower in quality. In Georgia Dowfume W-10 (30 and 40 g.p.a.) and D-D (15 and 20 g.p.a.) were compared. All treatments greatly reduced the amount of root knot but at the rates used, D-D appeared to be slightly the more effective. The very best control was obtained in a series of plots that received rain about 12 hours after treatment. Average yield increases were about 600 lbs. of cured leaf per acre and quality was not affected. Root knot infection developed rapidly inthe treated plots after harvest, so the treatments would provide little or no residual protection.

The land used for the tests in both Georgia and North Carolina was very heavily infested so the conditions were more severe than those on the average farm. A large scale experiment in South Carolina yielded entirely negative results. At this location the soil was very dry at the time of treatment, and drought conditions continued for some weeks.

COTTON

ROOT KNOT - MEADOW NEMATODE - FUSARIUM WILT: Tests in Alabama with Dowfume W-10 at rates of 12.5 and 37.5 g.p.a. 10 days before planting, showed effective control of both nematodes and wilt. Marked increases in yield were secured.

SUGAR BEETS

ROOT KNOT AND SUGAR BEET NEMATODE: Large scale field experiments were conducted in Colorado, Wyoming and Nebraska. Applications were made 10-14 days before planting at the rate of 25 g.p.a. In 6 out of 7 tests D-D gave yield increases ranging from 3 to 10 tons per acre. In 7 out of 11 tests Dowfume N gave yield increases - ranging from 3 to 13 tons per acre. In 3 out of 3 tests with Dowfume W-40 increased yields from 4 to 10 tons per acre. Results with chisel and plow sole applications were equally good.

SUGAR BEET NEMATODE: About 700 acres of land were fumigated for nematode control in the Intermountain area in 1947. The standard application was D-D and Dowfume N 25 g.p.a. Control was satisfactory, but protection was for one year only.

VEGETABLE CROPS

TOMATO, OKRA AND BEANS

ROOT KNOT: Tests in North Carolina with D-D, ethylene chlorobromide, Dowfume W-10 Iscobrome D and Uramon applied 17-32 days before planting showed effective root knot control with all treatments. Greatly increased yields of tomatoes were obtained. All treatments except Uramon increased okra yields. Bean yields were reduced by the treatments. Tests with tomatoes and beans at another location using the same materials showed effective root knot control, except with the lowest rate of D-D (200 lbs p.a.). Again tomato yields were greatly increased in the treated plots, but the bean yields were poor.

CARROT AND BEAN

ROOT KNOT: Florida reported on treatments applied 1 to 20 days before sowing seed. Dowfume W-40, D-D and Cyanamid were used. Dowfume W-40 gave perfect root knot control at 17.5 and 15 g.p.a. and was less effective at 12.5 g.p.a. D-D gave good control at 25 and 20 g.p.a. and was less effective at 15 g.p.a. Cyanamid at 500 and 1500 pounds per acre gave poor control.

LETTUCE

ROOT KNOT: Tests in Florida with Larvacide, Dowfume W-10, D-D and Iscobrome No. 1, applied 3 weeks before seed sowing, all showed partial root knot control. Larvacide (28 g.p.a.) was the most effective and Iscobrome No. 1 (45 g.p.a.) least effective.

POTATOES (Irish)

ROOT KNOT: Tests conducted in Idaho showed excellent control - less than 10 percent of tubers infected - with Orthofume, Dowfume N, D-D and Dowfume W-10. Untreated checks were 77 to 85 percent infected.

ORNAMENTALS

ROSE

ROOT KNOT: Experiments were conducted in Maryland with Larvacide

(23 g.p.a.), D-D and Dowfume W-15 (both 40 g.p.a.) applied in May. A clean crop of chrysanthemums was produced in the fall. Next year rose seedlings were grown and all treatments gave excellent root knot control.

PANSY

SEEDLING DECAY: Soil was fumigated for 7 days in tight boxes and then aerated in shallow flats for 5 days before sowing pansy seed. Treatments were Larvacide DD and allyl bromide 5 cc per cubic foot, Dowfume W-15 10 cc and Iscobrome No. 1 15 cc. Larvacide and D-D increased germination 96 and 57 percent. Dowfume W-15 and Iscobrome No. 1 had little effect. Allyl bromide inhibited germination completely.

RESULTS WITH SEED TREATMENTS

Requests for summarized information on the performance of seed treatment materials were sent to 55 investigators in 30 States and 4 Canadian Provinces. Reports were received from 27 cooperating groups or individuals located in 18 States and 3 Provinces. Fifteen proprietary fungicides and 9 experimental materials were reported as having been tested on one or more of 16 crops.

Thirteen materials were tried on wheat, 12 on barley, 11 on flax, 6 each on corn, soybeans, and peas, 5 each on cotton, oats, and peanuts, 4 on beans, 3 each on alfalfa and tomatoes and 1 on sweetpotatoes.

With the exception of the reports on cotton, the number of reports received on the different crops was not sufficient to form a basis for adequately evaluating the relative efficiency of the materials used on seed of these crops.

COTTON

ANTHRACNOSE, DAMPING-OFF AND RELATED DISEASES:

Reports were received on cooperative experiments conducted in 21 locations in 10 States. The materials used were Ceresan M (dust and slurry), Dow 9B, separately and in combination with Zerlate or Fermate, and Mycotox. These materials were applied at several different rates to fuzzy, reginned and delinted seed lots. Ceresan M seemed to be best for treating fuzzy and reginned seed as it generally resulted in slightly better stands. The slurry method of applying Ceresan M seemed to have no special merit except that it reduced the poisoning hazard. Dow 9B and Mycotox gave comparable results. Combining Zerlate or Fermate with Dow 9B did not increase its effectiveness.

Throughout the experiments no fungicide was consistently better than the others and few differences were significant and large enough to be reflected in increased yields. Therefore, the fungicidal superiority of any one of these chemicals for all kinds of cotton seed and under all kinds of field conditions has not been demonstrated.

BARLEY

COVERED SMUT: In Saskatchewan, with 20 percent infection in the check, covered smut was eliminated by N. I. Ceresan, Leytosan, and Lunasan at 1/2 oz. per bushel and N. I. Ceresan dip (1 to 800 for 5 minutes); smut was reduced to less than 0.5 percent by Ceresan M (1/2 oz.), Phygon (2 oz.), and formaldehyde dip (1:320 for 5 min.).

OATS

HELMINTHOSPORIUM VICTORIAE:

In Kansas, N. I. Ceresan increased yields about 2 bushels per acre in both resistant and susceptible varieties. In Illinois the stand in Vicland oats was 95.1, 77.1, and 70.7 for N. I. Ceresan, Parsons Seed Saver, and check, respectively. The corresponding percentages of diseased plants were 7.6, 39.6, and 70.7, respectively. In Indiana the percentage increases in stand for Ceresan M dust, Ceresan M slurry, N. I. Ceresan, and Parsons Seed Saver were 29.5, 27, 18.9, and 10.2, respectively. The corresponding percentage increases in yield were 17.7, 14.1, 5.9, and -2.5, respectively. In another test the corresponding percentage increases in yield were 55, 66, 73, and 13, respectively.

COVERED SMUT:

In Washington, in a series of experiments, infection was reduced to less than 0.6 percent by N. I. Ceresan and Ceresan M. Spergon allowed 12 to 29 percent, Parsons Seed Saver 25 to 37 percent, while the checks ranged from 10 to 32 percent.

WHEAT

BUNT CONTROL AND STAND:

In Michigan, N. I. Ceresan (1/2 oz.) reduced bunt to 2.3 percent (38.8 percent in the check), while Parsons Seed Saver allowed 19.2 percent bunt. In Washington, N. I. Ceresan, Ceresan M, and Spergon, controlled bunt satisfactorily, while Parsons Seed Saver averaged 71 percent, with an average of 80 percent in the checks.

In Manitoba the stand from Helminthosporium-infected seed was increased appreciably by N. I. Ceresan, Lunasan, phenyl mercury acetate, and Leytosan. In Kansas the stand from untreated seed was 65.4 percent as compared with Ceresan M 75, Arasan 74.4, N. I. Ceresan 73.8, copper carbonate 70.5, and Spergon 68.9 percent. In North Dakota, N. I. Ceresan increased the stand significantly while Parsons Seed Saver and Dow 9B did not.

SORGHUM

SEEDLING BLIGHT AND KERNEL SMUTS: At Beltsville, Maryland, Arasan (2 oz.), N. I. Ceresan, Ceresan M, Spergon, and Phygon, greatly improved emergence and furnished excellent control of covered kernel smut. Dow 9B, Fermate, Zerlate, Dithane-10, sulfur, and Parsons Seed Saver, were inferior.

CORN

SEED DECAY AND SEEDLING BLIGHTS: Reports were received from Iowa, Indiana, and Michigan. In general, Arasan either as dust or slurry, excelled in improving stands. Phygon, Spergon, Barbak C, and Semesan Jr. were slightly less beneficial. The slurry method of applying dusts to corn is increasing in popularity.

FLAX

IMPROVING STANDS: In North Dakota stands were increased 23.6 percent by N. I. Ceresan (1/2 oz.) but decreased 20 percent by Parsons Seed Saver (1/2 oz.) and 31 percent by Dow 9B (3 oz.). In Manitoba emergence from seed treated with N. I. Ceresan (1-1/2 oz.), Leytosan 1/2 oz., Ceresan M 1/2 oz., and Lunasan (2 oz.) was 57.7, 48.6, 48.2, and 45.6 percent, respectively, as compared with 29.6 percent from untreated seed. The general recommendation in the United States and Canada is N. I. Ceresan at 1-1/2 oz. per bushel.

OTHER CROPS

One report from Alabama on PEANUT seed treatment recommended Ceresan M at 1.5 oz. and Spergon, Arasan, Phygon, and Dow 9B at 3 oz. per 100 lbs. One report from Oklahoma recommended Phygon, Arasan, and Dow 9B for ALFALFA seed. The fungicides did not injure bacterial inoculum but enhanced nodulation. In North Carolina, Arasan (dust or slurry) was superior to Spergon for improving emergence in SOYBEANS. Arasan, especially in slurry form, was found superior also at Beltsville, Maryland, while Phygon, although promoting emergence, injured seedling development. In North Dakota, Spergon increased the yield of STRING BEANS 90 percent. In Oklahoma, Dow 9B, Phygon, Arasan, and Spergon used on MUNG BEANS varied in results according to the dosage used. At high dosages, Dow 9B and Phygon were injurious. One report from Michigan showed little benefit to emergence from CUCUMBER seed after treatment with Spergon, Phygon, Dow 9B, or Arasan. These same materials improved emergence in PEAS only slightly. Better results with peas were reported from Pennsylvania from the use of "Carbon and Carbide", Tribasic copper sulfate, and Arasan. One report from Maryland recommended Puratized 1-5000 as a dip for SWEETPOTATO sprouts to control scurf and *Fusarium* wilt.

USEFULNESS OF SOME OF THE NEWER ORGANIC FUNGICIDES FOR SEED TREATMENTS

ARASAN: For treating seeds of corn, flax, forage crops, peanuts, sorghum, sugar beets, most vegetables, and alfalfa

DOW 9B: For seed of cotton, corn, beans, peanuts, and possibly some vegetables.

CERESAN M (Du Pont F-1452): For treating seed of barley, oats, wheat, flax, possibly corn and sorghum.

PURATIZED: Sweetpotato sprouts.

PHYGON: For seed of cereals, sugar beets, vegetables, and other seeds. It is injurious to soybeans and mung beans and some other seeds at heavier dosages.

MYCOTOX: For cotton seed

LEYTOSAN: For barley, oats, wheat.

PARSONS SEED SAVER DUST has proved generally inferior to other materials recommended.

THE PLANT DISEASE REPORTER

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Division of Mycology and Disease Survey

BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING

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SUPPLEMENT 177

SOME UNUSUAL OR OUTSTANDING PLANT DISEASE DEVELOPMENTS IN THE UNITED STATES IN 1947

Supplement 177 October 15, 1948

The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

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THE PLANT DISEASE SURVEY
DIVISION OF MYCOLOGY AND DISEASE SURVEY

Plant Industry Station Beltsville, Maryland

SOME UNUSUAL OR OUTSTANDING PLANT DISEASE DEVELOPMENTS IN THE UNITED STATES IN 1947

Compiled by Nellie W. Nance

Plant Disease Reporter
Supplement 177

October 15, 1948

This summary of the incidence of some unusual or outstanding plant disease developments in the United States has for the most part been taken from reports to the Plant Disease Survey. No attempt has been made to make it a complete record of plant disease occurrence during the year.

Since weather conditions play an important role in the development and distribution of plant diseases, it seems desirable to give a brief review of the weather of 1947 in the United States (Monthly Weather Review, December 1947).

Temperatures. The mean temperature for the year, derived by weighting the average temperatures of the different States according to their areas, was slightly above the average for the period 1886 to 1947. Temperatures averaged about normal for the year over most of the country, ranging from somewhat above normal in Florida and New England to considerably above in the extreme Northwest, and registering somewhat below in large areas of the Ohio Valley and South Central States. Annual averages were as much as 2 to 4 degrees above normal in western Washington and northern Oregon. For the year's highest temperature, Cow Creek, California recorded 126° F., on July 19, a figure 8° below the all-time high. The lowest temperature of -43° F. was recorded at Gavilin, N. Mex. (7,350 feet elevation), on January 16, a reading of 23° above the all-time low. (Figure 3)

An interesting pattern is presented by the variation of 1947 temperatures from the normal. In January they averaged above normal in the East, below in the West, although the reverse was true for February through May, inclusive. June temperatures averaged above normal for the southern one-third of the country and below normal for the northern two-thirds.

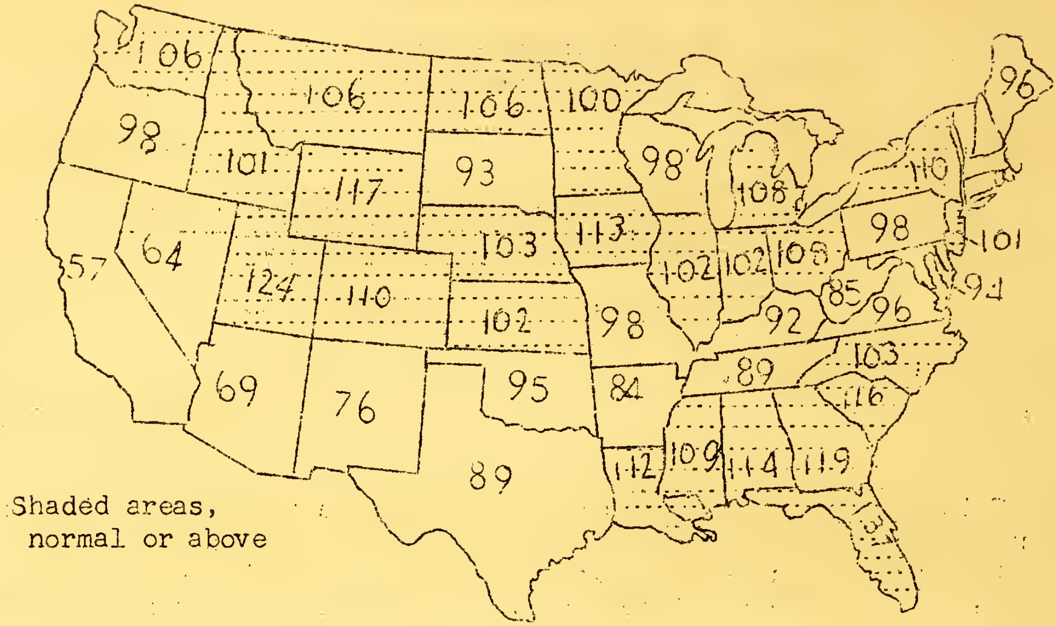

Figure 1. Percentage of normal precipitation for the year 1947.

Geographic distribution changed in July, with the western two-thirds of the country experiencing above-normal heating while the eastern one-third average was below normal. For the next three months averages were generally above normal, dropping to below in November and rising again to above normal in December.

Precipitation. The average annual precipitation for the country as a whole, based on weighted averages, was 28.78 inches, 0.39 inch less than the average for the period 1886 to 1947, or very near the normal. Figure 1 gives the percentages of normal precipitation by States for 1947. Figure 2, the percentages for the growing season. The areal distribution of the percentages of normal is presented by a chart which shows a rather broad belt of above-normal precipitation, extending from New England westward to the central Rockies, thence northwestward through western Montana, northern Idaho and northern Washington. Another belt of above-normal amounts included the coastal areas from eastern Texas to central Virginia. Precipitation was only one-fourth to three-fourths of normal in California, Nevada, Arizona and New Mexico.

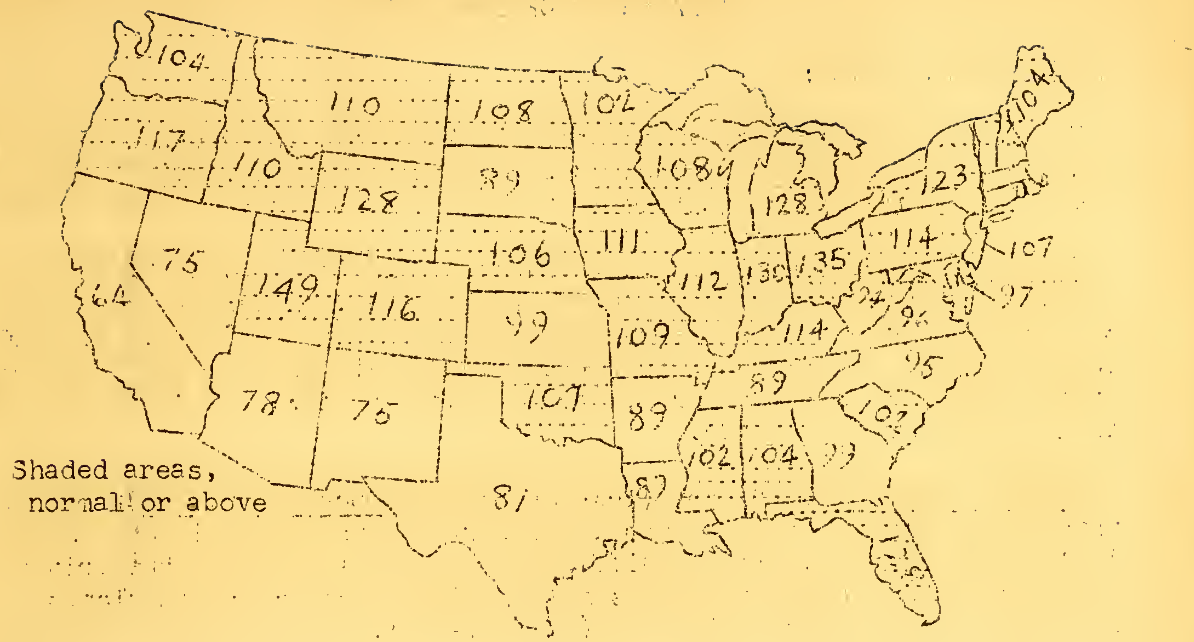

Figure 2. Percentage of normal precipitation, April 1 - September 30, 1947

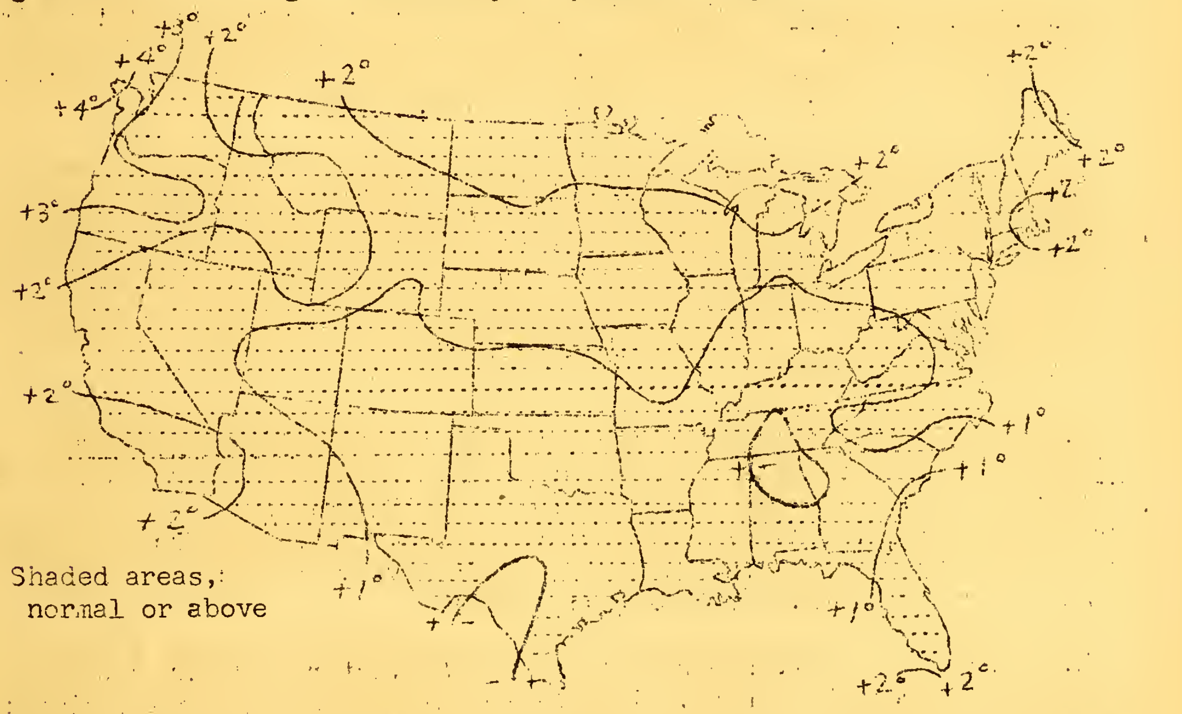

Figure 3. Departure of mean temperature from normal for the year 1947. (Weekly Weather and Crop Bulletin January 6, 1948)

DISEASES OF CEREAL CROPS

AVENA SATIVA. OATS:

H. R. Rosen summarized oat diseases in Arkansas, in 1946-47. The acreage of oats in the State increased 21 percent over the previous year and the average yield of 31 bushels is the highest on record for the State.

Colletotrichum graminicolum, anthracnose. As in 1946, anthracnose was noted all through the growing season in Arkansas. A survey showed that it was found in every important oat growing county in the State. From 50 to 100 percent of the plants were infected. The disease became less abundant as one went farther north into Missouri and Iowa. A State loss of 5 to 10 percent was reported.

Helminthosporium leaf spot (leaf blotch (Pyrenophora avenae)) next to anthracnose was the most common and important parasitic disease on oats in 1947 in Arkansas. It was difficult to estimate losses, but only an occasional leaf failed to show some of this disease when the plants reached the milk stage. (PDR 31 (12):471-475).

Helminthosporium victoriae, blight, was reported for the first time in West Virginia by H. L. Barnett. A survey in the vicinity of Morgantown showed the disease was most severe in most fields of Vicland. Estimated loss ranged up to 50 percent. (PDR 31 (10): 397).

Julian H. Miller gives the results of a survey of diseases of small grains in Georgia for 1946-47 (PDR 31 (8): 303-308). The new blight (Helminthosporium victoriae) disease of oats received the most attention owing to its high disease incidence and widespread publicity. This blight was found widely scattered over the State, but in only 16 counties out of 32 sampled. On the other hand H. avenae was very prevalent in almost every field inspected.

J. R. Wallin summarized observations on the oat Helminthosporium victoriae blight situation in the Upper Mississippi Valley region as of December 1947. The data indicated that the 1947 blight damage was greatest in Iowa, Illinois and Indiana while Nebraska and Kansas reported only moderate damage. The disease was relatively unimportant in North Dakota and Wisconsin. (PDR 32 (3): 94-96).

E. D. Hansing et al. reported that in 1946 Victoria blight caused a loss of 1 percent in Kansas. In 1947 the disease was generally distributed on susceptible varieties and caused a loss of 30 percent in northeastern Kansas, 20 percent in southeastern Kansas, 5 percent in central Kansas, and a trace in western Kansas. Osage, Neosho, Boone, and Tama were susceptible, while Kanota and Fulton were resistant, Cherokee, Nemaha, and Clinton were recommended for 1948. These are resistant to Victoria blight, smut, and the crown and stem rust races found commonly in Kansas. Victoria blight was favored by high soil temperatures (optimum 22° to 26° C.) and by moderately high moisture. Seed treatment was effective in controlling the disease in sterile soil, but only partially effective in infested soil. Crop rotation was partially effective in controlling Victoria blight. In eastern Kansas, when susceptible oat varieties were preceded by the following crops, percentages of loss occurred as follows: susceptible oat varieties, 38; corn, 27; clover and meadow, 26; soybeans, 24, wheat 18; and resistant oats, 4. (Phytopath. 38 (1): 12)

I. M. Atkins reported blight was severe in the breeding nursery at Denton, Texas, so that excellent information on the reaction of oat strains was obtained. (PDR 31 (9): 321).

Puccinia coronata, crown rust, was of minor importance in commercial fields around Denton, Texas and very little was observed in West Texas. (I. M. Atkins, PDR 31 (9): 321)

Sclerospora macrospora, downy mildew, was reported by W. E. Cooper on oats in Louisiana in late May. This constitutes the first report of the disease in this State. (PDR 31 (7): 270)

Winter killing. I. M. Atkins estimated that loss from winter killing of oats by the January 1947 freeze was approximately 80 percent in the area from Denton, Texas eastward to Greenville and south as far as Hill County. This area grew 350,000 acres in 1939. The Rolling Plains area covering an acreage of perhaps 500,000 or more was damaged from a trace to as much 60 percent. An average estimate of 30 percent was made. (PDR 31 (5): 213-214)

HORDEUM VULGARE. BARLEY:

Erysiphe graminis, powdery mildew, was severe on barley in Virginia. Wong and a few other resistant varieties showed very little or no powdery mildew. (S. B. Fenne PDR 31 (7): 281)

Rhynchosporium secalis, scald, according to H. L. Barnett in West Virginia, was found on some varieties in the barley variety trial plots at the University Agronomy Farm at Morgantown. He found no previous report on barley from West Virginia. (PDR 31 (10): 397). R. S. Kirby reported scald found in a field of winter barley in Lebanon County Pennsylvania on May 29. This is a new disease for Pennsylvania. (PDR 31 (7): 271)

Ustilago nuda, loose smut. An unusual amount of loose smut was observed on barley this spring in Virginia. Five percent infection was reported by S. B. Fenne. (PDR 31 (7): 281)

ORYZA SATIVA. RICE:

Ophiobolus oryzinus, black sheath rot. Tullis and Adair reported black sheath rot caused lodging of rice in Drew County, Arkansas, in 1946 and 1947 and in Harris County, Texas in 1947. Examination of a variety test in a field in Arkansas showed that eight named varieties were more resistant than other varieties in the test.

In Texas, the disease also was found in a variety test field. The symptoms were the same as in the Arkansas field in that the infection had caused breaking at the nodes, and only the fungus O. oryzinus was found on the diseased plants. (PDR 31 (12): 468)

Seedling blight. E. C. Tullis reported there were many reports of failure of rice stands in Arkansas and Texas. Blighted seedlings from Arkansas were attacked by Fusarium. Others from Texas were attacked by species of Aspergillus. Seed treatment was advised to avoid these losses. (PDR 31 (7): 280)

TRITICUM AESTIVUM. WHEAT:

Erysiphe graminis var. tritici, powdery mildew, was unusually severe on wheat in most parts of Virginia with 10 percent infection in many fields. (S. B. Fenne PDR 31 (7): 281). In Kansas powdery mildew was general and very severe according to C. O. Johnston. The long cool wet spring favored the widespread development of the disease (PDR 31 (9): 323)

Gibberella zeae, scab. According to C. O. Johnston scab was favored by the long cool wet spring in Kansas. There were unusually heavy infections in the eastern part of the State. (PDR 31 (9): 323)

Puccinia rubigo-vera var. tritici, leaf rust. According to I. M. Atkins, leaf rust was slow in developing in Texas in the spring, but before maturity it gave excellent readings on all breeding material. Because of the recent increase in new races of rust, it seemed that many strains which previously appeared promising will have to be discarded. (PDR 31 (9): 321). K. Starr Chester and D. A. Preston made an experimental forecast of wheat leaf rust in Oklahoma for 1947. The proposed basis for forecasting wheat leaf rust destructiveness is based on conditions as of April 1. The 1946 forecast was for late rust, somewhat heavier than in a "normal year", but not reaching the epiphytotic destructiveness of 1938 or 1945. This proved to be the case. By April 1, 1947 rust was generally very much lighter than at the same time in 1946, and no rust carryover from the fall epiphytotic was noted. Their conclusion that 1947 in Oklahoma would be no more than a normal leaf rust year, was borne out by the development of the disease during the season. (PDR 31 (5): 201-203). They stated (PDR 32 (5): 176-181) that the lighter-than-normal occurrence of leaf rust in 1947 extended to wheat fields far to the north. They quoted D. G. Fletcher as reporting only light to moderate leaf rust in the Dakotas and western Minnesota and further summarizing the situation for the wheat belt as a whole by saying "1947 will go down in the records as a non-rust year. Leaf rust in certain areas developed in epidemic form but usually too late to cause severe damage."

C. O. Johnston reported that the fall of 1946 was an unusually wet one in most of Kansas but especially in western counties. As a consequence there was a rank growth of volunteer and early sown wheat. By mid-October, this wheat was heavily infected with leaf rust. The rust disappeared during the late winter of 1946-47 and was late in its appearance and development the following spring. The 1947 crop therefore developed with the lightest infections of leaf and stem rust observed in many years. Thus the 1947 Kansas bumper crop was produced without rust damage. (PDR 32 (7): 290-291)

R. E. Atkinson reported a trip was made on April 16 to the southeastern corner of Colorado to check up on the survival of leaf rust. Overwintering was very rare as no more than a trace was observed in any field. (PDR 31 (6): 244)

Sclerospora macrospora, downy mildew, was reported by G. C. Kent et al. at Ithaca, New York. About 30 infected plants were found within an area 25 x 5 feet in a low wet portion of the field. The disease was also found at Perry, New York (PDR 31 (9): 320). This constitutes the first report from this State.

Septoria tritici, speckled leaf blotch, was unusually severe in Kansas. The heaviest infection seemed to be in a strip about three counties wide along the entire southern border of the State. (C. O. Johnston PDR 31 (9): 323). Speckled leaf blotch was the most prevalent disease on winter wheat in southeastern Colorado according to R. E. Atkinson. (PDR 31 (6): 244)

Ustilago tritici, loose smut. An unusual amount of loose smut was observed on wheat this spring in Virginia. Some varieties had as much as 8 percent loose smut. (S. B. Fenne, PDR 31(7): 281).

Wheat mosaic (virus), which was prevalent last year was observed in trace amounts in southeastern Colorado according to R. E. Atkinson. (PDR 31 (6): 244)

DISEASES OF FORAGE AND COVER CROPS

LUPINUS ANGUSTIFOLIUS. BLUE LUPINE:

Ceratophorum setosum, leaf spot, was reported found near Perry, Georgia, in December, 1947 by J. L. Weimer. This is the first report of this disease on lupine in the United States. This fungus causes a leaf spot on many species of lupine in Europe, Ceylon and Brazil. The fungus is seed-borne which he states may account for its wide distribution. (PDR 32 (4): 133)

Coyt Wilson reported anthracnose (Colletotrichum sp., probably Glomerella cingulata) in many fields of blue lupine in southern Alabama. The disease was not observed until after May 1. In many fields all plants were infected and in some as much as 90 percent of the seed had been destroyed. This seems to be the first time anthracnose had occurred on cultivated lupines in sufficient amounts to attract attention. The greatest threat appeared to be to the seed crop. The seed is grown locally in southern Alabama with much ease; and any disease which reduces the seed crop is serious. (PDR 31 (7): 270). At harvest time, according to Phares Decker, anthracnose (Glomerella cingulata) was prevalent in some lupine fields in southern Alabama and Georgia and in northwest Florida. Certain seed lots contained as much as 10 percent infected seed harvested from these fields. It was proved that these anthracnose infected seed can serve as a source of inoculum in the fall lupine plantings. (PDR 31 (12): 486)

MEDICAGO SATIVA. ALFALFA:

Corynebacterium insidiosum, bacterial wilt, was found in Shenandoah, Montgomery and Botetourt Counties, Virginia during the week of April 14. Previously, this disease had been found only in Shenandoah and Montgomery Counties. (S. B. Fenne et al. PDR 31 (8): 302)

Peronospora trifoliorum, downy mildew, was observed rather generally distributed in new stands of alfalfa in Virginia. (S.B. Fenne et al. PDR 31 (8): 302)

Sclerotinia trifoliorum, stem rot, was seen in one field of alfalfa in Culpeper County, Virginia, and in the experimental plots at Blacksburg. There was little evidence of stem rot in the Valley Counties. In the eastern part of the State stem rot is the most serious diseases of alfalfa, and kills some 20 to 50 percent of the stands in many instances. (S. B. Fenne et al. PDR 31 (8): 302)

Winter injury. S. B. Fenne reported extensive damage and total losses in some cases have occurred in alfalfa fields in Northern Virginia. (PDR 31 (7): 281)

PHLEUM PRATENSE. TIMOTHY:

Urocystis agropyri, stripe smut. K. W. Kreitlow reported stripe smut of timothy in the northeastern United States is commonly caused by Ustilago striiformis (West.) Niessl. In the fall of 1944, Kreitlow and Cassel collected a smut on timothy near Brandon, Vermont, that was indistinguishable macroscopically from U. striiformis, but when spores of the smut were examined with a microscope they were found to consist of spore balls resembling those of Urocystis agropyri (Preuss) Schroet. No previous report of this fungus on Phleum pratense was found. Collections of smutted timothy were made in 1946 and 1947. One collection obtained near Walpole, New Hampshire proved to be U. agropyri. (Phytopath. 38 (2): 158-159)

SOJA MAX. SOYBEAN:

Diaporthe phaseolorum var. sojae, pod and stem blight was observed in two counties in Ohio in 1947 according to T. H. King. The blight was found affecting the Mandel variety of soybeans in a field in Defiance County on August 30. On September 12, the blight was found in a 21-acre field of Manchu soybeans in Delaware County. Within an area of 30 feet in diameter all the plants were dead and the fungus was found fruiting profusely on these plants and was spreading rapidly to the adjacent plants. (PDR 32 (5): 193)

Phyllosticta glycineum, leaf spot, caused an appreciable amount of defoliation of soybeans in southeastern Missouri during August 1947 according to James M. Crall. (PDR 32 (5): 184-186)

TRIFOLIUM SPP. CLOVER:

Botrytis anthophila, anther mold. John R. Hardison reported that in August one Ladino clover plant (T. repens var. Ladino) was found near Grants Pass, Oregon which contained the typical clover anther mold B. anthophila. This was the only specimen found in several thousand flowers examined. This appears to be the first record of clover anther mold caused by B. anthophila in the United States, and also is apparently the first record of the disease anywhere on Ladino clover. (PDR 32 (6): 242)

Winter injury. S. B. Fenne reported extensive damage and total losses in some cases in clover fields in Northern Virginia. Away from protected areas 75 to 90 percent of the clover was killed. (PDR 31 (7): 281)

Heterodera marioni, root knot, was observed to be causing severe injury in one field of T. pratense in Botetourt County, Virginia, according to S. B. Fenne et al. Plants in spots 5 to 10 feet in diameter were dying or had been killed. (PDR 31 (8): 302)

VIGNA SINENSIS. COWPEA:

According to G. H. Boewe bacterial canker (Xanthomonas vignicola) of cowpea, new to the State of Illinois, was collected in September, in Calhoun County in southwest-central Illinois. Approximately 0.5 percent of the plants in a six-acre field were diseased. No pods were present on the diseased plants. (PDR 32 (6): 275)

AGROPYRON REPENS. QUACKGRASS:

Physoderma sp. was reported on quackgrass, Agropyron repens by Thirumalachar and Dickson in Wisconsin. Basal rotting of the culm and wilting and dying out of the leaves occurs in the case of the more severe infection. In external appearance the symptoms simulate those of downy mildew on the grasses. This disease is new for Wisconsin and so far as can be determined this is the first report of this fungus in North America. (Phytopath. 37 (12): 885)

Roderick Sprague reported nearly 4 percent of all fungi isolated from the roots of Gramineae in the northern part of the western United States were Rhizoctonia solani. Symptoms included seed, root, stem, and culm rots. Inoculations in the greenhouse at Mandan, North Dakota, and at Pullman, Washington during 1940 to 1947 inclusive disclosed that five races of this species were recognizable by differences in their attacks on cereal and cover crops. (Phytopath. 37 (11): 846 [abs.])

DISEASES OF VEGETABLE CROPS

ALLIUM ASCALONICUM. SHALLOT:

Peronospora destructor, downy mildew, appeared on shallots in 1947, in Louisiana but was not so widespread or destructive as in the spring of 1946. Many of the seedling progenies were lost in the breeding plots. (PDR 31 (10): 386-387)

ALLIUM CEPA. ONION:

Peronospora destructor, downy mildew, appeared in Southern Louisiana in a widespread and destructive form. Few seed of the Creole variety were saved. Since this variety makes up the bulk of onions grown in the State, the loss from mildew was serious. (E. C. Tims. PDR 31 (10): 386)

APIUM GRAVEOLENS. CELERY:

Mosaic (Virus). According to G. R. Townsend mosaic of celery in the Florida Everglades did not assume critical importance until 1938 when heavy losses occurred in some of the older fields. The association of weeds in the celery fields is related to the severe outbreaks. The most outstanding weed host for carrying this virus seems to be Commelina longicaulis. A program of weed control was started in 1944. This program has been aided by the use of 2,4-D sprays in the last two years. One farm of 200 acres lost less than one percent of the crop to mosaic. On nearby weedy farms 100 percent infection had occurred. (PDR 31 (3): 118-119)

BRASSICA OLERACEAE VAR. CAPITATA. CABBAGE:

Phoma lingam, Blackleg. "For more than twenty years the Puget Sound area of western Washington has been this nation's chief producer of cabbage seed, primarily because seed grown there has not been known to carry the blackleg (Phoma lingam) and blackrot (Xanthomonas campestris) organisms. Such seed has been used commonly without hot-water treatment because of this known freedom from infection, although a mildly pathogenic strain of P. lingam has been recorded recently from that area. In 1947 a severe epidemic of blackleg occurred in most cabbage-producing sections of the country. Extensive field surveys indicated transmission from Puget Sound seed. Isolations have been made from several seed lots grown in the Puget Sound area in 1946 and P. lingam has been repeatedly isolated from 4 lots, representing a growing area 200 miles in length. Koch's posulates have been repeatedly applied to isolates obtained, establishing proof of blackleg transmission on Puget Sound seed. Certain isolates obtained from seed show cultural and pathogenic characteristics of the mild strain described from the Puget Sound area, while other isolates are typical of virulent eastern strains. This suggests a probable increase in pathogenicity of the Puget Sound strain and renders use of seed grown there without hot-water treatment unreliable." (Pound and Calvert. Phytopath. 38 (1): 21 [Abs.])

CAPSICUM FRUTESCENS VAR. LONGUM. CHILE PEPPER:

Phytophthora capsici, blight, reached epiphytotic proportions in ten days during August in the chile pepper fields of southern New Mexico. Approximately 50 to 60 percent of the green fruit became infected during the ten-day epiphytotic. A total precipitation of 2.17 inches during the ten-day period was considered very unusual. (Philip J. Leyendecker, PDR 31 (11): 421-422)

CUCURBITS. CUCUMBER, MELON:

Pseudoperonospora cubensis, cucurbit downy mildew. A summary of cucurbit downy mildew reports from the Atlantic Coastal States in 1947 was sent in by C. J. Nusbaum. He states: "For the seventh consecutive season a cooperative reporting service on cucurbit downy mildew in the Atlantic coastal areas was conducted with the view of furthering the development of an organized forecasting system for this disease. Cooperating pathologists in nine States from Florida to Massachusetts submitted a total of 26 timely reports upon the establishment and spread of downy mildew in relation to the development of cucurbit crops and the climatic conditions in their respective localities. These reports were assembled by the writer and copies were sent to each collaborator in order to disseminate information on the progressively northward spread of the disease, thus affording a means of anticipating the time of its appearance and probable severity in cucurbit producing areas." The 1947 season was characterized by the early establishment of the disease all along the Atlantic Seaboard. It appeared to spread inland more than usual, especially in Virginia, Pennsylvania, and upper New York. The disease caused considerable damage. However, the economic losses in some areas were minimized by a break in the market before the disease became serious. This was also the case with cantaloups in South Carolina and cucumbers in Delaware and Long Island. (PDR 32 (2): 44-48)

Mosaic (cantaloup mosaic virus). John T. Middleton reported that a two and one-half million dollar crop loss estimate was incurred in the 1946 melon harvest in southern California. In 1947 infection varied in cantaloups from 53 to 100 percent, in honeydews from 84 to 100 percent. A survey showed that virus infection in Yuma, Arizona was similar to that in the Imperial Valley of California. In the Palo Verde Valley heavy losses were incurred, some on cantaloups but primarily on honeydews. Both the pea and melon aphids are efficient vectors. The striped and spotted cucumber beetles are less efficient than the aphids. A number of weeds harbor the cantaloup mosaic. It was suggested that relief from the virus may be given if sulfur-resistant melon varieties are grown and given frequent sulfur applications for the control of aphids. (PDR 31 (10): 385-386)

IPOMOEA BATATAS. SWEETPOTATO:

Internal Cork (Virus). In Maryland R. A. Jehle reported that typical root symptoms of internal cork of sweetpotato were found in 23 percent of the roots in a storage house in Dorchester County, in 18 percent of the roots in one storage house and in 5 percent of the roots in another in Wicomico County. (PDR 31 (5): 189). D. E. Ellis reported the results of a survey in June and July, 1947 of the incidence of the internal cork disease in 31 North Carolina counties. This survey showed that the disease is generally distributed throughout the major sweetpotato producing areas in the State. However, it occurred in only 65 of the 176 samples collected, although mostly at a relatively low level. Of the 7,858 sweetpotatoes examined only 343 showed internal cork, 199 slightly affected, 181 moderately, and only 13 severely. (PDR 31 (11): 443-447)

LYCOPERSICON ESCULENTUM. TOMATO:

Bacterium solanacearum, bacterial wilt, was found in one home garden planting of tomatoes at Hope, Arkansas according to V. H. Young. This is the first report of this disease in the State in several years. (PDR 31 (7): 282)

Fusarium sp.. wilt. Douglas C. Bain described a local outbreak of *Fusarium* wilt of tomato in Mississippi following the hurricane that swept the Gulf Coast on September 18 to 19, 1947. "The fact that the vascular system of the wilted plants was discolored upwards several inches indicated that the plants had been infected prior to the storm but not to a degree of wilting. Various conditions that accompanied the storm, however, apparently predisposed the plants to sudden wilting." (PDR 32 (2): 48-50)

Galla australiensis, big bud virus, was reported on tomato in central California in San Joaquin County, by Donald M. Coe and George E. Altstatt. (PDR 31 (12): 478-479).

According to John T. Middleton (PDR 32 (3): 92), big bud apparently was recorded first from California in 1940. Since that time the disease has been observed in all subsequent years in varying percentages of infection. Big bud has been found in the following counties: Imperial, Kern, Los Angeles, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, and Ventura. It has been noted on all varieties of tomatoes grown commercially in this area. It seems that the virus and the vector or vectors are generally distributed throughout southern California.

Phytophthora infestans, late blight. Paul R. Miller described the warning service for late blight which was established in February of this year to fill the acute need for accurate and timely seasonal information. This service operated primarily through key pathologists designated by the chief collaborators of the Plant Disease Survey to work with it in each cooperating State and Canada. The warning service area included the States east of the Mississippi River, and Minnesota, Iowa, Missouri, Arkansas, Louisiana, and Texas, and Provinces of Canada as far west as Manitoba. (PDR 31 (4): 140-143)

Tomato late blight in the warning service area in 1947 is summarized in Supplement 171 (pp. 191-236. Dec. 15, 1947). The reports and estimates of loss show that tomato late blight was much less widespread and caused less loss in 1947 than in 1946. Hot dry weather was said to be responsible for the absence or small amount of late blight in the southern and western parts of the warning service area. In the Central Atlantic section where the disease was general and severe control applications reduced the loss.

In some States where the weather was not favorable to serious general occurrence fungicidal treatment was considered to be an important factor in preventing local outbreaks. The presence or absence of the tomato strain of *Phytophthora infestans* was another factor reported as influencing the amount of tomato late blight. This was of interest this year since southern grown transplants were not infected and could not have been responsible for its spread northward. In Pennsylvania extensive carry-over was reported, 13 out of 25 isolates of P. infestans from potato tubers being of the tomato strain. The tomato strain was also isolated from potatoes grown in Indiana and Idaho. (See also under Solanum tuberosum)

Harold T. Cook reported the 1947 results of the late blight forecasting in eastern Virginia. Since over 60,000 acres were planted to potatoes and tomatoes in the State in 1947, the cost of spraying or dusting would have cost approximately $2,000,000. This amount of money could well be spent in a year such as 1946 when late blight was very destructive. It was possible for them to avoid this expense during the 1947 crop season with some safety since the late blight forecasts issued by the Plant Pathology Department of the Virginia Truck Experiment Station showed the weather was unfavorable for development of the disease. He states that the purpose of the forecasts is to eliminate needless spraying or dusting in years when blight is not important and to insure prompt and adequate protective measures in years when it threatens to cause serious damage. (PDR 32 (2):54-57. See also Phytopath. 38 (1): 6)

Stemphylium solani, gray leaf spot. According to R. W. Samson outbreaks of this disease in Indiana tomato canning fields were conspicuous and severe in August and September, 1947. The disease developed very suddenly, which attracted the attention of Indiana canners and fieldmen. The severe defoliation from Stemphylium probably reduced yields by 40 percent or more in local fields. This is perhaps the first reported record of the disease in Indiana. (PDR 32 (2): 51)

Blossom drop. Weather conditions contributed to an unusually large amount of this trouble during July in Utah; as a result there was a lighter fruit crop than usual in most fields in the State. (H. Loran Blood. PDR 31 (10) 366-367).

Mosaic (virus) was reported more prevalent than usual in Utah. From 2 percent to as high as 89 percent of the plants were infected. (H. Loran Blood, PDR 31 (10): 366-367)

PHASEOLUS LIMENSIS. LIMA BEAN:

Nematospora phaseoli. W. E. Cooper reported that this disease was collected by a grower in a local garden in Louisiana. The infection was associated with insect injury. This is the first report of this disease in Louisiana. (PDR 31 (10) 397)

PHASEOLUS VULGARIS. BEAN:

W. J. Zaumeyer and H. Rex Thomas reported 1947 bean diseases in Colorado, Wyoming, Utah, Montana, Idaho, Washington and Oregon. (PDR 31 (11): 432-442)

In Colorado a severe infection of bacterial blights (*Xanthomonas phaseoli* and *Pseudomonas phaseolicola*) was generally correlated with local rain or hail storms.

In Fremont County, Wyoming, bacterial wilt (*Corynebacterium flaccumfaciens*) was very serious. In the most serously affected planting, approximately 60 percent of the plants were dead or stunted.

In Oregon (Benton County) common and halo blights were severe on several snap bean varieties. *P. viridifaciens* was noted.

In Montana, common blight was widespread and serious in a large percentage of Great Northern and Pinto bean fields both of local and Idaho seed origin.

In Idaho a severe infection of *Corynebacterium flaccumfaciens*, bacterial wilt, the first to be reported from Idaho, was noted in a large field causing a considerable reduction in yield.

Sclerotinia sclerotiorum, white mold, was very serious in many of the Blue Lake fields in Lane and Marion Counties, Oregon. In many of the infected fields, 4 to 5 tons of beans were picked before they were abandoned, which is about 40 to 50 percent of a normal crop. The disease is becoming a serious factor in production in these counties.

Virus diseases. Greasy pod (virus) was found in a few fields in Colorado. In Wyoming the disease did not cause much reduction in loss. Greasy pod was again found fairly widespread in fields of many snap bean varieties in Idaho which are susceptible to common bean mosaic virus. All of those varieties resistant to the latter virus showed no greasy pod. In Oregon greasy pod was very serious in a large number of mosaic-susceptible varieties.

Black root (virus) in Idaho in 1946 and during the past season was observed on a number of common bean mosaic-resistant varieties and hybrids such as Idaho Refugee, Logan and Pioneer. One common bean mosaic-resistant hybrid with Great Northern U. I. No. 1 parentage was resistant to black root. Black root was not observed on any of the common bean-mosaic-resistant Great Northerns, Red Mexicans and Pinto Varieties. These observations confirmed several years' data, which showed the identity of the virus causing greasy pod and black root symptoms, respectively, on different groups of varieties.

Mosaic (virus). H. Loran Blood reported that all but 75 of 240 acres of beans planted for canning in the Cache Valley of Northern Utah were abandoned because of an outbreak of common bean mosaic and yellow bean mosaic. The common bean mosaic was about equally distributed throughout all the fields, while the yellow bean mosaic, which was the most destructive, was most prevalent around the borders and became less severe towards the middle of the fields. Sweet clover, an important wild host of yellow bean mosaic, was abundant along the fence lines, ditches and roadsides. The extensive and rapid distribution of the viruses was probably accounted for by the large aphid population. (PDR 31 (10): 384)

SOLANUM TUBEROSUM. POTATO:

Actinomyces scabies, scab. Eddins and Foster reported that fields of Sebago and Chippewa potatoes growing in Florida muck were inspected when dug. About 10 acres of Chippewa had been ruined by scab and rhizoctonia (Rhizoctonia solani). The small tubers were numerous and few were free from scab. In adjoining rows Sebago potatoes were almost free of rhizoctonia. (PDR 31 (10): 376-377)

Erwinia carotovora, soft rot. Potato diseases observed in the Hastings area of Florida in 1947 were reported by A. H. Eddins. The most destructive disease seemed to be E. carotovora, which destroyed almost all of the tubers in fields totaling 500 acres following a 6-day period when the rainfall was 6 to 8 inches. Many tubers were also affected with internal necrosis. (PDR 31 (10) 375-376)

Phytophthora infestans, late blight. Thomas and Lane reported that late blight was observed on May 7, 1947 in cull piles in Weld County, Colorado. On July 3 a trace of seed-borne late blight was found in the field in Montrose County. This was the first time this disease had been observed in this semi-arid area. With less infected seed planted, elimination of cull piles and more active control programs it was hoped to hold late blight to a minimum in Colorado in 1947. (PDR 31 (8): 310-311). Early potatoes in a garden near Hagerstown, Maryland, were severely infected with late blight. Foliage of Solanum dulcamara (bitter sweet) growing as an ornamental in the same garden showed symptoms of late blight. (PDR 31 (8): 311-317).

W. D. Mills reported isolation of the tomato race of late blight overwintering on potato tubers in Pennsylvania. Blight infected tubers were obtained from 9 Pennsylvania counties. From 25 isolates 13 were of the tomato race and 12 of the potato race. (PDR 31 (6): 230). O. D. Burke reported the disease in nearly every county in Pennsylvania. (PDR 31 (9): 332)

Ralph E. Lincoln and R. W. Samson reported the isolation of the tomato strain of Phytophthora infestans in potato tubers grown in northern Indiana and in Idaho. It is believed that the occurrence of this tomato strain in these two States had not previously been reported. (PDR 31 (4): 145-146). See also under Lycopersicon esculentum.

Pythium rot of seed piece potatoes had not been observed in Maine before 1947, according to Donald Folsom. One grower in central Maine dug up some of the seed pieces and found lesions on every piece. With better weather conditions suberization occurred and the rot was stopped. (PDR 31 (10): 377)

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DISEASES OF SPECIAL CROPS

AGARICUS CAMPESTRIS. COMMON MUSHROOM:

Myceliophthora lutea, vert-de-gris. A disease of cultivated mushrooms that has caused severe losses for several years in southern Pennsylvania has been identified by T. F. Manns as identical with the vert-de-gris disease reported in France in 1894. In severe cases the losses would probably be as high as 50 to 75 percent. A special method for sterilizing soil and houses was showing much promise. (T. F. Manns, PDR 31 (11): 417-418)

ALEURITES FORDII, TUNG TREE:

John R. Large reported that Septobasidium, probably S. pseudopedicellatum, was observed on tung trees in two widely separated orchards in St. Tammany Parish, Louisiana. So far as is known this fungus has not previously been reported on tung. (PDR 31 (8): 317)

GROSSYPIUM HIRSUTUM. COTTON:

Ascochyta gossypii, "wet weather canker", was wide spread and caused serious damage on cotton in Georgia during the last week of June. According to B. B. Higgins reports and specimens were received from eight counties and the disease was found active in every cotton field visited. Later its prevalence was reported throughout the northern half of the State. The disease was recorded in Georgia in 1915, 1922, 1940, 1947. Cotton was planted several weeks later than normal, and the cool weather caused the plants to be severely damaged by insects. Owing to their weak condition, the damage done in 1947 appears to be more severe than any previous year. (PDR 31 (8): 299). Julian H. Miller also reported that during a survey from Banks County southward through Jasper County losses of as high as 30 percent dead or dying plants were observed in some fields. The disease did the most damage to the early plantings in the southern part of the State, where the plants were making slow growth. Low temperatures with frequent showers during April and May favored the development of the epidemic. (PDR 32 (4): 132). A. L. Wilson and Coyt Wilson reported Ascochyta blight widespread throughout Albama in 1947. Losses varied from slight reductions in stand to complete loss of the crop. (PDR 32 (4): 132)

Phymatotrichum omnivorum, root rot. D. C. Neal reported that on August 12 cotton plants affected with root rot were found in a field near Bossier City in Bossier Parish. This was the first time this disease had been found in Louisiana. From August 26 - 28 an extensive survey was made for evidence of the disease. One other infested field was found near Dixie, in Caddo Parish. An estimated 30 acres of land was infested on the farm near Bossier City and 3 1/2 or 4 acres in the field near Dixie. (PDR 31 (11): 416)

Verticillium alboatrum, Verticillium wilt. S. G. Lehman and Howard Garriss reported the discovery and distribution of Verticillium wilt in North Carolina in 1947. The disease was found in seven counties. Apparently, aside from Carpenter's report in 1914 of finding the disease on two cotton plants at Arlington, Virginia, this is the first evidence of the disease on cotton east of Tennessee and Mississippi. (PDR 32 (3): 88-91)

P. J. Leyendecker et al. reported on a survey for Verticillium wilt of cotton in Mesilla Valley, New Mexico. The disease appeared late, consequently the damage to plants and reduction in yield were less than in some seasons. The disease was more widely distributed this year than in 1944 when it appeared to cause serious damage. (PDR 31 (12): 483-484)

MENTHA SPP. MINT:

E. C. Stevenson reported observations on mint diseases in the principal mint growing areas in 1947. These areas included northern Indiana, southern Michigan, south-central and western Washington and western Oregon.

Puccinia menthae, rust, in late July attacked spearmint in Indiana and growers were forced to cut early. Spearmint was practically defoliated in fields where cutting was delayed after the rust became widespread.

Verticillium wilt was serious again this year in Michigan. Production in the St. John's area, at one time an important peppermint growing section, has been declining rapidly because of wilt. Many growers in this area have resorted to producing spearmint. However, some of the spearmint fields were rather severely damaged by Verticillium wilt in 1947 and growers were forced to cut early to save their crops. (PDR 32 (2): 68-69)

NICOTIANA TABACUM. TOBACCO:

Erwinia aroideae, hollow stalk, was quite common in Kentucky according to Valleau and Johnson. A few affected plants could be found in nearly any field after topping, and some growers reported over 50 percent of the plants with hollow stalks and the lower leaves falling off. (PDR 31 (11): 427-431)

Peronospora tabacina, blue mold, was reported by James Johnson as a field disease on half-grown tobacco in Dane and Columbia Counties, Wisconsin. A field survey of the surrounding district located the disease on 27 farms. The affected section apparently corresponded to a region in which precipitation occurred July 12-13, associated with very

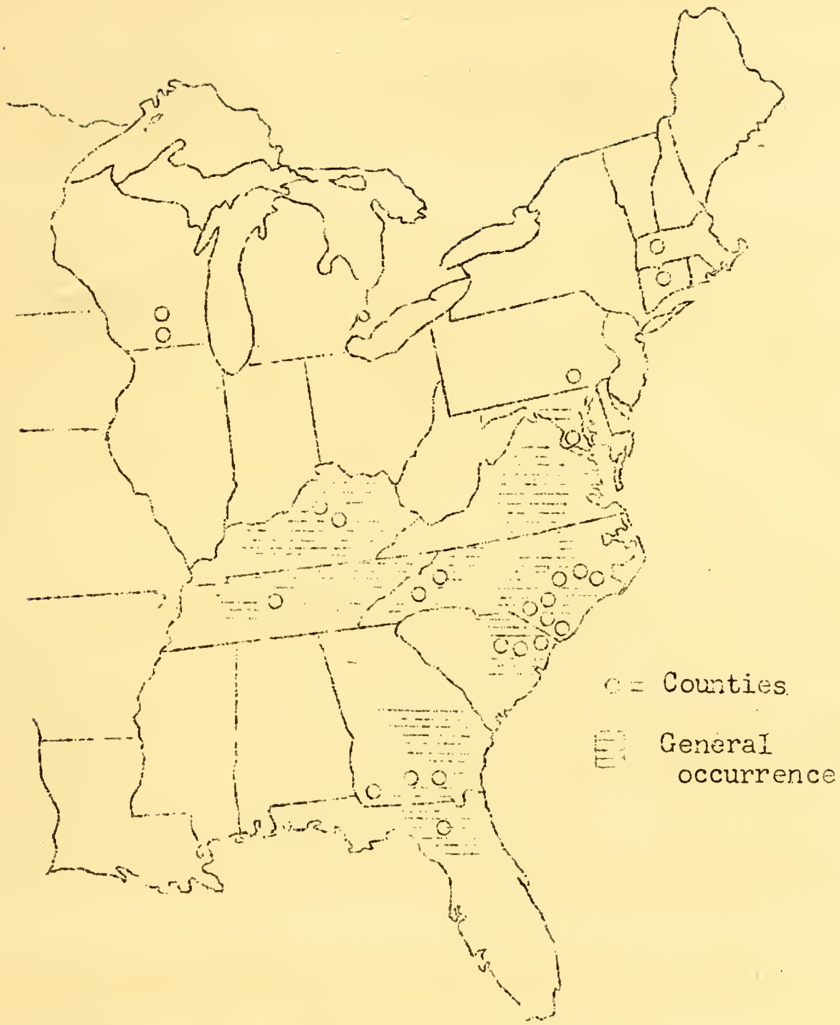

Figure 4. Tobacco (Nicotiana tabacum) blue mold (Peronospora tabacina) distribution in 1947.

humid weather, followed by relatively warm days and cool nights. This is the first observation of blue mold from Wisconsin. Although blue mold was first found during the 1947 season on Wisconsin farms it did occur in November 1945 at the station greenhouses. Apparently the seedlings picked up the spores while exposed outdoors. (PDR 31 (11): 419-420). In Georgia John G. Gaines reported blue mold was more destructive in flue-cured tobacco beds than in any previous year. Approximately 95 percent of unprotected and untreated plants were killed by cold and mold. In many instances mold killed over 95 percent of plants protected from cold. A shortage of fungicides interrupted spray and dust schedules. Because of this interruption, cold complications, and inefficient application, at least 75 percent of the flue-cured plants were lost. However, enough plants were left to set substantially all the alloted acreage before May 1. Blue mold caused slight damage in the cigar wrapper area of Southwest Georgia. No beds in the flue area escaped, whether new or old. (PDR 31 (7): 275-280)

Massachusetts experienced one of the lightest years for blue mold damage to seed beds since the disease appeared there in 1937. Blue mold became widely distributed in Maryland but did not cause serious losses. Distribution in Virginia was general, but little actual damage occurred because of dry, hot weather. In North Carolina a survey conducted April 21-23 showed blue mold to be generally distributed over the eastern part of the State as far north as Nash County and west into lower Piedmont Counties. By May 12 the disease was scattered throughout the flue-cured belts and had been reported at two locations in Yancey County of the Burley area. In the new areas damage was slight. Blue mold was quite prevalent in Burley tobacco fields in the vicinity of Waynesville, Haywood County, North Carolina, definite damage occurred. In South Carolina blue mold caused severe damage in some untreated beds. In the flue-cured area of Florida blue mold was generally distributed by March 15. Distribution in Kentucky was general. Most of the first reports were in second-year beds, indicating carry over from the previous year. There was no evidence of blow-in from the South or Southeast. By June 12 blue mold was widespread in Tennessee but sudden changes in the weather arrested further development. In Texas in early March Nicotiana repanda was heavily infected, with sporulation abundant. For distribution of blue mold in 1947 see Figure 4.

T. E. Smith reported that wind-borne inoculum seemed implicated as the means of spread of tobacco black-shank (Phytophthora parasitica var. nicotianae) in one North Carolina instance. (PDR 31 (3): 120)

Blackshank was found in three additional counties in Virginia during 1947, namely Dinwiddie, Brunswick and Amelia, and is now known to be present in eleven Virginia counties including these three and Pittsylvania, Mecklenburg, Charlotte, Franklin, Lunenburg, Patrick, Nottaway, Cumberland. (PDR 32 (1): 16-18)

Thielaviopsis basicola, black root rot, was reported by Valleau and Johnson to be very severe in susceptible varieties because of the cool, wet season following setting. (PDR 31 (11): 427-431)

DISEASES OF FRUIT CROPS

FICUS CARICA. FIG:

Mosaic (Virus). A fig mosaic typical of that described from California by Condit and Horne was found this spring in gardens in Macon, Georgia, according to the report of Kenneth H. Garren.

The owner of one of these gardens first noticed the condition in 1946, when only one plant of the variety Celeste appeared diseased. Adjacent Green Ischia and Brown Turkey bushes had also developed the disease by April 1947. The disease was prevalent on Brown Turkey bushes in an adjoining garden and has also been found on Brown Turkey bushes located one mile from these gardens. Since all the diseased bushes reported were apparently of local origin, it would seem that a mosaic disease has become established and is spreading in Georgia-grown fig bushes. (PDR 31 (8): 300-301)

FRAGARIA SP. STRAWBERRY:

"Witches'-broom" (Virus). George M. Darrow reported that the "multiplier" trouble in the Bayfield area of northern Wisconsin closely resembles the "witches'-broom" virus disease described by Zeller in Oregon. (PDR 32 (1): 8)

PRUNUS SPP. CHERRY:

Little cherry disease. E. C. Blodgett et al. reported that the little cherry disease recognized in Washington first in 1946 in four orchards in three sections of the State was found to be widely scattered according to the 1947 survey. A total of 172,078 bearing cherry trees (about one-third of the State's total) was examined on 2,458 properties in 16 counties east, and in 5 west, of the Cascade Mountains. A total of 289 infected properties was located in 13 counties east of the Mountains, which represent a total of 1,471 trees affected or less than 1 percent of those examined. It is believed that the disease had been in the State about five years. Control of the disease was being attempted with a voluntary tree removal program. (Phytopath. 38 (1): 2)

PRUNUS AVIUM. SWEET CHERRY:

Virus diseases. M. M. Afanasiev and H. E. Morris reported on diseases of sweet cherries in western Montana during the summers of 1946 and 1947. During the survey the following viroses were found on sweet cherries: mottle leaf, rusty mottle, and rasp viroses were present in traces, but the ring-spot and lace-leaf complex viroses occurred on more than 10 percent of the trees surveyed. Crinkle was found on a number of trees. Evidence of the deep suture disease was also present. Some other diseases and disturbances were also noted. (PDR 32 (1): 3-4)

PRUNUS CERASUS. SOUR CHERRY:

Glomerella cingulata, bitter rot, was reported in Jefferson County, West Virginia, by Carlton F. Taylor and Clyde E. Peet on sour cherry. In two orchards where the rot was most severe the poorest air drainage existed. Preceding and during cherry harvest, the weather was unusually wet. This seems to be the second report of this disease in the U. S. on sour cherry. A mycological collection was made in Indiana in 1915. (PDR 31 (10): 392-393. See also Phytopath. 38 (1): 20)

X-disease of sour cherry. In New York according to K. G. Parker and D. H. Palmiter in 1947, in the more severely affected part of one orchard 110 of 160 English Morello trees examined bore no fruit at all and 15 others bore a high proportion of immature fruit. In the same part of this orchard, 11 of 87 interplanted Montmorency trees bore no good fruit and 33 others bore partly poor fruit. When a careful study was made, chokecherry showing X-disease symptoms was observed within a few hundred feet of the affected cherry trees. (PDR 32 (5): 188-190. See also Phytopath. 38 (1) 20)

PRUNUS PERSICA. PEACH:

Bordeaux injury. In spraying for blight (Coryneum carpophilum) and dieback before the fall rains started, it was found that Bordeaux mixture was the probable cause of lesions on new wood of peach trees according to evidence reported by Adin P. Steenland from Oregon. (PDR 32 (2): 62-63)

Glomerella cingulata, anthracnose. According to G. B. Ramsey et al. during July 1947, Georgia peaches arriving on the northern market showed an unusual type of decay never before observed in commercial shipments. In some carloads up to 12 percent of this rot was found in various stage of development. Brown lesions 1/4 to 3/4 inches in diameter were most common. Numerous isolations from typical lesions always yielded pure cultures of Glomerella cingulata. Inoculation experiments showed the organism to be pathogenic to peaches, apples, pears and plums without evident wounds as well as through wounds. (Phytopath. 38 (1): 22)

Monilinia fructicola, blossom blight. John C. Dunegan and M. C. Goldsworthy reported the effect of blossom blight control on the amount of fruit brown rot at harvest time. Results of the blossom blight spraying experiments indicated that where there is a reduction in the number of blighted blossoms there was also a reduction in the number of infecte fruit at harvest time. (PDR 32 (4): 136-137)

Donald Cation reported a severe epidemic of brown rot blossom blight i early June on peaches in Southwestern Michigan. In three counties there was a loss of 85 to 90 percent of blossoms. He also reported leaf curl

(Taphrina deformans) very severe in unsprayed peach orchards. (PDR 31 (7): 269-270)

Xanthomonas pruni, bacterial spot, caused very severe defoliation in a 100-acre planting of 2-year old peach trees near Nashville, Arkansas, according to V. H. Young. (PDR 31 (7): 282)

Heterodera marioni, root knot. C. N. Clayton reported that greenhouse data and observations in the orchards in North Carolina suggest that nematode races rather than individual plant reactions seem to be responsible for observed variation in resistance of Shalil peach seedlings to root knot (Heterodera marioni). (PDR 31 (4): 153-154)

Winter injury. A considerable number of peach trees died from winter injury in the largest Arkansas peach area near Nashville, according to V. H. Young. (PDR 31 (7): 282)

PRUNUS SALICINA. JAPANESE PLUM

Xanthomonas pruni, bacterial spot, appeared in a severe form on the fruits in a 20-acre planting of Japanese plums near Prescott, Arkansas, according to V. H. Young. (PDR 31 (7): 282)

PYRUS COMMUNIS. PEAR

Erwinia amylovora, fireblight, occurs every season in the pear orchards of the Wenatchee district according to Theodore R. Wright. 1947 was the first year in 25 that the disease had been serious. This year weather conditions did not force the organism to become dormant; blight increased very rapidly, and a new problem of blight of nearly mature fruit arose. Blight sometimes occurred on fruits on trees having no observable sources of infection. This condition became a matter of concern particularly to handlers and processors. An investigation was made, the results of which showed that infection of pear fruit by the blight organism was of little consequence, once the fruit had left the trees. (PDR 32 (2): 58-61)

RUBUS SPP. CANE FRUITS:

Blackberry: Kuehneola uredinis, cane rust, was reported by George M. Darrow to have become more prevalent during the past few years at the testing grounds, Plant Industry Station, Beltsville, Maryland, possibly because of new strains of the fungus. (PDR 32 (1): 5-6)

Raspberry: Erwinia amylovora, bacterial twig and blossom blight, of raspberry was reported in Maine by Donald Folsom. S. G. Lehman reported the disease in North Carolina in 1932, and again in June 1947. (PDR 31 (9): 324)

Mild streak. According to Jeffers and Woods mild streak, a disease apparently of virus nature, is the most serious trouble affecting black raspberries in Maryland. This disease was first observed in Maryland about 1935 and since that time has increased to such an extent that nearly all plantings in the State are affected. (Phytopath. 38 (3): 222-225)

Plasmopara viticola, downy mildew, according to G. H. Boewe, was much more prevalent on grapes in Illinois in 1947 than in an average year. On cultivated grapes the disease was probably statewide. Severity varied with the varieties, type of treatment, and location. In central and northern Illinois it was very prevalent on wild grapes. The weather seemed to have favored its development in 1947. (PDR 31 (10): 392-393)

DISEASES OF NUT CROPS

According to P. W. Miller, reporting on the incidence of walnut and filbert diseases in Washington and Oregon in 1947 (PDR 32 (1): 6-8), the bacterial blights of both crops were widespread and important.

Xanthomonas corylina, bacterial blight, of filbert occurred in practically all orchards. In orchards 2 to 3 years old many trees died.

Xanthomonas juglandis, walnut blight, was widely distributed. An estimated 20 percent of the crop in non-sprayed orchards was either destroyed or affected by the disease. It was most destructive in the Willamette Valley in Oregon.

DISEASES OF ORNAMENTALS

AZALEA:

T. J. Nugent reported petal blight (Ovulinia azaleae) in the Norfolk area of Virginia for the first time on May 8, 1947. (PDR 31 (6): 244)

Phytophthora cinnamomi, root rot. C. M. Tucker and C. T. Gregory reported Azalea root rot in two greenhouses in the St. Louis area of Missouri. In both cases it had been present for some time and was first noticed in plants from the South. The disease was not present when homegrown cuttings were used. Ten percent of the plants were lost this year and there was evidence that the losses were increasing.

This is the first record of occurence of the fungus on azalea in the St. Louis area, but the species has previously been noted as a parasite of azalea in other regions. (PDR 31 (3): 111-113)

BEGONIA SP.

Phytomonas (Xanthomonas) begoniae, leaf spot, developed to a severe extent in a large commercial house at Houston, Texas, according to E. M.

Hildebrand. In past years this leaf spot has been serious on winter begonias grown in greenhouses in the United States, England and Portugal where overhead watering had been used, as happened in this case. (PDR 32 (1): 19)

CALENDULA OFFICINALIS. POT MARIGOLD:

Puccinia flaveriae, rust. According to E. M. Hildebrand and W. L. Vitopil a sudden severe outbreak occurred in a cloth house at Texas A.and M.College at the end of October. Numerous leaf lesions appeared almost overnight and affected leaves soon dried up. The entire bed was sprayed once on November 1, with Fermate, 2 pounds per 100 gallons, using 6 gallons to cover the 200 square feet. No new lesions were observed. However, about two weeks later a change in weather took place, with considerable drop in temperature, rains and cloudy skies. Since there were no unsprayed plants for comparison it was not possible to conclude that the practically perfect control was due entirely to the fungicide and not partly to the changed weather conditions. (PDR 32 (1): 13-15)

CHRYSANTHEMUM SPP. CHRYSANTHEMUM

Foliar nematode, probably Aphelenchoides ritzema-bosi. In July 1947 E. M. Hildebrand reported a sudden outbreak of a leaf spot or blight on chrysanthemum in a Texas greenhouse. An abundance of nematodes was found in the lesions of the foliage when examined microscopically. (PDR 32 (1): 19)

COLCHICUM AUTUMNALE. AUTUMN CROCUS:

Botrytis elliptica, the cause of a well-known leaf rot and spot of Lilium spp. was observed on two non-lily hosts in western Washington in 1947, according to Neil Allan MacLean. The newly noted hosts are autumn crocus and Gladiolus spp. (Phytopath. 38 (9): 752-753)

FICUS ELASTICA. INDIA-RUBBER FIG:

Clitocybe tabescens, mushroom root rot. In Florida Arthur S. Rhoads reported a case of mushroom root rot in a stock planting of India-rubber fig, where it had been observed for about two years. The disease was said to be becoming progressively worse and it was estimated to have killed 20 to 25 percent of the original stock planting. By January 1947 the disease had become so severe that growing these plants in this particular location was no longer profitable. (Phytopath. 37 (7): 523-524)

FORSYTHIA VIRIDISSIMA. GOLDEN BELL:

Sclerotinia sclerotiorum, twig blight, was found on golden bell in the spring, in the vicinity of Durham, North Carolina according to

Frederick A. Wolf. This organism is of especial interest because of its world wide distribution and its wide suscept range. Literature was searched for records of its pathogenesis to woody plants. These records disclosed that this fungus has been noted to cause a blight of twigs and larger branches of citrus in Chile, Palestine, New South Wales, and California; and a twig blight of figs in Texas and Chile; of guayule in California; of apricot in South Africa; and of Camellia japonica in Chile. (PDR 31 (9): 325)

GLADIOLUS SPP:

Curvularia spot, possibly C. lunata, a new disease of gladiolus, caused considerable losses in the varieties Picardy, Corona, and Vredenburg in commercial areas of Florida, according to Robert O. Magie. The disease was also reported from Alabama where it caused much damage during the summer. In fields with severe leaf spotting growers seemed to have controlled the disease by frequent sprays of Dithane with zinc and lime. (PDR 32 (1): 11-13) See also under Colchicum autumnale

ROSA SPP. ROSE:

Mycosphaerella rosigena, leaf spot, was reported by D. E. Ellis and C. N. Clayton on rose plants in commercial greenhouses in Raleigh, North Carolina in the fall of 1947. The plants were severely affected. (PDR 32 (1): 9-10)

TULIPA SP. VAR. WILLIAM PITT:

Rhizoctonia solani. Neil Allan MacLean reported that in January 1947 a greenhouse planting of William Pitt tulips from Spokane, Washington showed a top rot bulb infection. The injury was so severe that 7,000 out of 15,000 bulbs were either destroyed or injured to the extent that they did not produce marketable flowers. The causal agent appeared to be R. solani Kuehn. (Phytopath. 38 (2): 156-157)

DISEASES OF TREES

ALBIZZIA JULIBRISSIN. MIMOSA:

Fusarium oxysporum f. perniciosum, wilt, of mimosa has been found near Silver Spring, Maryland, according to Curtis May. Three trees standing within 50 feet of one another have died from the disease this year, and it was said that one tree with similar symptoms died in 1946. The disease has been very destructive in the Southeast. (PDR 31 (9): 326)

Distribution of mimosa wilt as known in 1947 is reported by E. Richard Toole. It occurred in 82 counties in 6 States, as far north as Montgomery County, Maryland, and southwest to Pike and Tallapoosa Counties, Alabama. (PDR 32 (2): 67)

BETULA SPP. BIRCH

J. R. Hansbrough and Donald C. Stout reported virus like symptoms accompanying dieback of birch in Maine. (PDR 31 (9): 327)

CRATAEGUS MOLLIS. HAWTHORN:

Gymnosporangium globosum, hawthorn rust. Roy A. Young and George L. McNew reported a severe loss in a stand of hawthorn seedlings growing in a nursery at Ames, Iowa, in 1947. Counts made in October showed that only 2 out of 18 plants per foot had survived the summer. Two rows of red cedars nearby, used as a wind break, were heavily infected with G. globosum and G. juniperi-virginianae. Infection and destruction of plants were most severe in the area nearest to the cedars. In Iowa during the spring of 1947 weather conditions were ideal for infection of hawthorn by G. globosum. (PDR 31 (12): 484-486)

MAGNOLIA GRANDIFLORA. MAGNOLIA

Glomerella cingulata, leaf spot. According to Marvin Fowler this spot is prevalent on older foliage of M. grandiflora in the South. Collections of this leaf spot have been made on native and planted Magnolias in South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas. All collections were made in the natural range of the magnolia. (PDR 31 (7): 298)

PLATANUS ACERIFOLIA. LONDON PLANE:

Endoconidiophora sp., canker stain. This destructive disease of London plane was reported by T. W. Bretz and C. M. Tucker in two widely separated locations in St. Louis, Missouri, a location far from previously reported centers. It is not known how the fungus could have reached St. Louis. The causal organism could have been brought on contaminated pruning tools or tree working equipment from some distant place. (PDR 32 (2): 65-66)

ULMUS AMERICANA. ELM:

Phloem necrosis (virus). J. E. Livingston reported that phloem necrosis of American elms has been found in Lincoln, Nebraska, the most northwestward point of advancement of the disease. About fifteen trees have died. The disease has also been observed in Richardson and Lancaster Counties. (PDR 31 (9): 328)

THE PLANT DISEASE REPORTER

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THE PLANT DISEASE SURVEY

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UNITED STATES DEPARTMENT OF AGRICULTURE

SUPPLEMENT 178

THE WARNING SERVICE IN 1948
TOBACCO BLUE MOLD - POTATO AND TOMATO LATE BLIGHT - CUCURBIT DOWNY MILDEW

Supplement 178 December 30, 1948

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THE PLANT DISEASE SURVEY
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Plant Industry Station Beltsville, Maryland

THE WARNING SERVICE IN 1948
Tobacco Blue Mold - Potato and Tomato Late Blight - Cucurbit Downy Mildew

Paul R. Miller and Muriel O'Brien

Plant Disease Reporter
Supplement 178 December 30, 1948

INTRODUCTION

This is a summation of the first year's work under our Crop Plant Disease Forecasting Project. It is a summary of an active year of disease observation and reporting on the part of key pathologists and cooperators, forming, as it does, the informational background for accurate forecasting in the years to come. Nothing is included here on the regional studies on epidemiology. In later years it is hoped that these epidemiological studies, together with the information gained from observing and reporting disease occurrence, development, and spread, will furnish the basis for forecasting disease appearance and distribution and for advice on the most timely and effective preventive or control measures.

The diseases included in the project, late blight of potato and tomato (*Phytophthora infestans* (Mont.) de Bary), blue mold of tobacco (*Peronospora tabacina* Adam), and downy mildew of cucurbits (*Pseudoperonospora cubensis* B. & C.), varied somewhat in distribution, spread, and destructiveness but all followed a set pattern of development - dependence upon cool, wet weather for initiation, development, and spread. In most cases, along with the proper use of spray and dust materials, hot, dry weather checked activity.

Beginning with tomato late blight, *Phytophthora infestans* (Mont.) de Bary, infection this year was of several types, namely, foliar and petiolar, fruit infection, and the stem canker type of infection. The stem cankers completely circled areas of main and lateral stems, causing a girdling effect which induced toppling of the plant. In some cases very little foliar damage could be seen after the fruits showed infection and in other cases more foliar damage occurred than was noted on the fruits. Infection in other cases showed up after the apparently healthy fruits, having been packed green, had been stored for some time. In some cases differences in type between the potato and tomato strain of late blight could be noted. In cases reported, virulence expressed itself sometimes in heavy foliar damage and at other times with little foliar damage but heavy fruit damage. In some cases the fungus appeared to be transitional between the potato strain and the typically virulent tomato strain.

Concerning the dissemination of blight, spread has been reported from aerial spore showers, blowing from infected potato plants and cull piles to tomatoes in adjacent fields and from blight carried into northern regions on healthy-appearing tomato transplants received from Tifton, Georgia, area. In many cases the stem canker type of infection was reported on plants from this southern area.

The disease as a whole seemed more severe than in 1947 in certain localities. It was, perhaps, more scattered but followed a general line all along the Atlantic Coast seaboard and extended into the tomato canning acreage in some midwestern states. Losses were less than in 1946 as this year's late blight, controlled by adequate spraying or dusting and the hot, dry weather, did not reach the epidemic proportions of the 1946 blight attack. The losses on late blight infected tomatoes ranged from 2 to 40 percent of the acreage planted. On the whole these losses were not severe and a good crop was obtained.

Fixed coppers, Dithane, Bordeaux, Zerlate, Parzate, used as sprays, with neutral coppers, Bordeaux, Phygon, Dithane D-14-zinc sulphate-lime, Parzate, and Zerlate, used as dusts, were employed with varying degrees of effectiveness by 10 - 80 percent of the growers who utilized ground machines or airplanes. Effectiveness seemed to be governed by time and regularity of application and the coverage obtained, rather than by the material itself. Without spraying and dusting losses would have gone much higher than the modest figures noted in some of the reports (see reports for the individual states).

Potato late blight, Phytophthora infestans (Mont.) de Bary, appeared in the fall crop of potatoes in Louisiana; in Florida it appeared in December and was intermittently active in several localities for an extended period of time, depending more on nights of heavy dew and cooler temperatures for its development and spread rather than on heavy rains. Its origin was traced in some instances to cull piles, diseased seed, and infection from tomato plantings.

Potato late blight was not severe in 1948, present, as it was, however, along the eastern seaboard states. It was also reported in Minnesota, Iowa, Colorado, Manitoba, eastern Canada, and in an isolated case in British Columbia. Dry weather seemed to be a limiting factor in its development and spread. Along with the dry weather adequate spraying and dusting prevented loss. Reduced yields occurred in some instances

Fig 1. DISTRIBUTION and IMPORTANCE of TOMATO LATE BLIGHT in 1948

Fig 2. DISTRIBUTION and IMPORTANCE of POTATO LATE BLIGHT in 1948

where foliage was destroyed by disease, in the hastening of vine maturation with chemicals, and also in the destruction of the vines by chemicals. An insignificant amount of tuber rot accounted for some losses. Losses, on the whole, did not exceed in some cases those for the year 1947, ranging as they did from 1 to 20 percent. Inadequate spraying and possibly poor hilling and harvesting could then account for most loss.

Control measures for potato late blight included among the sprays Dithane D-14, Bordeaux Mixture, a program of fixed copper early, Bordeaux later, tribasic copper sulphate, copper oxychloride sulphate, cuprous oxide (Perenox), Basicop, Phygon, Parzate, and among the dusts neutral copper and zinc ethylene bisdithiocarbamate were the most widely used by growers.

BLUE MOLD

Blue mold, Peronospora tabacina Adam, in this past season was generally distributed along the Atlantic Coast, characterized in its action by a mild spread with no great severity noted in any particular area. It was first noted late in February in the tobacco-growing area of northern Florida on cigar-wrapper tobacco in Gadsden County. The source of inoculum was presumed to be oospores in the soil. Application of fungicide and dry weather in March seemed to retard its activity.

In south Georgia reports indicated that all tobacco beds throughout the entire tobacco-growing area of southern Georgia became affected by blue mold between early February and April 15th. Disease spread was slow with no marked peak of activity. Overall damage was slight and markedly less than in 1947.

In this mid-April period blue mold was reported in eastern Tennessee and the Cumberland area (burley tobacco). Likewise in mid-April South Carolina reported blue mold with the start noted about March 15th. Spread was slight owing to the warm weather. At the end of April Kentucky reported blue mold in Simpson County with northward movement in the state noted in the next ten days, but it was generally mild over the entire tobacco-growing areas of Kentucky. North Carolina's entire eastern half of the state suffered attack by blue mold as shown in Fig. 3.

About middle May Canada reported blue mold in the new tobacco belt seedbeds of Ontario, a few days later noting its occurrence in the old tobacco belt. During the latter part of the transplanting season the disease was prevalent throughout all Ontario tobacco-growing districts (except east of Toronto) although overall damage was consistently mild owing to the large percentage of growers using control measures. Some field damage was noted in Ontario, some places suffering severe leaf-spotting. Quebec, oldest Canadian tobacco-growing area, remained free of the disease.

Fig. 3. Distribution of Tobacco Blue Mold in 1948.

Pennsylvania first observed blue mold on August 4th in Lancaster County with spread noted as being slow and with little loss incurred.

Blue mold in the New England states area was not severe, Connecticut reporting attacks mild in type and with little loss owing to adequate spraying and dusting. Massachusetts reported about middle August the presence of blue mold, just prior to harvest, on mature plants in the field. Overall damage was negligible; occurrence noted on map, Fig. 3.

Consideration of the blue mold picture in the 1948 season points to an emphasis placed by cooperators on the role of oospore infection as being the initial cause in most cases. The checking of infection was owing, in this year, to hot, dry weather at optimum time for infection and, if the weather were suitable for infection, to the adequate use of fungicides, in particular dithiocarbamates. Also, the isolated cases of field infection in Massachusetts, Canada, and Connecticut, present no hazard that blue mold would be a threat when plants are in the full-grown stage.

DOWNY MILDEW

The 1948 season in the initiation and spread of downy mildew, *Pseudoperonospora cubensis* B. & C. was quiet, the fungus appearing in early February in frost-free areas in coastal south Florida on squash and cucumber plantings. It spread slowly along the eastern seaboard to the Virginia state line where dry weather arrested its development. After a three-week interval it gradually moved northward at a time when harvest was already underway and thereby caused little damage. It was reported as far north as Massachusetts, hot, dry weather checking the spread and severity of the disease.

Losses are estimated in low figures, the greater percentage of growers using sprays and dusts,with copper sprays and biscarbamates apparently holding the disease in check.

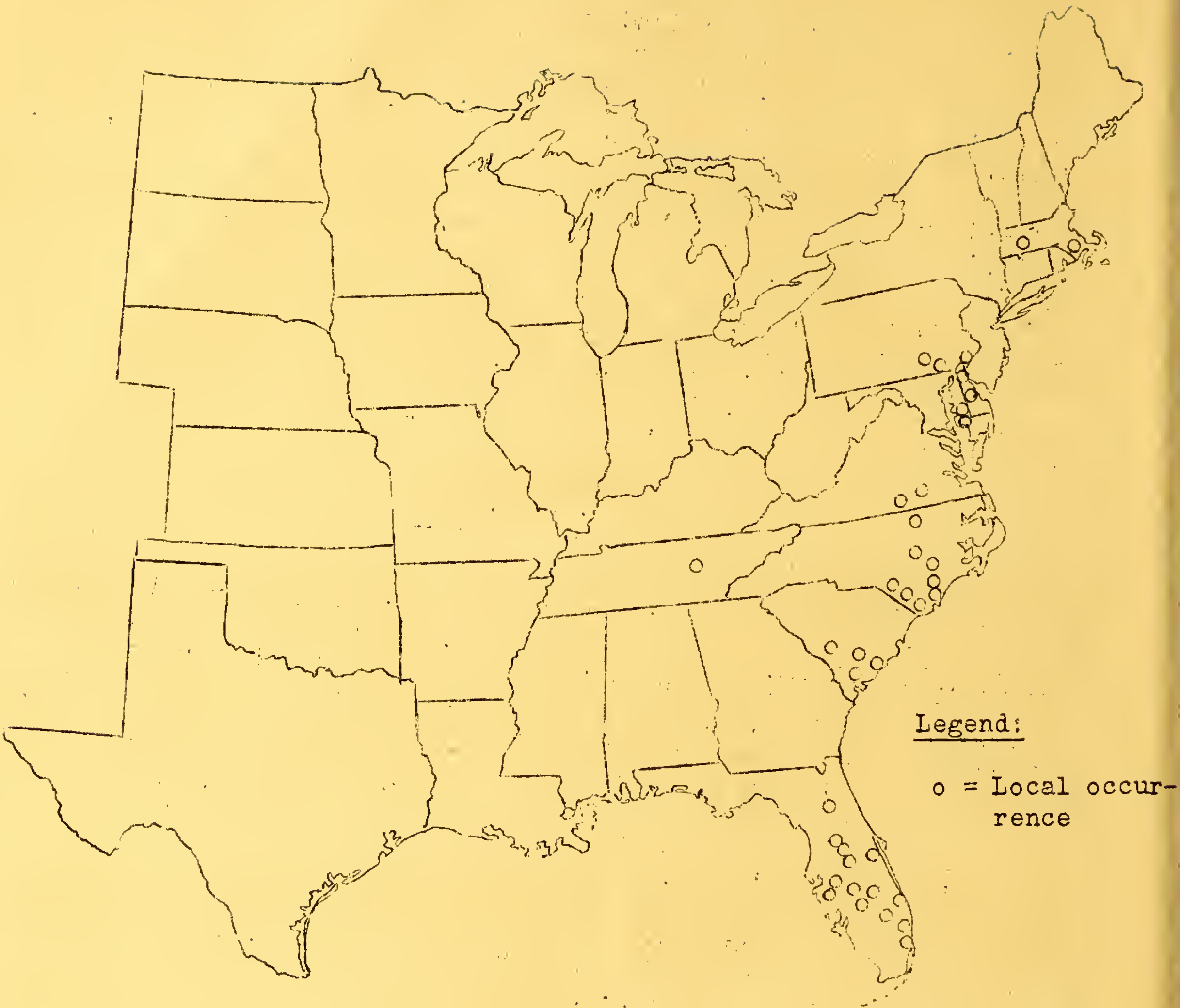

Fig. 4. Distribution of Cucurbit Downy Mildew in 1948.

WEATHER

The known high correlation between disease incidence, development, and spread of these mildews with wet, cool weather prompts us to present at this time a summary of weather data in the form of maps. Since the daily records for different places will not be published for some time to come, we present the maps showing overall conditions in the localities covered by the Warning Service without any data at this time regarding extreme differences in weather between short distances, any variations in a given locality, or differences in the microclimate in one planting. These maps are an attempt to show in combination temperature and precipitation extremes below and above normal, the material for these maps being taken from the Weather Bureau's Weekly Weather and Crop Bulletin which gives departure from normal temperature and percentage of normal precipitation for the entire country. These maps, then, present an estimate only of the season's weather.

An analysis of the monthly weather maps presented in Figure 5 will indicate to a marked degree the overall weather factors which apparently were responsible for the development and spread of the mildews. Beginning with April, which is the starting point for this year's presentation, reports from Florida indicated the continued activity of potato late blight. Temperatures reported were in the 80's, dropping at night to 62°, 57°, and 59° in the Everglades area. Heavy dews were reported also. The weather picture on the map in April bears out the overall warm and wet weather for Florida, ranging into normal and wet for northern Florida, eastern Georgia, and South Carolina, from which latter state late blight on potatoes was reported from Charleston County. In North Carolina normal, dry weather prevailed at this time also, with no reports of late blight being found in that state. Virginia likewise experienced a normal, wet period during this month with late blight reported on April 27th on tomato transplants shipped in from southern Georgia. These transplants had been received about two weeks earlier, shipped at a time when Georgia was experiencing a normal, wet period but just prior to which there existed, although not presented in this series of maps, an overall warm, wet condition for the month of March over the larger portion of eastern United States. This March wet period encompassed the whole Atlantic seaboard up to and including Illinois, half of Missouri, Arkansas, and all of Louisiana. In the southern Georgia area for March percentage of normal precipitation was as high as 200% with a +4° mean departure from the normal temperature. On the transplants from this area Virginia reported tomato late blight as being of the stem canker type.

In another vein potato and tomato late blight in Mississippi and Florida in May was reported as occurring during periods when weather was unfavorable for late blight development. Ohio's blight epidemic on tomato transplants from Georgia likewise was initiated and developed at a time when the weather on the whole was cold and dry. Also, in June, North and South Carolina reported late blight when weather was not too favorable for its development. However, Kentucky's, Virginia's, and New York's late blight seemed to follow the more general weather pattern as is given for blight development, in the former two states developing during warm, wet weather, and in the latter during a cold, wet spell.

In June late blight was reported in Maryland, Delaware, New York, Connecticut, Pennsylvania, Rhode Island, Virginia, and West Virginia, at which time in all these eastern states normal temperatures with precipitation above normal were prevailing. Mississippi reported in June the cessation of tomato late blight when, as shown on the maps, weather was normal in temperature and dry.

During July's rather extended wet weather through Georgia, Alabama, middle Kentucky, extending across the middle section of the country, reports of late blight of potatoes came from Iowa, Massachusetts, New York, Indiana, New Jersey, and on potatoes and tomatoes from Pennsylvania and Ohio. This was probably the most active time of disease spread in commercial canning areas. Delaware, dry during this period, noted the checking of the progress of late blight. However, in early August in Delaware, late blight develope[d] and spread, aided by the warm, wet weather.

During this summer period also active late blight was found in Canada in the various eastern provinces on both tomato and potato, correlated with rains and favorable temperatures. We have not shown on maps nor will discuss here the relation of weather to disease in Canada as we do not have any weather data to tie in with the reports from the various provinces except those which are noted in their individual reports.

In spite of the somewhat dry August and particularly the hot spell towards the end of the month, late blight on tomatoes continued to be active in Indiana, Connecticut, Tennessee, and Virginia; on potatoes in Minnesota, Wisconsin, and Massachusetts; potatoes and tomatoes in Rhode Island and Michigan. However, in early September, from Minnesota, Wisconsin, and Michigan came active reports that the weather was too hot for active sporulation and spread.

September's weather presents a warm, dry area over most of the northern mid-western states with spotty areas of cool, wet weather in southern and lower eastern states. Normal, wet weather occurred along the lower eastern seaboard and, extending from upper Atlantic Coast seaboard in serpentine fashion to the lower southern states, as a wide band of normal, dry weather. It is probable that the advent of this hot, dry weather, along with an adequate spray program employed by many growers, helped check the widespread destruction of tomato and potato crops by late blight.

Blue Mold

Early reports from northern Florida and southern Georgia in March indicated the presence of blue mold - weather was cool and wet, March's weather data showing a high percentage of normal precipitation with normal mean temperature in this area. In Georgia tobacco blue mold had made a progressive spread from the first of February but with no marked general peak of activity. Reported during the latter part of March and in early April in North Carolina and in the latter part of April in Maryland, blue mold's occurrence in North Carolina came at a time when warm, dry weather occurred. In South Carolina in April, too, blue mold was reported as being slow owing to the warm weather. A survey of the map will show a normal, dry stretch of weather ranging from western Georgia, eastern Alabama, up through South Carolina and North Carolina. A warm, dry area also extended over a small portion of western Virginia and a warm, dry area over most of Tennessee.

In this warm, dry period Virginia's report in April noted the presence of blue mold, whereas Tennessee at the time of this dry weather had a negative report. For the greater part this hot, dry weather checked the advance of blue mold - weather, plus the adequate application of Fermate and Dithane Z-78 by growers. Maryland's weather at time of reporting in April was normal in temperature and above in precipitation, with additional spread in Maryland and Virginia during May at a time when the weather was warm and wet. However, Kentucky's and Tennessee's weather during May's spread was normal in temperature and dry. Connecticut's, Massachusett's, and Pennsylvania's reports during the latter part of May were in a period of cold, wet weather, as shown on the map in the New England states area.

Outbreak of blue mold in Canada also came in May after a period of wet weather and was checked in early June by abundant sunshine.

In June tobacco-setting was delayed in the North Atlantic states because of almost continuous rain during May and June. Summer activity of the fungus was marked by the unusual occurrence of field infection on mature plants in Massachusetts in August at a time when the weather for the previous period in that state was normal in temperature and dry. This occurrence proposes in part the question of how closely does the weather tie in with blue mold. July's weather across Pennsylvania and New Jersey was normal in temperature and wet, Massachusett's June weather normal and dry preceded by normal in temperature and wet. Until we know more about spore showers travelling from an infection area where conditions are optimum for disease development and spread into a disease-free area where heavy dews and/the microclimate at plant bed make conditions humid, cool, and we even if the overall weather in the disease-free area were dry, disease occurrence and existing weather are simply noted.

Downy Mildew

Downy mildew first appeared in the Everglades area of Florida on squash and cucumbers in early February. Spread was not rapid but by the end of February and at the beginning of early March reports gave occurrence in the West Palm Beach, Stuart, Sanford, and Bradenton areas. At the end of March Mascotte and Webster areas were added. By the middle of April the overall conditions for the state for the month being warm and wet, downy mildew had reached the epiphytotic stage on cucumber plants in the Fort Lauderdale-Pompano region, severe on cucumbers in the Bartow, Wauchula, and Arcadia areas, and increasing in severity in the Mascotte and Webster areas. At the end of April downy mildew was observed in the Gainesville area. By the middle of April infection was found on watermelons in the Leesburg area. At the end of May downy mildew on watermelons in the Leesburg area and north to Ocala were reported in a warm, dry period but one with heavy dews.

With the warmer and drier weather of May, and at the end of the season, downy mildew was not observed in the Belle Glade area. By that time spread had taken place northward and at the end of May it was found in Charleston County, South Carolina, in a warm, wet area and by early June had spread into three additional counties. By early June, also, it had spread into North Carolina. In early July D. E. Ellis reported finding downy mildew at Norlina near the Virginia line, reporting that while downy mildew developed rapidly and caused severe defoliation in the south central portions of the state up to June 22nd, the warm, dry weather (as borne out by the maps, Fig. 5) apparently slowed mildew development in areas farther north. It was not until the end of July that downy mildew was reported in Virginia, having been unreported in Maryland (July 30th), Delaware (before July 26th), New York, and checked in North Carolina. Normal, dry weather is indicated on the map for July in this middle-Atlantic area.

At the beginning of August downy mildew on cantaloups was reported in Virginia and found in Delaware distributed throughout lower Delaware on cucumbers. By middle August Massachusetts reported non-appearance (a dry period as depicted on the map). By middle August, too, Virginia reported continued increase in severity of downy mildew on cucumbers and cantaloups in a warm, wet area. In southern Pennsylvania, bordering on this warm, wet area, downy mildew on cucumbers was reported in northern and southern Lancaster County. In early September Massachusetts, reporting an extended dry period, borne out by the map, observed mildew on cucumbers in Bristol County, ending the reports on cucurbit mildew for this season.

As borne out by the maps, perhaps, the most striking factor in the development and spread of downy mildew of cucurbits was its check in June and July in the middle-Atlantic states area by the extended normal temperature and dry weather conditions, stopping the infection practically at the

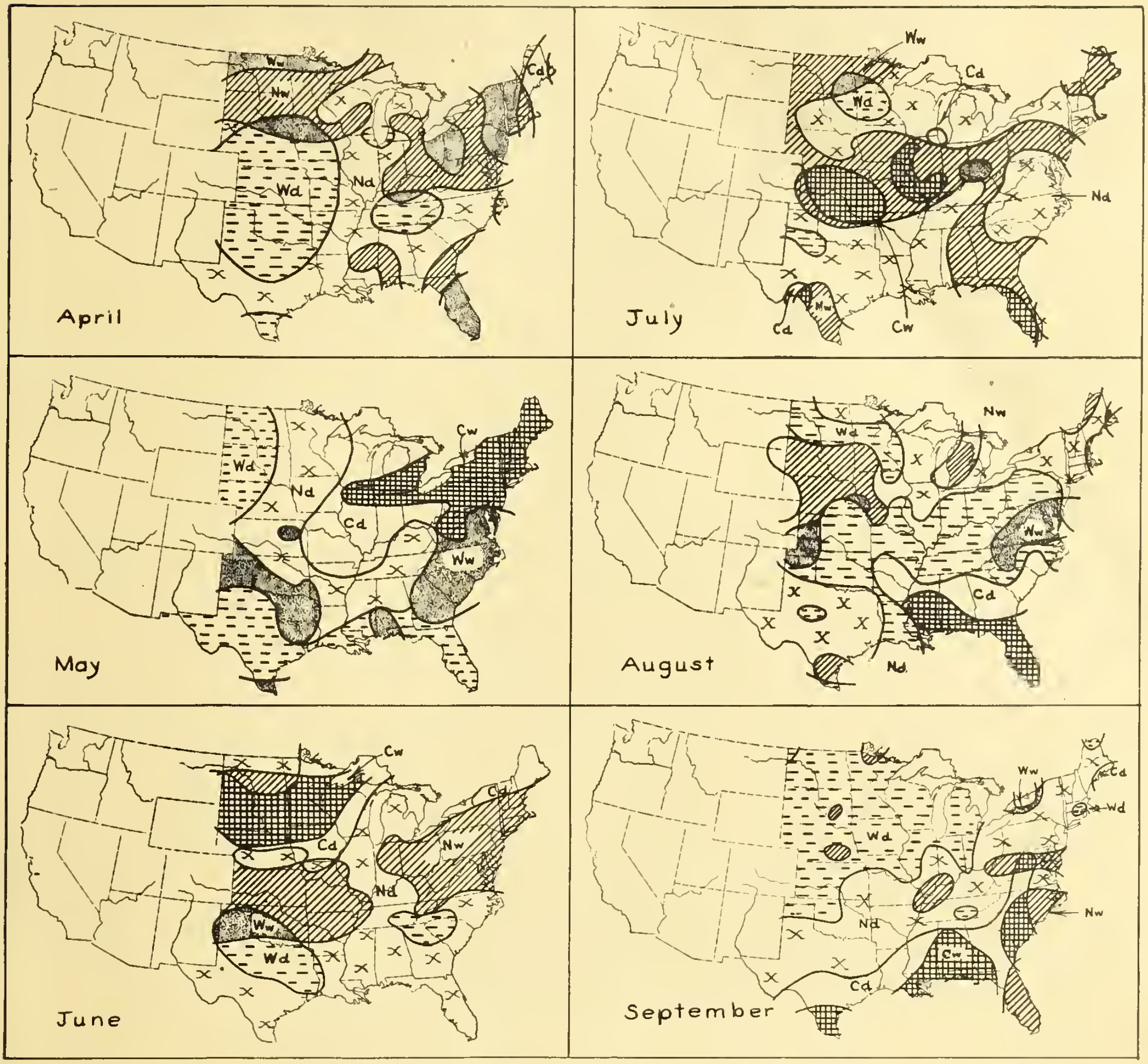

Fig. 5 - MONTHLY WEATHER CONDITIONS - April through September 1948

Unshaded - Temperature and precipitation below normal - Cd

Temperature and precipitation above normal - Ww

Temperature above, precipitation below normal - Wd

Temperature normal, precipitation above normal - Nw

Temperature below, precipitation above normal - Cw

X Temperature normal, precipitation below normal - Nd

Virginia line and then when conditions favoring development occurred in late July and early August, its spread into Delaware, Pennsylvania, and Massachusetts.

In discussing this relation of weather to the development and spread of these mildews, there may be some discrepancies between this overall weather picture and the actual facts in specific cases. Therefore, it is brought to attention that in discussing these reports, we are dealing with monthly averages on temperature and precipitation on one side and with individual, carefully itemized reports on the other. Until such time as microclimatic records are available, or even macroclimate reports for stations other than first order weather stations, we offer these comments solely as an analysis of existing conditions surrounding the development of these mildews and as an expression of the trends toward which our phytopathological thinking seems to be turning.

The individual reports of the States and Canada for all diseases are included in this supplement to permit your closer scrutiny of conditions in any state, a particular area, county, or town.

Will you please note on Pages 289-291 a useful index which will help you in locating the subject matter in which you are particularly interested.

LATE BLIGHT ON POTATO IN 1948

LATE BLIGHT IN ALABAMA IN 1948

Coyt Wilson

The first report of late blight in Alabama in 1948 was on April 5 when the disease was found in a field of potatoes about five miles south of Fairhope in Baldwin County. The disease appeared to have originated from diseased seed. A second outbreak occurred a few days later at Fairhope on the Gulf Coast Substation. In this instance the disease originated in plots where blighted seed had been planted.

Weather was favorable for development and spread of late blight during the first two weeks of April. In the last half of the month, however, and throughout May the weather was fair and humidity was generally low. The spread of the disease was reasonably slow after April 15. Blight was present in practically all fields in the southern half of Baldwin County by the time the potatoes were dug in May.

Probably one-half of the growers in the affected area practiced some kind of control program. The most commonly used fungicide was one of the neutral copper dusts. Some growers tried a zinc ethylene bisdithiocarbamate dust. Most of this was mixed to contain 3.9 per cent of the effective ingredient, but some 6 per cent dust was used. These organic dusts wereeoual to, or perhaps slightly better than, the copper dusts. The effectiveness of the material was governed more by the thoroughness of application than by the material itself. Most of the dusts were applied with tractor dusters. Dithane D-14 spray, as usual, gave excellent control, but very few growers in Alabama are equipped to spray.

Losses from late blight in Alabama varied from none to approximately 20 per cent. The overall loss in the state would not exceed 5 per cent.

Dry weather after April 15 appears to have been the limiting factor in late blight development in 1948.

ALABAMA AGRICULTURAL EXPERIMENT STATION
AUBURN, ALABAMA

LATE BLIGHT IN CANADA IN 1948

MANITOBA

by J. E. Machacek

Late blight appeared first on July 13th in the southeast corner of Manitoba. Aided by continued cool, moist weather the disease spread rapidly northward and westward until by the end of August all agricultural areas of the province were affected. A considerable amount of tuber-rotting in soil occurred in the more northern areas, while in the south such rotting was checked by a prolonged rain-free period from the early part of September until the first frost in late September. Losses from rotting in storage will probably be less than those anticipated - probably not more than 10%.

DOMINION LABORATORY OF PLANT PATHOLOGY
FORT GARRY, MANITOBA, CANADA

NEW BRUNSWICK

by J. L. Howatt

In the province of New Brunswick, Canada, late blight of potatoes was first detected in commercial fields during the last week in July, when local outbreaks were detected at Grand Falls and New Denmark in Victoria County, and at Bath and Hartland in Carleton County. The Hartland outbreak was definitely traced to an infected cull pile. The counties involved are adjacent to the United States border and are the concentrated potato-producing areas of the province. Abundant rainfall with favourable temperatures (max. 72°, min. 55°F.) for a three-day period, July 25-28, established the infection and blight spread rapidly for a few days. Intermittent showers during the period August 6-15 maintained the infection but the spread was not rapid owing to day temperatures beyond the optimum. However, during this period infestations were common in potato fields in the southern half of the province. A hot period, average day temperature above 83, from August 16-29 effectively checked blight development. Abundant rain and low temperatures (max. 65°, min. 45°F.) during the last two days of August and the first four days of September caused a rapid spread of the infection and during this time blight was generally distributed throughout the province. Every indication pointed to a severe epidemic but hot, dry weather followed for the next three days and again the blight was effectively checked. Favourable moisture and temperature conditions were again experienced during September 10-12 and the epidemic was rejuvenated only to be checked by a few succeeding days of hot, dry weather. Temperature and moisture conditions were again favourable to infection over the period September 16-26, but high day temperatures during the last three days of the month considerably slowed down, but did not stop, the ravages of the disease.

The timely intervention of short periods of unfavourable weather conditions during the months of July, August, and September were chiefly responsible for the failure of an impending epidemic. The effectiveness of these periods, enhanced by timely applications of fungicides, enabled the greater number of our growers to control the disease. Ample hilling of the potatoes, the common use of potato top killer, and the killing effect of slight frosts during the latter part of September contributed greatly to the reduction of rot in the tubers. On the whole, a very large crop of relatively sound tubers is being harvested.

Bordeaux, copper basic sulphates, copper oxychloride, and Dithane D14 are the common fungicides used in the province of New Brunswick to combat late blight. About 75 percent of the growers use wet sprays and 25 percent use dust. All these materials are applied by ground machines. One half of the acreage (69,000) is sprayed with Bordeaux of a 4-2-40 or 4-4-40 formula. The remainder of the wet spray acreage is chiefly sprayed with fixed copper compounds, Dithane being utilized on but a small acreage. The average number of sprays or dusts applied is about four. Seven applications are commonly made by the better growers and occasionally as many as ten applications are applied. Practically all the dusts used are ready mixed copper basic sulphates. DDT in powder or emulsion form is generally used as an insecticide. The use of DDT has enhanced and prolonged vine growth, necessitating better spraying and the use of top killers. Growers, generally were of the opinion that fixed copper sprays hastened vine maturation with consequent reduction in yield, but this effect appears to have been compensated for by DDT. In general, Bordeaux, in the hands of growers or experimentalists, has proven the best fungicide for the control of blight. On the whole, the standard or commonly available copper fungicides are more efficient in their action than is the available machinery for application. While destruction of the vines is chiefly responsible for reduction in yield, poor hilling and harvesting while viable spores are present account for most of the tuber rot.

Spray tests conducted at the Dominion Laboratory of Plant Pathology this season, utilizing (1) Zinc ethylene bisdithiocarbamate (S. W. Co.), (2) Perenox, (3) Basi Cop, (4) Puratized, (5) Coppa Tone, (6) Copper A, (7) Dithane D14, (8) Spray Cop, (9) Copper Hydro 40, (10) Phygon XL, (11) C.O.C.S., (12) G 658, (13) Bordeaux (4-2-40), (14) 629 - 308, (15) 629, and (16) Parzate (C.I.L.), revealed 100 per cent late blight vine infection in treatments 4, 15, and checks. Vine infection in the other treatments was as follows: No. 11 - 40%; No. 16 - 30%; No. 10 - 25%; No. 14 - 25%; No. 7 - 8%; No. 8 - 5%; Nos. 6, 9, 12 - 2%, and Nos. 1, 2, 3, 5, 13 - trace %. Seven applications were made between July 30 and August 17.

DOMINION LABORATORY OF PLANT PATHOLOGY
FREDERICTON, NEW BRUNSWICK, CANADA

NOVA SCOTIA

by K. A. Harrison

Late blight of potatoes was first found July 17 on plants on a cull pile at Centreville, Kings County. The disease had been active for over a week. This cull pile was burnt down immediately and covered with sand.

It was not found in a commercial planting until August 4th and it was not until August 12th that the Potato Inspectors reported late blight in the Scott Bay seed growing area. Late blight was found generally from Yarmouth County to Cumberland County by August 20th. The rest of the province was not visited. Fields in Queens-Lunenburg were black on September 13. The disease became established early in the summer in many widely separated localities and then progressed rather slowly due to low rainfall. Temperatures in Nova Scotia are always favorable for the disease and when once established it spreads when rainfall and humidity are suitable. This year the rainfall was not sufficient for a destructive outbreak. Rain early in September enabled blight to spread, and unsprayed fields along the Atlantic shore were killed by the middle of the month.

The potato crop in Nova Scotia was planted late this year owing to excessive rains during May and June. The summer and early fall had a low rainfall which resulted in a slow development of the disease. Losses may reach 20 percent for unsprayed fields.

A great variety of spray materials is used. The commonest is a commercial product known as Basicop sold by "Green Cross" agencies. There are a number of brands of fixed coppers from other manufacturers. Dithane is used to a very slight extent. Bordeaux Mixture is used with widely varying amounts of hydrated lime. Ten-five-one hundred is recommended but many growers use larger quantities of lime. Dust is not used and the size of fields does not permit application by airplanes. Control of late blight was good when spraying was carried out regularly.

DOMINION LABORATORY OF PLANT PATHOLOGY
KENTVILLE, NOVA SCOTIA, CANADA

MARITIME PROVINCES - Prince Edward Island, Nova Scotia, New Brunswick

by L. C. Callbeck

Late blight of potato was observed on the young sprouts in a small cull pile near Charlottetown, P.E.I. on July 3, and a severely infected cull pile was found at Centreville, King's County, N.S., on July 17. Field infections were observed almost simultaneously in Prince Edward Island

and New Brunswick, the first (July 26) being a field of Cobblers at Harrington, Queens County, P.E.I. During the next several days infected fields were found in all three counties of Prince Edward Island and in Carleton, York, Victoria, and Queens Counties in New Brunswick. No blight was reported from Nova Scotia until the second week of August when infected fields were found in the counties of Kings and Yarmouth. In some instances field infections were definitely traced to local cull piles. The epiphytotic in Prince Edward Island was quite severe, but in New Brunswick only slight damage was observed in most areas.

The weather during July was probably ideal for the initiation of the epiphytotic in Prince Edward Island. Weather data were taken daily at 8:30 a.m., 2:30 p.m., and 8:30 p.m. and weekly weather charts were prepared. The table that accompanies this summary report has been composed from these charts. The total precipitation of 10.49 inches at Charlottetown for the months of July, August, and September was slightly below the 26-year average (10.53 inches) for this period and, therefore, cannot be considered excessive. Some years of much greater precipitation have been blightless. The frequency of the rains rather than the cumulative amount may be the chief factor in bringing on and sustaining the attack in 1948. During the period of July - September there were 41 days in which rain or light showers occurred. The table shows that only 9 times during the season did single-day rains occur, most wet periods consisting of two-day or three-day periods of showers, and the foliage was kept damp for long periods. The season was thus characterized by series of periods of weather favourable to sporulation and germination by Phytophthora infestans.

By August 20 many unsprayed or inadequately sprayed fields were dead in Prince Edward Island, but growers who followed a persistent spray program maintained control in their fields. Failure to spray until the disease had become established was the main reason for losses. In only two or three fields was the amount of tuber rot so great that digging was abandoned, but in most fields the losses from late blight tuber rot will be slight. The destruction of the vines by chemical sprays or mechanical beaters has been very general this season and the practice has been a big factor in saving the crop. The main loss to the province will be caused by a reduction in yield brought about by the reduction of foliage or its premature death from disease. It is difficult to estimate the yield for the province at time of writing. The Cobblers are being dug and yields are running from about 100 bushels to 350 bushels per acre. Few fields of Green Mountains, Sebagoes, or Katahdins, the three leading late varieties, have been harvested. However, with an increase in acreage, and with higher average yields in plantings where blight has been controlled, the production is likely to be about the same as in 1947.

Fungicides used in the region include Bordeaux Mixture, tribasic copper sulphate, copper oxychloride sulphate, cuprous oxide (Perenox) and a small amount of Dithane. Spraying was the chief means of application especially in Prince Edward Island where few dusters are used. In tests conducted at Charlottetown two organic fungicides, Phygon and Parzate, showed outstanding promise. Zinc nitrodithioacetate was worthless.

Charlottetown Weather Data for July - September, 1948

Period	Mean Temp.	Mean Humidity	Rains (Dates and Frequencies)	Rain (inches)
July 1 - 7	63.5	84.0	2,3,4: 6,7	1.29
July 8 - 14	67.8	76.5	12, 13	0.72
July 15 - 21	70.6	71.8	19, 20	0.27
July 22 - 28	67.5	79.9	22, 23: 25: 28	1.13
July 29 - Aug. 4	72.0	74.1	2	0.36
Aug. 5 - 11	66.8	76.0	6,7 : 9,10,11	0.42
Aug. 12 - 18	67.4	80.9	13,14,15	2.36
Aug. 19 - 25	69.8	76.0	25	trace
Aug. 26 - Sept. 1	64.3	85.3	29,30 : 1	0.99
Sept. 2 - 8	67.2	73.0	2 : 8	0.36
Sept. 8 - 15	64.9	81.0	9, 10,11 : 15	0.16
Sept. 16 -22	54.0	85.3	16,18,19,20,21,22	1.90
Sept. 23 - 29	54.2	73.6	23,24,25	0.53
			41 days in which rain fell	10.49

DOMINION LABORATORY OF PLANT PATHOLOGY
CHARLOTTETOWN, P.E.I., CANADA

EASTERN ONTARIO

by L. T. Richardson

The first report of late blight on potatoes in Eastern Ontario was from Prescott County on August 14. The same week it was reported on potatoes in Grenville County (August 18) and Renfrew County (August 20). The weather at this time was hot and humid, with frequent showers and heavy dews. The following week late blight became general in these areas and attacked tomatoes in Prescott County. It was found on both potatoes and tomatoes in Carleton County on August 26 and on potatoes in Dundas County on September 3.

After the initial infections the disease spread rapidly, particularly in those fields that were not adequately protected. In fields that were well sprayed or dusted, the injury was confined to the new terminal growth. The disease was checked in September by a prolonged period of dry weather. Considerable tuber rot was found on harvesting on some farms, especially where the soil was heavy. In the development of late blight on tomatoes, the initial infections, which appeared at the same time as those on potatoes, chiefly affected the foliage. Later in the season it was almost impossible to find infected leaves even where a high percentage of the fruit was infected. The greatest amount of damage was caused to late harvested fruits, especially those lying on the ground. In one case where fruits were picked green for indoor ripening, 100% developed late blight rot.

Tomatoes are not grown on a large scale in Eastern Ontario and virtually no fungicides were applied. Practically all potato fields in this district were treated with fungicides, sprays and dusts being used about equally. Bordeaux, 10-10-100 or 10-5-100 (Imperial measure), was the spray most commonly used. Most of the dusts used contained fixed copper. Where either sprays or dusts were applied thoroughly at regular intervals, damage owing to late blight was slight. Data are not available on acreage of potatoes in Eastern Ontario or percentage loss owing to late blight.

DIVISION OF BOTANY AND PLANT PATHOLOGY
CENTRAL EXPERIMENTAL FARM
OTTAWA, ONTARIO, CANADA

ONTARIO

by J. D. MacLachlan

This report concerns all of Ontario except the extreme northwest portion adjoining the Manitoba border. A report for the extreme eastern part of Ontario is being submitted by Dr. Richardson, Ottawa. [directly above].

The principal tomato districts in Ontario extend along Lake Erie, through the Niagara Peninsula, and east along Lake Ontario. In addition, some tomatoes are grown on the south side of Georgian Bay. Potatoes are grown generally throughout Ontario, the northern limits being along Lake Superior. In the extreme southwest part early potatoes are grown, primarily, and are usually harvested before the late blight season.

Late blight was first reported in Ontario on July 19 - on tomatoes in the Niagara district and on potatoes in Dufferin County (Central Ontario). The degree of infection in these loci would indicate that the initial appearance of late blight in Ontario was not later than July 15.

Weather conditions during the latter part of July and early August were conducive to the spread of late blight and by mid-August late blight had been reported in all the major tomato and potato areas of Ontario.

The stage was set for a severe epiphytotic of late blight but the advent and continuance of hot, dry weather from mid-August through most of September prevented significant losses. There were only a few isolated fields of tomatoes in which severe losses were experienced. Likewise, only a few scattered records of tuber rot in potatoes were reported.

Little or no information was obtained on the effectiveness of sprays or dusts for the control of late blight owing to the minor extent of loss experienced in fields where fungicides were not used.

Sun scald, during the intensive hot, dry weather, caused some loss in certain tomato districts. The effect of fungicides on the transpiration rate during the hot, dry weather was quite evident in tomato spray-test plots at the Ontario Agricultural College. In contrast to the checks, plots receiving repeated applications of Bordeaux showed the greatest amount of wilting with less wilting in the fixed-copper plots, and the least wilting in plots where organics such as Dithane were used.

In reviewing the pattern in which late blight developed, it was quite evident that diseased potatoes are a primary source of inoculum for tomatoes in Ontario. Garden patches of potatoes and tomatoes were, in many cases, the initial loci of infection.

DEPARTMENT OF BOTANY
ONTARIO AGRICULTURAL COLLEGE
GUELPH, CANADA

QUEBEC

by C. Perrault

Late blight on potatoes was general throughout the Province of Quebec this year although late to appear and generally slow to spread. It was first observed at Lennoxville in the Eastern Townships and in Temiscouata County, Lower St. Lawrence Valley, on July 31. In other districts the disease was observed much later.

Original infection in most of the fields under observation is attributed to spores carried along with air currents. Four of these fields were isolated (one of them was five miles in the woods away from any other potato fields or possible source of infection). During the week of August 22, late blight was reported from most potato-growing centers. At that time growers were beginning to dig the early crop in the Montreal district, whereas in the lower St. Lawrence and Lake St. John districts potatoes had just passed the blooming period.

Infection was favoured by the heavy dews that persisted late in the forenoon. Fortunately enough, precipitation was exceptionally light, particularly in Western Quebec and were it not for the long drought period that extended up to October 10, growers would have sustained heavy losses. As a matter of fact, the amount of damage on tubers is insignificant as compared with the extent of the disease on foliage. Well-sprayed potato fields were practically free from disease, whereas neighbouring unsprayed fields were destroyed within a few weeks on account of the high degree of air humidity. Along the Lower St. Lawrence, however, the disease was checked much longer on account of atmospheric conditions being different to those that prevailed inland.

Generally speaking, control measures, where carefully applied, were quite satisfactory. They consisted mainly of four to eight applications of 4-4-40 Bordeaux Mixture according to districts and time that growers could dispose of. In the Lower St. Lawrence, few sprayings are generally required on account of the later appearance of the disease. An exceedingly small percentage of growers dust their potatoes with C.O.C.S. This practice is confined to a limited number of farms where water supply is inadequate.

DOMINION LABORATORY OF PLANT PATHOLOGY
STE. ANNE DE LA POCATIERE, QUEBEC, CANADA

LATE BLIGHT IN CONNECTICUT IN 1948

Saul Rich

Although we had late blight fairly early in the State, our long, dry spell stopped any serious damage by the disease. The greater majority of potato grower use either Bordeaux or Dithane D-14 (plus zinc sulfate and lime). In spite of our attempts to tell them otherwise, most of the

Bordeaux users apply concentrations up in the 15-12-100 range. It is probably fair to say that this year the Dithane fields outyielded the Bordeaux fields. Many of our tomato growers attempt to squeeze through the season without spraying. However, those who do spray use Bordeaux, inert coppers, Dithane, and Phygon, in about that order of popularity. There is no airplane fungicide application on potatoes and tomatoes in this State. All work is done by ground application. We try to discourage dusting against late blight, but many growers prefer it to spraying because of ease of application. We fell that although dusting may be effective in light blight years, under our conditions it is a waste of effort and money when heavy blight infections threaten.

Late blight was first noticed on potatoes in a cull pile near Hartford on June 14. The first report of blight on field plants was on August 2 near New Haven. The potatoes were unsprayed. The early occurrence of late blight (June 14) was owing to a several week period of cool nights and wet, cloudy days. Late blight on tomatoes was not reported until the second week in August, appearing first in the New Haven area. In the same week serious localized tomato infections were reported near Windsor. During this same period, late blight was first found in the commercial potato fields north of Hartford. For a while it looked as if late blight would be serious, but a record drought during part of August through September and into October stopped any further spread of the disease.

Southern tomato transplants are not used to any great extent in this area so that late blight introduction in this manner is not important.

Within the past two weeks, since the breaking of the long, dry spell, [early October] late blight has reappeared on both late potatoes and tomatoes so that if the potato growers do not take some precautions, they may suffer losses from storage rot.

On the whole, 1948 was a very light late blight year.

* * * *

In a letter dated October 13, 1948, Dr. J. G. Horsfall comments as follows:

"I may say that in my own garden late blight on small cherry tomatoes has suddenly appeared and wiped out my crop, but the disease has not appeared on Rutgers nearby. The outbreak of this disease came along with the advent of cool, fall weather and a little bit of rain. We have had a terrific drought here since early in August".

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION
NEW HAVEN, CONNECTICUT

LATE BLIGHT IN DELAWARE IN 1948

J. W. Heuberger
R. F. Stevens

Late blight of potatoes was first found on June 4 in two potato fields in the vicinity of Dover. Source of infection appeared to be infected seed. Spread was very rapid up to the middle of June as weather conditions were favorable. By June 15th 40 per cent of the potato fields in the state were infected. Unfavorable weather the end of June and during July, coupled with control measures, slowed down the progress of the disease. Most of the growers used dusts. However, the disease was serious in many untreated fields. Loss is estimated at 15 per cent.

Numerous surveys throughout the growing season showed that the various diseases were much less serious in treated fields than in untreated fields. As to method of control, it was observed that ground spraying was most effective, ground dusting was next most effective, and airplane dusting was least effective. On tomatoes and potatoes, most of the growers used copper compounds as dusts but those who sprayed used Dithane mainly.

AGRICULTURAL EXTENSION SERVICE
UNIVERSITY OF DELAWARE
NEWARK, DELAWARE

LATE BLIGHT IN FLORIDA IN 1948

BELLE GLADE

by David L. Stoddard

Potato late blight appeared at Belle Glade about December 6th.

Source of inoculum. Apparently spread from tomatoes just across the road. No attempt to find source of infection in fields infected at a later date.

Spread. Not determined. During the entire season all the growers but one did such a good job of spraying that the disease was hard to find. One man in the spring deal did a pitiful job and finally lost about 75 per cent of his crop. Most of my observations were made in this field.

Environmental factors. Data readily available for Belle Glade only. For eight days before first appearance temperatures had averaged 73.5°F. during the day and 65.3°F. at night for an overall average of 65.3°F.

During this period 1.54 inches of rain fell. In spite of the fact that little rain fell during the 5 December - May period, dews and fogs were apparently heavy enough to provide the necessary moisture for the fungus. In fact it is a rare morning here when there is not a heavy dew. From Townsend's report in Plant Disease Reporter [P.D.R. 31:58, 309. 1947], his verbal reports to me, and my observations this year, it is apparent that the classic conception of temperature as it relates to late blight development and continuation is not quite accurate. Possibly temperatures below an average of 70°F. are necessary for the initiation of infection. Once established, however, the disease spreads around here long after the average temperatures have risen over the 70 mark.

Control. The figures in the table are rough estimates but probably accurate within 10 percent. The percentage figures are based on total acreage rather than on number of growers. The grower number was small and I felt that any figures given on that basis would be misleading.

MATERIALS USED AS DUSTS IN 1948

Control of late blight of potato:

Fungicide	Formula	Percent growers using	Percent applied by Ground Machine	Airplane	Results
Belle Glade					
Dithane	10% Z-78	80	0	100	See note
CuA	7% Cu	10	0	100	" "

Note: Dust applied last three weeks before harvest when grower considered vines too big for spray machine to pass over without excessive wheel damage. Blight appeared following dust application but did not affect total yield appreciably.

MATERIALS USED AS SPRAYS IN 1948

Control of late blight of potato:

Fungicide	Formula	Percent growers using	Percent applied by Ground Machine	Airplane	Results
Belle Glade					
Dithane D-14	2-1-1/2-100	100	100	0	5% loss*

* This loss represents a 75% loss in 160 acres where crop was sprayed improperly.

EVERGLADES EXPERIMENT STATION, UNIVERSITY OF FLORIDA, BELLE GLADE

GAINESVILLE

by George F. Weber

Late blight, Phytophthora infestans (Mont.) de Bary, was prevalent in South Florida and killing tomato plants in extensive commercial plantings on the first of January 1948; also some potato infections were present. The disease of this host was less severe and control, by using Dithane D 14 at less than weekly intervals, was more effective. By the end of January the disease was reported on both hosts in Central Florida in the Gulf Coast and interior areas and in scattered Atlantic coastal regions. Fungicidal applications gave control where intelligently applied.

By the end of February the disease had advanced, or at least appeared on a broad front in north central regions of the state, being prevalent south of a line east and west from St. Augustine - Leesburg - Clearwater, where by March first most tomato plantings were killed and potato plantings showed the disease more or less prevalently except where dusting with copper or dithane spraying had given some control along with dry, warmer weather. Through March the importance of the disease on both hosts was erratic in severity and locality and largely controlled in commercial areas by intensive and extensive spray and dust programs and higher temperatures.

By the middle of April the disease had apparently been seriously hindered in its development by warm weather and had almost ceased to be a factor in south central and east Florida counties. By the first of May the crest of the crop seasons had passed.

UNIVERSITY OF FLORIDA
GAINESVILLE, FLORIDA

HOMESTEAD

by George D. Ruehle

Late blight of potato was first found on December 15th (environmental conditions are discussed under late blight of tomato). The source of inoculum in this field probably was infected seed pieces although the disease was present on tomatoes at the time in the vicinity. Control in commercial fields was very good with the standard Dithane-zinc-sulfate spray applied with ground machines. Losses from late blight were light, with the exception of a few fields where Bordeaux Mixture or one of the fixed copper fungicides was used.

SUB-TROPICAL EXPERIMENT STATION
UNIVERSITY OF FLORIDA
HOMESTEAD, FLORIDA

LATE BLIGHT IN ILLINOIS IN 1948

L. R. Tehon

See report for ILLINOIS under section "Late Blight of Tomato in 1948".

LATE BLIGHT IN INDIANA IN 1948

R. W. Samson

As of September 1, tomato late blight had been reported from or observed in Vanderberg, Warrick, Daviess, Knox, Morgan, Johnson, Hendricks, Madison, Tipton, Tippecanoe, Clinton, Howard, Grant, Henry, and Wells Counties, thus representing all but the extreme southeastern and northern Indiana counties. Potato late blight was on record from Starke, Jasper, Elkhart, and DeKalb Counties in the general muck potato area of the state. In all instances, occurrence of the disease was correlated with the known requisite environmental conditions and heavy foliage growth. No evidence was observed of progressive spread from one area to another. Infection in either potatoes or tomatoes varied from a few, localized quite severe cases to generally very light.

Subsequent to September 1, the disease could be found generally throughout the state in any tomato fields still retaining much foliage after severe early blight infection and in late-maturing home garden potato plantings.

Temperature and rainfall conditions generally varied from somewhat marginal to fiarly favorable for late blight from late June until onset of a high temperature period on August 22. Frequent showers and fairly high humidity levels appeared to be the main factors, plus dense foliage cover in most tomato fields and in all muck potato plantings by late July. Weather conditions again became favorable from about the middle of September until frost on October 17, except in some very local areas that remained quite dry. However, only very late potatoes and tomatoes were subject to damage.

Possible sources of late blight:

No clear-cut indications of sources of late blight infection were observed. The first two severely blighted tomato fields observed were set partly or entirely with early plants out of southern Georgia. However, it is known that blight infection was equally severe in many direct-seeded tomato fields at the same time. As in the previous three seasons the most severe late blight was generally observed in direct-seeded fields and first observed in such fields by canning company officials. This seems clearly related to the dense foliage canopy that develops in such fields by late July or early August.

Late blight tuber infection was present in many home-grown potato seed stocks planted in southern Indiana in March and April and in northern Indiana in May. This infection followed ground-soaking September rains on late-maturing potatoes in the fall of 1947. Planting of such potatoes was rather general in March in southern Indiana, but we failed to find any potato late blight there in late June, contrary to the situation in the previous three Junes. From nineteen to twenty-one consecutive rainless days starting on May 15th may have effectively prevented much spread from any blighted seed that was planted.

Late blight control:

The more progressive growers in the intensive muck potato area of northern Indiana followed a weekly spray schedule, starting in mid-June and continuing until death of vines. Dithane D-14 or Bordeaux, or D-14 until late July and Bordeaux the remainder of the season, were the materials mostly used. These materials and schedules apparently were effective in preventing late blight from gaining a foothold in July and early August. Dry weather throughout the muck area from about August 22 until frost prevented further late blight development.

We noted failure of a weekly Dithane schedule to afford adequate protection of a muck potato field against a heavy spore drift from a severely blighted field immediately to the windward. Heavy applications at 4 day intervals seemed necessary to check the heavy infection resulting from this source.

Tomato spraying was generally of indifferent character. Very few canners and growers applied as many as five sprays, mostly of fixed copper. A few undertook the alternating schedule, and fewer followed it through. Acreages receiving five coppper sprays definitely were less troubled by late blight, but the spraying was insufficient to give much control of early blight. Considerable acreage was dusted from airplanes with very unsatisfactory results. Application of dust with orchard type dusters on several thousand acres gave unsatisfactory results.

Late blight loss estimates:

We estimate tomato late blight to have caused a loss of not more than two per cent. Early blight was far more destructive.

It may be too early to make an estimate of loss from potato late blight because of tuber infection yet to become apparent in very late-maturing plantings [report dated October 18]. Loss owing to vine and foliage destruction has been very small, except in a very few cases. Tuber infection has been almost absent in crops maturing by mid-September or the first of October in the muck areas. This has been owing to lack of drenching, ground-soaking rains. The reverse occurred in the fall of 1947 when heavy rains on rather late-maturing crops resulted in extensive tuber blight. Considerable tuber infection of late-maturing home garden potatoes and July-planted commercial fields in southern Indiana is expected.

DEPARTMENT OF BOTANY AND PLANT PATHOLOGY
PURDUE UNIVERSITY
LAFAYETTE, INDIANA

LATE BLIGHT IN IOWA IN 1948

W. F. Buchholtz

Late blight was first observed on potatoes at Armstrong, Iowa, on July 22nd. The source of inoculum was not known. It was probably traceable to infected tubers and not likely traceable to tomatoes. By August 19th it was found on all muck land potatoes in north central Iowa, from Fertile (Worth County) to Armstrong (Emmet County), Swan City (Kossuth County), and Webb (Clay County). It was found on tomatoes near Columbus Junction (Louisa County) by August 20th.

Disease development was held in check by fairly dry, warm weather during the daylight periods. There were few periods of continuous rainy weather, but periodic, moderate rainfall was obviously conducive to some spread. Regular spraying with Bordeaux was universally practiced by growers of muck land potatoes but not intensively enough to check the local epiphytotics near Armstrong and Swea City. Spread was continuous except for a brief period late in August and early in September when the weather was extremely hot and dry.

Control: Potato growers all use Bordeaux Mixture, applied with 8-row pressure sprayers. Spraying probably held the disease in check and increased potato yields 10-15 per cent under local epiphytotic conditions at Armstrong and Swea City although control there was not entirely successful. Tomato growers near Pella applied one precautionary dust with insoluble copper. No blight development was noted.

Summary:

(1) No active development was traced to tomato transplants.

(2) Spore dispersal must have been involved in spread. Probable sources not determined.

(3) Development later and less active on tomatoes but in warmer part of state and on upland rather than on muck soil locations.

(4) July 22nd is the earliest that late blight has been reported in the state since 1940. This fact is surprising in view of the relatively unfavorable weather during early July. The absence of what is usually considered favorable weather throughout the season made the occurrence of any late blight in Iowa in 1948 somewhat surprising.

(5) Control: Grower practice and control on potatoes has been given above. Experimental control was measured in spray plots at Crystal Lake [table at end of this report].
No control practices (other than copper dusting mentioned above) by commercial growers of tomatoes. There was little or no blight development on tomatoes. No late blight was present in experimental tomato spray plot.

(6) Potato loss estimated at 2 per cent on commercial muck land acreage in northern Iowa. Tomato loss was virtually nil.

CONTROL OF POTATO DISEASES ON IRISH COBBLER POTATOES AT CRYSTAL LAKE, IOWA, IN 1948
SIX SPRAYS EMPLOYED

Fungicide	Percentage defoliation 7/29	8/12	8/24	Yield, U.S. #1 per A. 9/8
Check	27	81	96	311
Bordeaux	9	49	79	377
Tribasic Cu SO_4	16	49	85	425
Copper zinc chromate	23	43	82	405
Zerlate	27	56	82	402
Dithane D 14	18	43	76	428
Dithane Z 78	22	50	78	410
Zinc eth. bis dith.	20	43	76	428
Mn. eth. bis dith.	23	43	79	425

Note: Late and early blights present in moderate amounts.

BOTANY AND PLANT PATHOLOGY SECTION
IOWA STATE COLLEGE
AMES, IOWA

LATE BLIGHT IN MAINE IN 1948

M. T. Hillborn

Late blight has been generally absent in Maine during the 1948 season and no data are available on control measures at present. After visiting most of the commercial plantings of tomatoes in the central and southeastern parts of Maine, I came to the conclusion that late blight was probably at the lowest ebb I have ever seen. I do know that some late blight has been found on potatoes, but in the better commercial fields it has been controlled rather easily and little information can be obtained. Dr. Bonde, of the Experiment Station, has data on the relative effects of newer fungicides when applied to artificially infected plots, but his data will not be available until late in the year when the yields have been obtained and subjected to analysis.

MAINE AGRICULTURAL EXPERIMENT STATION
ORONO, MAINE

LATE BLIGHT IN MARYLAND IN 1948

Carroll E. Cox

See report for MARYLAND under section "Late Blight of Tomato in 1948".

LATE BLIGHT IN MASSACHUSETTS IN 1948

O. C. Boyd

Late blight of potatoes was first reported July 2 at Sheffield, Berkshire County, with potatoes in early bloom. No particulars as to source. Second report: I observed spotty infestation in Worthington, Hampshire County, on July 9 in Green Mountains not yet in bloom. Source undoubtedly blighted volunteer plants. Spotty infestations also in Bristol County during first half of July. Weather more favorable than usual during late May and during June for development of the disease. Did not appear generally over the state, however, until first half of August, and then only as light, scattered infections in gardens and fields. Weather generally warm and dry during August with exception of 2-day rainy period August 12-13.

Following the wet period of August 12 - 13, late blight made its one and only real splurge and that was confined largely to the Connecticut River Valley -- too dry in other parts of the state for appreciable development. The abnormally hot period on August 26 - 28 literally rendered the disease inactive and it remained so during the rest of the season.

Loss - about 5%.

Control:

Fungicide	Formula	Percent growers using	Percent applied by Ground machine	Airplane	Results
Dusts:					
Copper dusts (various)	6 - 7% Cu	5 +	5	Trace	Poor to fair
Sprays:					
Bordeaux	10-5-100	40	40		Good
Neutral Coppers	6 - 7%	15	15		Fair to good
Dithane D-14	2 - 3qt.-100	20	20		Fair to good

EXTENSION SERVICE
MASSACHUSETTS STATE COLLEGE
AMHERST, MASSACHUSETTS

LATE BLIGHT IN MINNESOTA IN 1948

Carl J. Eide

Late blight of potatoes was first found on July 30 two miles east of Mallory, Minnesota. About 1.25 inches of rain had fallen in the previous week, another 1.25 or 1.5 inches on July 30. Heavy mists were present on July 29 and 30 when it wasn't actually raining.

Sources of inoculum: The epidemic in the field near Mallory undoubtedly came from a cull pile. Another cull pile was found later near another heavily infested field a few miles north. No other cull piles were found. It cannot be assumed that the epidemic all over the Valley came from these two cull piles although they were in the center of the worst blight area.

During July 30 to August 3 blight was found scattered in an area about 75 miles long and 25 or less wide, extending from a short distance south of East Grand Forks to north of Kennedy. By August 11 - 17 it was present practically over this enitre area. By September 1 it had killed the vines in many fields, being especially severe around East Grand Forks.

Rainy periods from July 21 to 31 and August 10 and 24 apparently were the weather facotrs that favored the epidemic. July 29 and 30 were misty and windy in addition to having over 1 inch of rain.

Blight developed primarily during the month of August. Some fields were approaching maturity while others matured later. The blight seemed worse on the more mature fields with heavy vines. Much tuber infection occurred in August, the crop loss running from zero to almost 100 per cent in individual fields. The average loss in the area probably won't run over 10 per cent.

Control: Most growers dust with copper dusts plus DDT in July to control insects. A few have sprayers and use copper sprays or one of the carbamates. Casual examination indicated that control in some fields was good but in most it was poor. This is probably owing to the fact that farmers can't get into the fields to spray or dust when the ground is wet. A few planes were used, but data on the efficiency of these applications are not available. The use of mechanical beaters to destroy the vines, dalayed harvest, and dry weather during September are expected to reduce storage decay to a minimum. At present (October 14) no reports of storage decay have been received.

No blight was found in other parts of Minnesota on potatoes except for traces around Duluth and in Lake of the Woods County. This was probably owing to the relatively dry summer in most of Minnesota.

DEPARTMENT OF PLANT PATHOLOGY AND BOTANY
UNIVERSITY OF MINNESOTA
ST. PAUL 1, MINNESOTA

LATE BLIGHT IN NEW HAMPSHIRE IN 1948

M. C. Richards

Late blight on potatoes was first found about July 15 in low-lying fields in central New Hampshire in connection with rains of 1.10 inches and cool nights (47-58°F) at that time. The source of inoculum was from infected plants in the fields. Spread was general but not severe; by the middle of August it was general but not severe even on Houmas which had been well-sprayed.

This has been one of the driest falls on record in New Hampshire. Rainfall as follows at Durham: July 23 - 1.21 inch; July 27 - .52 inch; August 5 - .20 inch; August 12 - 1.14 inch; August 31 - .28; and no rain during the harvest season.

Control: All commercial potato growers in the state use fungicides. In the central and southern part of the state neutral copper dusts are general, while in the northern part Bordeaux Mixture 10-5-100 or stronger is used and neutral coppers 26_ copper 6-8 lbs. per 100.

Loss from this disease was very small this year.

BOTANY DEPARTMENT
AGRICULTURAL EXPERIMENT STATION
UNIVERSITY OF NEW HAMPSHIRE
DURHAM, NEW HAMPSHIRE

LATE BLIGHT IN NEW JERSEY IN 1948

C. M. Haenseler

No extensive potato area was severely affected by blight but individual fields in various parts of the state had losses of 5 to 25 per cent depending on the blight control program used. Practically no losses were experiencedin fields properly sprayed or dusted with ground equipment. Most losses occurred where excessive rainfall prevented timely applications of fungicides, or where uneven distribution of dusts was obtained. This uneven distribution was most conspicuous where fungicides were applied by aircraft. As a whole, airplane treatments gave less effective control than ground application.

The average loss for the state due to potato late blight was probably not over 5 per cent.

DEPARTMENT OF PLANT PATHOLOGY
RUTGERS UNIVERSITY
NEW BRUNSWICK, NEW JERSEY

LATE BLIGHT IN NEW YORK IN 1948

LONG ISLAND

by H. S. Cunningham

General report on weather conditions: Rainfall was approximately normal for the months of June and July. August and September were hot and dry. Rainfall records at Riverhead show the following: August 0.97; September 0.74.

Late blight of potatoes was first found at Orient (Eastern Suffolk County on June 9. This was a small area in a field and consisted of leaf and stem infection. On the whole late blight was general on Long Island and could be found in most fields. It spread rather slowly up to the latter part of July and stopped when the hot, dry weather set in. The disease never was serious in fields where ordinary control measures were followed. In a very few fields the plants were killed early. In these instances control measures were either not used or applications were made after the disease was well-established.

Loss from late blight was practically negligible on the Island.

Our growers are using either Bordo, copper oxychloride sulfate, tribasic copper sulfate, or Dithane as sprays. The two insoluble coppers mentioned are used as dusts. I am not in a position to state which was the more effective this season. Each one has its advocate and under existing conditions each served to keep the disease in control.

NEW YORK STATE AGRICULTURAL EXPERIMENT STATION
RIVERHEAD, LONG ISLAND, NEW YORK

UP-STATE NEW YORK

by K. H. Fernow

First reports of late blight on potatoes were from Long Island June 9th. Spot infections in four fields in different areas. Up-state - Port Byron, July 28th.

Weather conditions were considered extremely favorable for blight throughout May, June, and most of July. August and September were extremely dry with some hot spells and it is thought this was largely responsible for failure of a serious outbreak to occur. For about a week between August 26 and September 2 extremely high temperatures were general.

There is no information as to source of inoculum. Occasional blighted leaves could be found in most fields in western New York in August but the disease never became prevalent except in a very few fields.

Control: In recent years there has been a marked shift of potato growing away from the general farm and towards professional potato growers. These men are mostly well-equipped with spray machinery and do such a good job of protection that, even in years of epiphytotics, losses are moderate. In a year like this losses will be negligible. Little information available as to specific materials or quantities. Most of the upstate growers are using fixed coppers for the early sprays and Bordeaux for the later sprays.

Losses: Certainly not over 1%. Perhaps much less.

NEW YORK STATE AGRICULTURAL EXPERIMENT STATION
ITHACA, NEW YORK

LATE BLIGHT IN NORTH CAROLINA IN 1948

L. W. Nielsen

The 1948 growing season in eastern North Carolina was generally favorable for potato production. The temperatures remained cool and there was a fair distribution of rainfall. Late blight first appeared in Pamlico County, May 16th. At this time the vines were very rank and the tubers were approaching marketable size. The last part of May was generally wet, with frequent showers and cloudy days. During this period an epiphytotic of late blight developed throughout the area.

Harvesting began the first week of June and the yields from early plantings were not appreciably reduced by the disease. In many cases growers harvested in excess of 200 sacks of U. S. #1 potatoes per acre. However, the yield of late planted stocks was appreciably reduced. Some late-planted fields are known to have yielded as low as 80 to 100 sacks per acre.

In general there was little effort made to control the disease. Late blight occurs only rarely in eastern North Carolina and the growers are not equipped to cope with it. One large grower attempted to control the disease by spraying with 6-8-100 Bordeaux Mixture. Two applications of spray were applied to a part of the potato acreage following the initial outbreak on May 16th. The benefits derived from the two spray applications are not known as the crop was nearly mature and no records were kept by the grower. A number of growers tried to control the disease by applying dusts containing 6 or 7% metallic copper. The proprietary compounds used or the benefits are not known. In all cases where sprays or dusts were used, it is doubtful that the materials did much good as the growers were not aware of the thoroughness required in applying fungicides. Coverage was poor and in many cases only a single application was made.

The greatest losses from late blight occurred during harvest. Sporangia from actively sporulating lesions on the foliage inoculated tubers during harvest and, in many cases, serious infection developed during transit. This tuber rot caused some rejections at the terminal markets and many price adjustments. Some growers attempted to control late blight tuber rot by killing the vines with chemicals. One large grower killed the vines with calcium cyanamide 7 to 10 days before harvest. Samples of potatoes were taken from this farm during the harvest period. After a 7-day incubation period the samples were examined and in no case did the amount of late blight tuber rot exceed 1 per cent. Potatoes collected from other farms in the same community were generally affected with tuber rot and in some cases the rot reached 30 to 40 per cent.

The Roto-beater was used to destroy infected vines by some growers in the Elizabeth City section. This machines was used the latter part of June. At this time the maximum air temperatures were in excess of 90°F., and late blight tuber rot did not develop in the samples collected. An evaluation of this practice in controlling late blight tuber rot was not obtained. As a rsult of this year's experience in eastern North Carolina, it appears that the tuber rot phase of late blight in early potatoes can be effective by controlled killing of the vines with a satisfactory chemical a week or ten days before harvest.

PLANT PATHOLOGY SECTION, DEPARTMENT OF BOTANY
NORTH CAROLINA STATE COLLEGE
RALEIGH, NORTH CAROLINA

LATE BLIGHT IN NORTH DAKOTA IN 1948

W. E. Brentzel

Late blight of potato made its first appearance sometime about the 25th or 30th of July. The first outbreak that I learned of came from the northeast corner of the state near the Canadian border. I have no information as to the source of the inoculum. The disease spread very quickly and extensively. I think we are safe in saying that it was quite general in the Red River Valley.

This rapid development appeared to be checked rather quickly, probably owing to dry weather and to the extensive use of fungicides. A variety of materials were used for controlling the blight, most of these being in the form of dust. Quite a few large growers were using sprayers where there was a supply of water and the equipment was available.

We do not have weather data from several important points in the valley. The first report of the blight that I received came from St. Thomas, a small town in Pembina County in the extreme northeast corner of the state. In this section of the state excessive rains fell during the month of July. At Cavalier (according to official weather reports) rain fell on twelve days during the month of July, giving a total of 6.01 inches, 3.37 in excess of normal for this point. Cavalier is located about 20 miles north of St. Thomas. At Pembina a little further north in Pembina County rain fell on 15 days during the month of July, with a total of 10.68 for the month, an excess of 8.27 inches for the month. Of course, the rains were not confined to Pembina County but they were more or less limited to the northeast corner of our state and nearby points in Minnesota and Canada. This excessive rainfall no doubt provided an ideal condition for the development of blight. I do not have weather data for the month of August, but, in general, the month was dry. Also, the development of blight was retarded rather quickly. We have not had any reports of extensive tuber infestation. This probably was owing to dry weather, to the use of fungicides, and to the destruction of vines by mechanical means. There was considerable early digging of potatoes because of blight and some trouble was encountered by growers who dug during warm weather.

And, Dr. W. G. Hoyman comments as follows on the North Dakota blight situation:

Blight was first noticed in Pembina County, North Dakota, during the latter part of July, climatic conditions being favorable for some spread. The source of inoculum was unknown.

Blight spread from Pembina County, North Dakota, and from Polk County, Minnesota, to Walsh, Grand Forks, and Traill Counties in North Dakota and was most prevalent in eastern Walsh County. Weather was favorable for spread the latter part of July and the forepart of August. After that the weather was unfavorable. Host stage was about midseason.

Dusts were most commonly used in North Dakota and probably were not very effective. Copper-containing dusts were most common and applied with ground dusters. There was some airplane dusting. A few growers used Dithane D-14 spray.

Summary: North Dakota had the most late blight on the vines this year of any year on record. The disease was confined to the Red River Valley. Unfavorable climatic conditions, beginning the latter part of August, were responsible for no further infection.

I know of no serious tuber-rot losses in the State but have seen a small percentage of blighted tubers in some fields. It is possible some growers may encounter losses in storage.

NORTH DAKOTA STATE COLLEGE
FARGO, NORTH DAKOTA

LATE BLIGHT IN OHIO IN 1948

J. D. Wilson

Late blight on potato was rather widely spread in Ohio in 1948 but caused comparatively little loss in most instances. It also was checked in many localities by the hot, dry weather of late August. It appeared in potatoes at the Marietta Truck Farm about mid-June and was quite destructive in untreated plots. However, loss in growers' fields in the vicinity was not serious. It was found and reported at various points in Ohio from then on until mid-August but caused comparatively little loss in most fields where it was present. In other words the environmental conditions favoring an epidemic did not exist except in special instances and those were rare. Initial infection did occur in many instances, but either the advanced stage of maturity of Cobblers at the time of initial infections and the high temperatures and low humidities that followed initial infection in later varieties, as well as the fact that potatoes are quite generally sprayed, prevented appreciable loss. A few muck areas did show heavy defoliation in restricted areas of large fields and this has been followed by some tuber rot. As a result, fatal loss from late blight in potatoes probably did not exceed three percent in Ohio in 1948.

Most of the commercial potato acreage and many of those grown in home gardens are sprayed. Some dusting is done but mostly on small plantings or in gardens. Bordeaux is still the most generally used spray in commercial plantings, but it is gradually being replaced by fixed coppers and Dithane. Some Zerlate and Parzate are also used. All of these materials have given good control of late blight with the exception of Zerlate. Airplane dusting or spraying of potatoes is seldom used in Ohio.

OHIO AGRICULTURAL EXPERIMENT STATION
WOOSTER, OHIO

LATE BLIGHT IN PENNSYLVANIA IN 1948

R. S. Kirby
O. D. Burke

Potato late blight was first observed on June 15th at Manheim in Lancaster County and became general over the state within a month after being observed. Cool, wet weather of June to August 23rd favored spread. The hot, dry weather after August 23rd checked the blight and thorough spraying prevented it. The source of most inoculum was seed-borne. A very little may have come in on tomato transplants.

Control:

Sprays and Formulae	Percent Growers using	Percent Ground Sprays	Percent air-plane	Results
Bordeaux 8-4-100	50	100		Very fine
Fixed Copper 2 lbs. actual copper per 100 gallons	25	100		Very good

Continued

Sprays and Formulae	Percent growers using	Percent ground sprays	Percent air-plane	Results
Dithane - 2 qts. D 14 plus 1 lb. zinc sulphate	20	100		) Good -- if periods) between applications) are too long, con-) trol becomes poorer) and poorer.
Parzate - 2 lbs. per 100 gallons	5	100		

Very little dusting in Pennsylvania. Results are usually much below spraying.

Loss for Pennsylvania in 1948 - about 5%. Without spraying loss would have been over three-fourths of the crop. Nearly all potato blight in 1948 came from potato tuber infection. In 1947 the tomato strain carried over on potato tubers and then spread to tomatoes.

PENNSYLVANIA STATE COLLEGE
STATE COLLEGE, PENNSYLVANIA

LATE BLIGHT IN RHODE ISLAND IN 1948

J. B. Rowell

Late blight of potatoes was first found in Newport County on a field of Green Mountain potatoes on June 22. The infestation was estimated to be three days old, probably developing in the rainy period of June 19th. Infections were scattered evenly throughout the field and the source of inoculum was undetermined. Surrounding fields of Katahdin potatoes were free of blight. On June 29 a trace of late blight was found in a field of Green Mountain potatoes in Kingston, Washington County. Volunteer plants from infected hold-over tubers were probably the source of inoculum as severe late blight occurred in this field during the preceding year. However, such plants were not found in a careful search of the field.

After the initial appearance of late blight, it spread throughout the potato-growing areas of the two counties. However, relatively dry weather in July and extremely dry weather in August and September aided tremendously in controlling the disease. Nevertheless, unprotected experimental plots were 95% defoliated by August 9. Only two growers' fields were observed where late blight reached epiphytotic conditions. On July 21 a field in Charlestown, Washington County, was found with

25 per cent late blight. The field was extremely weedy and a poorly arranged spray boom resulted in coverage of only the tops of the plants. The disease was checked when the spray boom was rearranged and the coverage improved. On August 27, during the heat wave, a field was visited in Tuckertown, Washington County, in which 30-40% infection of late blight was present. Fair Bordeaux coverage existed on the plants. Although daytime temperatures were 96-98°F., this infestation had resulted in 60-70% defoliation of the plants by September 10. On that date only a trace of active late blight could be found in the field.

The majority of the growers effectively controlled late blight of potatoes with a 10-5-100 Bordeaux Mixture. Many growers in Newport County use neutral copper dusts and late blight was more prevalent in their fields, with losses of 10-20% from defoliation by early and late blights. The overall loss for the state this year is difficult to assess, probably not amounting to more than 5%. Most fields died back from drought and a Fusarium complex causing foot and root rot, resulting in yields that were 50% of last year's crop.

AGRICULTURAL EXPERIMENT STATION
RHODE ISLAND STATE COLLEGE
KINGSTON, RHODE ISLAND

LATE BLIGHT IN SOUTH CAROLINA IN 1948

William M. Epps

Late blight was first observed on potatoes in Charleston County in South Carolina on April 16, 1948. Within the following week blight was found in two other locations in Charleston County, indicating simultaneous appearance in at least three locations. It was not possible to determine the source of inoculum although blighted tubers were observed in the seed used in the state in 1948 and it is probable that this infected seed served as a source. Spread over most of the potato-growing area of the state occurred very quickly. The weather following was generally dry, however, and the disease never became really serious on potatoes except in certain individual fields.

Potatoes were mostly harvested by June 1 and did not suffer severely. Losses in yield varied from nothing to about 50% on various farms. Total loss was estimated at about 15%. Most of the growers applied fungicide dusts which combined with the weather to keep losses down. About 75% of the potato growers applied fungicides to their crop. A dust containing 6% metallic copper, derived from one of the fixed coppers, was used almost exclusively. An occasional grower used Dithane D-14 spray, Dithane Z-78 dust, fixed copper spray, or Parzate spray or dust. Observations indicated sprays superior to dusts in controlling disease but no significant differences among materials. About 25% of the dust was applied by air, the remainder by ground machines.

SOUTH CAROLINA TRUCK EXPERIMENT STATION
CHARLESTON, SOUTH CAROLINA

LATE BLIGHT IN SOUTH DAKOTA IN 1948

C. M. Nagel

Late blight was first noted August 20 in epiphytotic conditions although it was probably distributed considerably earlier than this date. Conditions were quite favorable much of June and July as we had about normal rainfall. However, the week of August 18 was unusually warm, nearing the 100 mark or above and this perhaps kept late blight somewhat in check. Following this period we again had more favorable temperatures, particularly at night and late blight became quite severe, particularly on tomatoes. In fact our first observation was found on tomatoes in which 100% of the plants were infected and about 25% of the fruit. It was a very active epiphytotic.

On September 1 we examined three fields in the Watertown potato-growing section. This is the center of the potato production area. In these fields virtually every hill had tubers with late blight infection. As a result of this injury secondary soft rot organisms took over and completely rotted about 65% of the potatoes in these hills. This was true for certain areas in the other two fields comprising about 300 acres of certified potatoes. I have been advised in talking with the county agent that about 20% of the potatoes in these three fields were not dug. In general, late blight was apparently disseminated throughout the area as well as in gardens in the eastern counties of the State. The overall damage from late blight would appear to be 5%. This may prove to be low as the storage season develops. In this eastern area about 35,000 acres of potatoes are grown, including table and certified seed stocks. The same area holds for the tomato situation although tomatoes in general are not a commercial venture in this state on a large scale. Late blight on tomatoes was still very active until October 9 when we had our first frost. In areas which were lightly frosted, late blight is still active on the fruit.

We are of the opinion that late blight originated from potato fields. Because our season was rather ideal for late blight since June, weather factors may account for the general distribution of this disease throughout the eastern portion of the state on potatoes and tomatoes although blight was not actually observed until August 20th. We would say that late blight was more destructive on potatoes in the Watertown area, while in Brookings County it was more destructive on tomatoes. However, this may be merely a matter of stage of host development as most of the potatoes were near maturity when late blight was first observed and it is likely much more foliage damage occurred on potatoes than was recognized. By August 20th many potato fields "matured". At least the foliage was dry. Since we did not have time to observe the potato fields prior to this date, it might be assumed late blight was responsible for certain of this killing of the vines.

With regard to control measures, the growers' reports were not too favorable. I have the facts on one area near Watertown in which about 1,600 acres are controlled by one concern which followed a definite spray schedule. However, their reports of the advantages are only fair but this might be owing to the fact that our most common disease in this area is early blight and, as you will note, the predominate spray was zerlate which is not a recommended spray for that disease. In the meantime, late blight became established instead. Further you will note that the potato fungicide report in the Clark area is only fair. This is the second important potato section. This might be owing to the fact that late blight was not as severe in that area; usually early blight is the more important.

MATERIALS USED AS SPRAYS AND DUSTS IN 1948

Control of late blight on potato:

Fungicide	Formula	Percent growers using	Percent applied by* ground machine	Percent applied by* air- plane **	Re- sults**	Acres in- volved
CLARK AREA						
Yellow cuprocide (dust)	30 lbs.	60	50	50	Fair	6000
Yellow cuprocide (spray)	1.5 "	15	100		Fair	1000
WATERTOWN AREA						
Zerlate (spray)	2 lbs.	25	100		Poor to fair	2000
Yellow cuprocide (spray)	1.5 "	10	100			
Dithane D-14 (spray)	4-1-1/2	5	100			

* of the growers applying fungicides as sprays or dusts
** county agent's estimate

Loss on 300 acres of potatoes = 15 - 25 percent. Overall loss = 4 percent

AGRICULTURAL EXPERIMENT STATION
SOUTH DAKOTA STATE COLLEGE
BROOKINGS, SOUTH DAKOTA

LATE BLIGHT IN TENNESSEE IN 1948

E. J. Felix
J. J. Bird

Potato and tomato late blight apparently occurred in Tennessee in 1948 only in the extreme east portion of Middle Tennessee (Cumberland Plateau-Overton County area) and throughout East Tennessee.

Potato late blight first appeared in June in Johnson and Carter Counties, in the extreme eastern portion of the State, where high altitude and heavy rainfall prevail and late blight is said to occur almost every year. Late blight on potatoes appeared in Knox County in August and apparently throughout East Tennessee and to a slight extent on the Cumberland Plateau. Environmental conditions except for the extreme eastern part of the State, were characterized by intermittent periods of hot, dry and cool, wet weather. Loss for the state was insignificant; loss owing to late blight tuber rot in Johnson and Carter Counties - 5%.

UNIVERSITY OF TENNESSEE
KNOXVILLE, TENNESSEE

LATE BLIGHT IN TEXAS IN 1948

WESLACO AREA

by G. H. Godfrey

Late blight on potatoes was first reported March 3rd; general in a field at Bayview, near Los Fresnos. Fungicides applied immediately, generally throughout potato area. Another field near Brownsville also reported with blight. Most of the 12,000 acres free from infection. Later it was determined that light infection was also present at the same time near Raymondville about 50 miles distant. By April 16th there was no further spread. By May 18th, since there were no "effective" rains since February 2nd, blight entirely ceased its activity. Potatoes were mostly harvested. The original field in the Bayview area was damaged in yield by at least 50 percent.

TEXAS AGRICULTURAL EXPERIMENT STATION
WESLACO, TEXAS

YOAKUM AREA

by A. I. Harrison

I have nothing to report on the control of late blight. This disease was not observed in the Yoakum area last spring because of the extremely dry season.

TEXAS AGRICULTURAL EXPERIMENT STATION
YOAKUM, TEXAS

LATE BLIGHT IN VIRGINIA IN 1948

T. J. Nugent

During the week of May 10th to 17th approximately 2 1/2 inches of rain, accompanied by mean temperatures ranging between 67 and 73°F., made conditions favorable for late blight of potatoes in the Norfolk area and around Cape Charles on the Eastern Shore of Virginia. Late blight warnings were given the growers on May 17th. During the week of May 18th to 25th temperatures remained favorable but there was no rain. Late blight began to make its appearance in scattered fields throughout this area around the 22nd to the 24th of May. It was chiefly confined to those fields in which air drainage was poor owing either to windbreaks or low areas.

In some cases the blight apparently became established on certain plants and spread out from these centers of infection. Other instances showed a general sprinkling of infection throughout low areas or near a woods. Volunteer plants were suspected in one field. In the Cape Charles area there was some indication that the initial infections may have originated from infected tomato plants but this condition could not always be correlated. No tomatoes were present in the Norfolk and Princess Anne Counties where late blight was found on potatoes as soon as, or sooner than, on the Shore.

Further spread of this disease was slow until the first part of June when heavy rains made conditions ideal for blight and quite unsatisfactory for control measures to be followed. By June 9th late blight had become quite serious in some fields in the Norfolk and Cape Charles area. Little damage was done to potatoes by late blight in the northern part of Northampton County and Accomac County.

The chief factor in the spread and severity of late blight in this area was the amount of rainfall. In the Norfolk-Cape Charles area the cumulative rainfall line was above (sometimes considerably above) the critical rainfall line as determined by H. T. Cook in his late blight forecasting method. In the Accomac County area the cumulative rainfall line was never above the critical rainfall line. The temperatures averaged about three degrees lower for the Accomac area than for the Norfolk area. /See Fig. 6/.

Practically 100 per cent of the materials used for control of late blight was a form of insoluble copper used as a dust and applied with ground dusters. It is estimated that 75 to 90 per cent of growers attempted control at one stage or the other. Some growers failed to heed the warnings until it was too late for control measures to be of value.

It is impossible to come to any true percentage figure of loss. Some growers lost 100 per cent of their crop but this loss was not always owing to late blight alone. Soft rot was prevalent in fields where wet soil conditions necessitated delay in harvest. A loss owing to late blight of from 5 to 10 per cent is estimated for the Eastern Virginia area as a whole.

VIRGINIA TRUCK EXPERIMENT STATION
NORFOLK 1, VIRGINIA

LATE BLIGHT IN WEST VIRGINIA IN 1948

C. F. Bishop

Most of the contributing factors attendant to late blight of tomatoes apply also to potatoes /see report for WEST VIRGINIA under section "Late Blight of Tomato in 1948"/. Late blight of potatoes was found in Randolph County on June 26th on Irish Cobblers. This disease was found in most of West Virginia at about the same severity as tomato late blight.

Control: (potato late blight)

MATERIALS USED AS DUSTS IN 1948

Fungicide	Formula	Percent growers using	Percent applied by ground machine	Percent applied by airplane	Results
Yellow copper oxide	Met. Cu. 4.8%	20%	100	0	Fair to poor
Tribasic Copper Sulfate	Met. Cu. 7%	20%	100	0	Good
Copper-lime	Copper 20% Lime 80%	5%	100	0	Good

Loss estimated at 15 to 20%.

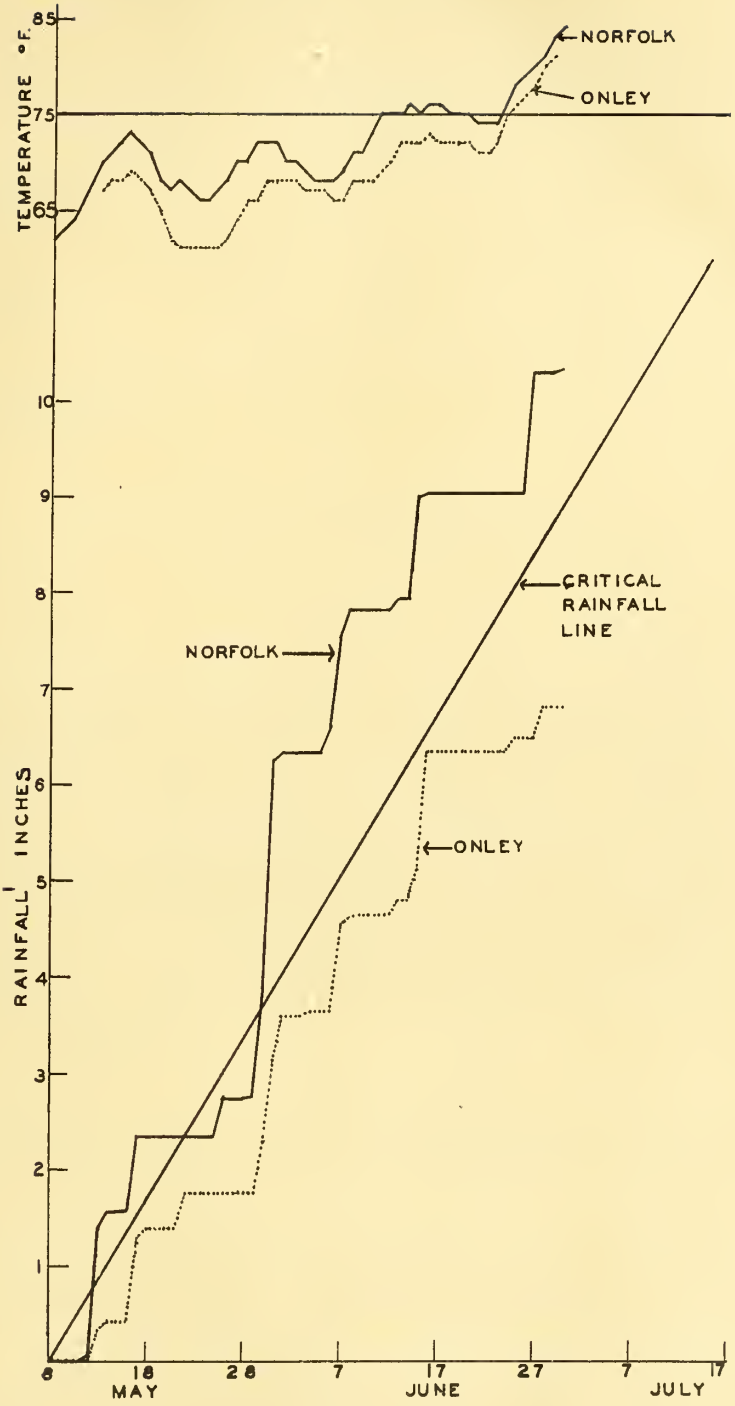

Fig. 6. The cumulative rainfall and temperature conditions in 1948 for Norfolk and Onley, Virginia, compared with conditions considered as critical for Late Blight

MATERIALS USED AS SPRAYS IN 1948

Fungicide	Formula	Percent growers using	Percent applied by Ground machine	airplane	Results
Bordeaux Mixture	4-4-50	70%	100	0	Good
Tribasic Copper (53%)	4#/100 gals.	20%	100	0	Good
Dithane-zinc-lime		1%	100	0	Poor

WEST VIRGINIA UNIVERSITY
MORGANTOWN, WEST VIRGINIA

LATE BLIGHT IN WISCONSIN IN 1948

R. E. Vaughan

Late blight of potato was first observed in Portage County August 3, and in Walworth County August 5. This was at a time of local showers. Soil in the Portage County area is a silt loam, in Walworth a muck. The Portage location was in a small farm field. There was no widespread distribution from this point although foliage infection was found in about ten days in adjacent Marathon County and in Langlade County. There was widespread foliage infection in Walworth County in the muck areas of Turtle Valley where several large potato-growing farms are located. By mid-September late blight was observed generally on farm fields that had received little or no spray protection in northern Wisconsin from Ashland to Marinette Counties. Large commercial fields that had been well sprayed showed no blight.

The source of late blight inoculum is unknown. The most probable source is chance seedlings in the field. Seed dumps were examined frequently in Langlade and Oneida Counties and no blight was found.

The distribution of late blight infection seems to be most dependent on local rains. Since Wisconsin was generally dry and in some sections, notably northwestern Wisconsin, very dry, little late blight occurred.

Dry weather after the first appearance of late blight was a deciding factor in keeping the disease from spreading. Protection of the foliage with a fungicide was also important. Late blight spread most destructively when the vines were wet with rain, dew, or fog, and did not dry off until mid-morning or later. The condition of the plants at the time of greatest spread was full foliage after blossoming.

Control materials used were: Bordeaux Mixture, tribasic copper, copper oxychloride sulfate, Dithane + zinc sulfate + lime, Dithane Z78, and Parzate. The kind of fungicide seemed to be less important than the timeliness and thoroughness of application. The Dithanes and Parzate were more efficient than the coppers in controlling early blight. The growers liked these newer materials because they were easier to make up than Bordeaux Mixture. This is an important point where labor is a factor. Bordeaux still ranks high because many growers have the know-how of making it and are skeptical of trying new materials too extensively. The use of materials was much influenced by the activity of local distributors and state agencies.

The losses from late blight in Wisconsin in 1948 were very minor, a trace would be enough. Even the badly blighted fields in Walworth County yielded over 250 bu. per acre with almost no throw-outs from rot.

AGRICULTURAL EXTENSION SERVICE
UNIVERSITY OF WISCONSIN
MADISON 6, WISCONSIN

FORECASTING LATE BLIGHT FOR THE CHARLESTON, SOUTH CAROLINA, AREA FROM NORFOLK, VIRGINIA

by Harold T. Cook, formerly Plant Pathologist,
Virginia Truck Experiment Station, Norfolk, Va.

Late blight forecasts were made at Norfolk in 1948 for the Charleston, South Carolina, area to see if the forecasting system developed for the Norfolk, Virginia, area would work in other places and to see if accurate forecasts could be made from a distance of several hundred miles. The forecasts were mailed weekly to the Plant Disease Survey Warning Service and to Dr. W. N. Epps, Plant Pathologist of the Truck Experiment Station at Charleston.

The Charleston area was chosen for this test because it had already been the subject of a previous forecasting attempt (Moore 1937) and as a result there was a considerable amount of published data on the occurrence of late blight there. Also, since Dr. Epps would be making regular reports to the Warning Service, it would be possible to compare the forecasts with the observed blight situation.

The April and May weather data from the Charleston Weather Bureau for the years 1917 through 1947 were analyzed and a critical rainfall line developed. The 1948 temperature and rainfall data for Charleston were obtained daily from the Norfolk Weather Bureau and were plotted on the forecasting chart shown in Fig. 7.

The forecasts made by the writer and the actual blight situation as observed by Dr. W. N. Epps and reported to the Plant Disease Survey Warning Service are compared in parallel columns below.

Forecasts made at Norfolk for Charleston	Blight situation reported from Charleston
April 19. "The rainfall during the first week of the critical period (April 10-16) was unfavorable for an epiphytotic. There was only .14 inches for the period ending April 16th and .60 inches would have been necessary to reach the critical	April 20. "Late blight was found on potatoes in Charleston County, South Carolina, today (April 16). Only a few lesions were found in one field. A survey made in several fields on the same and adjacent farms failed to reveal any other infected areas. A more

Moore, W. D. The relation of rainfall to the development of late blight of Irish potatoes in the coastal section of South Carolina. South Carolina Agr. Expt. Sta. Circ. 57:1-6. 1937.

rainfall lines. The temperature varied from 70-73 degrees and would have favored blight if there had been sufficient rain".

April 23. "The rainfall during the second week of the critical period (Apr. 17-23) continued to be unfavorable for a late blight epiphytotic. The .44 of an inch of rain on the 17th was still .1 of an inch below the critical line. There was no rain during the next 6 days and the rainfall line was .7 of an inch below the critical line on the 23rd. Temperatures during the week averaged 65-70°F.

The blight reported by Dr. Epps on the 16th probably resulted from the heavy rains during the first ten days of April which was before the critical period. Some spread may have resulted since the 17th as a result of the rain that day, but lack of rainfall since then is unfavorable for an epiphytotic."

April 30. "Rainfall during the third week of the critical period (April 24-30) continued to be unfavorable for late blight. There was no rain after April 16th until April 29th, when there was .12 of an inch. The rainfall for the critical period in 1948 is now 1.3 inches below the critical line and 1.65 inches less than the same period in 1946. Only one week of the critical period remains. Since two consecutive weeks of favorable weather during the critical period are required for an epiphytotic, it is very unlikely that the disease will cause serious damage this season."

detailed survey will be made within the next few days to determine present distribution and attempt to determine the source of the primary inoculum."

April 27. "During the past week potato late blight has been found in two new locations in Charleston County. A survey made on April 22 on Edisto Island on the same farms where blight was first seen in 1946 and 1947, revealed lesions quite generally distributed over the area and at least one small circular spot where the plants were almost completely dead. Late blight was reported on April 22 by a grower located just west of the city of Charleston. These two new reports, plus the report of last week from Johns Island, indicated the disease is spread over the southern half of Charleston County where most of the State's potatoes are grown. A survey of several farms in Beaufort County failed to reveal any late blight. The weather for the past week has been clear, cool, and dry, and apparently little or no spread has occurred. The many fresh lesions found were initiated during the night of April 15-16 when the last period favorable for spread occurred".

May 4. "The weather for the past week in Charleston County has been unfavorable for the spread of late blight. There has been no rain and no cloudy weather. Early morning visits to the fields where late blight was first found revealed that the lesions are still actively producing spores. No new lesions could be found. Very little, if any, spread has occurred since the rainy period of April 16-17.

Late blight is distributed so widely over the county that a single wet, cool period could cause severe damage. We are recommending regular use of fungicides so that the crop may be protected if such weather should appear."

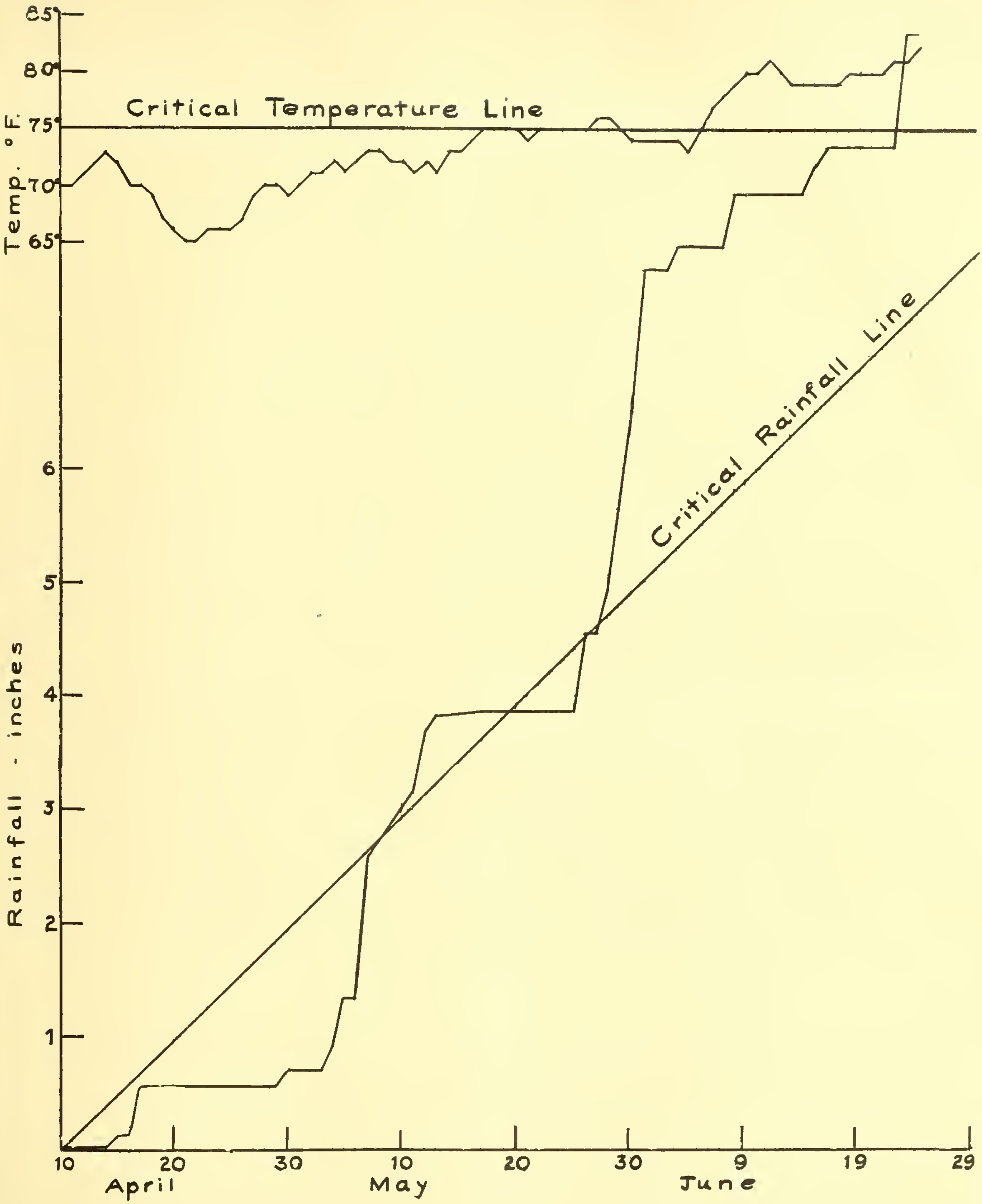

Fig 7. Forecasting Chart for the Charleston, South Carolina, area for 1948

May 12. "Rainfall during the fourth week of the critical period (May 1-7) amounted to 1.87 inches. This brought the rainfall line up to almost in contact with the critical line within a period of four days. The temperature (average for previous 7 days) was 73 on the last day of the week and therefore still favorable for blight.

"Some spread of blight may be expected as a result of the recent heavy rains. However, the blight, if it does develop, will have come too late to have much effect on yield of potatoes this season except in very late plantings. Normally the temperatures should be above 75° F by about May 25th and prevent any great amount of damage by blight during the rest of this season."

May 11. "Late blight on potatoes in South Carolina has still made no visible advance since mid-April. The lesions continue to show some spores each morning, indicating that the weeks of dry weather have not destroyed the fungus in the lesions. Three heavy rains, each accompanied by considerable wind, have fallen within the last four days. Total rainfall for the four days was 2.73 inches. It is still too early to determine the spread that occurred during these rains, but it is anticipated that at least some local spread occurred even if the spread was not sufficient to distribute the disease generally over the county."

No forecasts were issued after May 7 since the analysis of the data for the 30-year period 1917 through 1947 had shown that the critical period was the four weeks from April 10 through May 7.

Although no forecasts were made after May 7, the rainfall and temperature data through June 24 were plotted in Figure 7 to indicate how near correct the last forecast was in regard to the temperatures that were expected to follow. In that forecast temperatures above 75°F. by May 25 were predicted. The chart shows that the temperature was 75° or above (except for one day) from May 17 through May 29. Six days with temperatures 1 or 2 degrees below 75 at the beginning of June favored blight, but the outbreak that resulted was curbed rapidly by temperatures considerably above 75 that followed, even though the rainfall by that time was considerably above the critical line.

The success of the forecasting attempt for the Charleston area may be judged best by comparing the forecasts with the observations of the blight situation reported by Dr. Epps and his final estimate of the relative importance of late blight in 1948 on pages 209, 210 [potato].

The results obtained in 1948 indicate that:

1. The forecasting method may be used at Charleston and other areas where there are sufficient blight records on which to base a critical rainfall line.

2. It is possible to estimate the blight situation from a distance on the basis of the weather reports and a forecasting chart without observing the fields.

LATE BLIGHT ON TOMATO IN 1948

LATE BLIGHT IN ALABAMA IN 1948

Coyt Wilson

There was some late blight on tomatoes in Baldwin County but it did not cause any loss. The disease was not reported on tomatoes outside of Baldwin County.

Dry weather after April 15 appears to have been the limiting factor in late blight development in 1948.

ALABAMA AGRICULTURAL EXPERIMENT STATION
AUBURN, ALABAMA

LATE BLIGHT IN CANADA IN 1948

NOVA SCOTIA

by K. A. Harrison

The tomato crop in Nova Scotia is limited and is largely produced in the Annapolis Valley. Plants are raised locally and planted so as to obtain a maximum yield of "mature green" during September and early October. There is no problem of introducing late blight on the plants.

Late blight developed very much later on tomatoes than on potatoes, and the first infection found was September 7 at the Experimental Station, Kentville, Kings County, on some unsprayed varieties near unsprayed potatoes. It was reported in a number of gardens the next two weeks from from the same district.

All commercial producers do some spraying. Bordeaux 4-3-40 is most generally used against late blight but some of the fixed coppers are used as well. Control was good except where spraying was stopped too early in September. Some growers are having some loss at the present time and what the total loss will be is not known.

Excellent experimental control was obtained with Bordeaux, Basicop, Phygon, and a schedule of Zerlate early and Bordeaux or Basicop late. Deetrox dust was also effective. Applications were at 10 day intervals.

Total of seven sprays employed.

The check plots on September 30 showed 75 per cent infected fruit with sprayed plots completely free.

DOMINION LABORATORY OF PLANT PATHOLOGY
KENTVILLE, NOVA SCOTIA, CANADA

EASTERN ONTARIO

by L. T. Richardson

See report for CANADA - EASTERN ONTARIO under section "Late Blight of Potato in 1948".

ONTARIO

by J. D. MacLachlan

See report for CANADA - ONTARIO under section "Late Blight of Potato in 1948".

QUEBEC

by C. Perrault

Late blight was not observed on tomatoes until the middle of September in Drummond County and toward the end of the month in the vicinity of Quebec City and in the Lower St. Lawrence. Light infections were reported on late harvested tomatoes. However, the disease developed rapidly on green tomatoes once these were brought indoors for hastening maturity. In general, no loss was reported on this crop except in a few isolated cases in the Lower St. Lawrence Valley, where tomatoes are grown on a small scale. In this region, as well as in others, late blight on tomatoes appeared several weeks after it was established in potato fields. Such difference is much more interesting, knowing that tomatoes are not given any protection against the disease.

DOMINION LABORATORY OF PLANT PATHOLOGY,
STE. ANNE DE LA POCATIERE, QUEBEC, CANADA

LATE BLIGHT IN CONNECTICUT IN 1948

Saul Rich

See report for Connecticut under section "Late Blight of Potato in 1948".

LATE BLIGHT IN DELAWARE IN 1948

J. W. Heuberger
R. F. Stevens

Late blight of tomatoes was first found on June 10 at Rising Sun and the next day at Laurel. The source of infection at Rising Sun most likely was wind-blown spores from infected potatoes one mile distant; at Laurel, source of infection was infected, southern-grown plants. Spread of infection was slow in late June and July owing to adverse weather conditions. Wet weather early in August, followed by cool nights and heavy fogs and dews, allowed the disease to develop rapidly at that time and it became destructive in untreated fields. A heat wave the end of August (August 26-31), followed by dry weather in September, stopped further development until the bulk of the crop had been harvested.

It is estimated that 80-90 per cent of the growers used some control measure, most of them using dust. Loss is estimated at 10 per cent of the crop.

Control: See report for DELAWARE under section "Late Blight of Potato in 1948".

AGRICULTURAL EXPERIMENT STATION
UNIVERSITY OF DELAWARE
NEWARK, DELAWARE

LATE BLIGHT IN FLORIDA IN 1948

BELLE GLADE

by David L. Stoddard

Late blight of tomatoes appeared at Belle Glade about December 5th; West Palm Beach about December 20th; Indiantown about December 27th, Ft. Pierce and Stuart about December 31st; and Okeechobee probably the first week in January.

The inoculum was probably air-borne for all except Okeechobee which was so isolated that air-borne inoculum must not have been the source. For other localities no effort was made to find infection source nearby but all are old potato and tomato-growing sections.

Data in the first paragraph indicate northward spread. Belle Glade to Okeechobee by airline about 40 miles, Belle Glade to Indiantown by airline about 20 miles. Impossible to figure if spread to Indiantown, Ft. Pierce, and Okeechobee was up coast from West Palm Beach, from Belle Glade, or both.

Concerning environmental factors, data are readily available for Belle Glade only. For eight days before first appearance temperatures had averaged 73.5°F. during the day and 65.3°F. at night for an overall average of 65.3°F. During this period 1.54 inches of rain fell. In spite of the fact that little rain fell during the 5th December - May period, dews and fogs were apparently heavy enough to provide the necessary moisture for the fungus. In fact, it is a rare morning here when there is not a heavy dew. From Townsend's report in "Plant Disease Reporter", [P.D.R. 31:58, 309. 1947], his verbal reports to me, and my observations this year, it is apparent that the classic conception of temperature as it relates to late blight development and continuation is not quite accurate. Possibly temperatures below an average of 70°F. are necessary for the initiation of infection. Once established, however, the disease spreads around here long after the average temperatures have risen over the 70 mark.

Tomato late blight disappeared from the Belle Glade area by April 9th only to reappear again by April 24th following a drop in temperature which brough averages down to about 71°F. At this time there were no stem lesions, few leaf lesions, but heavy fruit infection. Leaflets died very quickly once infected. This expression of the disease was not typical of its appearance in the winter when stem lesions were common, and leaf and fruit infection was heavy. I have no particular explanation for this unless it might be strain difference. Specimens were sent to Dr. Cox at University of Maryland around April 24th. If he has had time to compare them with "normal" strains, he may have found some difference.

Late blight was noted during the season on plants of all ages.

Control: The figures in the table are rough estimates but probably accurate within 10 percent. The percentage figures are based on total acreage rather than on number of growers. The grower number was small and I felt that any figures given on that basis would be misleading.

Control of late blight on Tomato: [1948]

Fungicide	Formula	Percent growers using	Percent applied by Ground machine	Percent applied by airplane	Results
DUSTS					
Indiantown					
CuA	7% Cu	30	0	100	75% loss

Fungicide	Formula	Percent growers using	Percent applied by Ground machine	airplane	Results
SPRAYS					
Indiantown - experimental					
Dithane D-14	2-1-1/2-100	-	x	-	Good control
Parzate	2-100	-	x	-	" "
Z-78	2-100	-	x	-	90% loss
Indiantown					
CuA	5-100	30	100	0	Good control
Dithane D-14	2-1-1/2-100	30	100	0	" "
Belle Glade - grower					
Dithane D-14	2-1-1/2-100	100	100	0	Good control
Belle Glade - experimental					
Dithane D-14	2-1-1/2-100	-	x	-	Good control
CuA	5-100	-	x	-	60% loss
Okeechobee					
Dithane D-14	2-1-1/2-100	100	100	0	30% loss*

* Spray applied improperly. Represents 90% loss in 100 acres.

EVERGLADES EXPERIMENT STATION
UNIVERSITY OF FLORIDA
BELLE GLADE, FLORIDA

GAINESVILLE

by George F. Weber

See report for FLORIDA - Gainesville under section "Late Blight of Potato in 1948".

HOMESTEAD

by George D. Ruehle

Late blight of tomato was first noticed in Dade County on December 13, 1947 in a roadside tomato seedbed about 7 miles west of Florida City. This seedbed was an estimated 5 miles from other tomatoes and an estimated 9 miles from potato plantings. Weather - long, cool nights attended with heavy dews and ground fogs. Day temperatures moderate. The source of inoculum was unknown.

The period of greatest activity was between December 20 and January 30, with attacks on tomatoes of all ages. It was found in vegetable area east of Homestead on December 15th and well-distributed over the area by December 20. It built up rapidly, reaching a peak in early January, began declining in late January and early February, but sporadic outbreaks continued and were observed as late as April 28th.

In general, the weather during the winter vegetable-growing season is optimal for late blight development. Conditions were such when late blight appeared the past season as is attested by the rapid spread and severity of the disease after its initial appearance. Factors thought to be associated with decline of disease severity: (1) higher temperatures, (2) drier weather, (3) less inoculum (digging of potatoes; tomatoes which were poorly cared for had been abandoned and were dead).

Control: Most commercial growers used Dithane D-14-zinc sulfate-lime. This spray gave excellent disease control where it was applied thoroughly at 4-6 day intervals. Copper sprays and dusting for disease control did not give commercial control when blight was severe and were little used.

The tomato spray plots for the 1947-48 season were abandoned because of drought, salt intrusion, and severe mosaic. No data on late blight control were obtained.

SUB-TROPICAL EXPERIMENT STATION
UNIVERSITY OF FLORIDA
HOMESTEAD, FLORIDA

LATE BLIGHT IN GEORGIA IN 1948

H. I. Borders

In general, environmental conditions during the 1948 season were favorable for infection by the organism and spread of Alternaria blight (*Alternaria solani* (Ell. and Mart.)). Alternaria blight was first observed in the south Georgia plant-growing area about the 15th of April, 1948, and although some Alternaria infection was found in every portion of the plant-growing area during the growing season, there was only a light outbreak for the industry as a whole as compared with incidence of this disease in other years.

About 75 per cent of the tomato plant growers engaged in the production of certified tomato transplants used tribasic copper dust in their fungicide programs, the rest used tribasic copper as a spray. It is understood that quite a number of the growers who dusted during 1948 intend to go back to spraying during the 1949 season.

No late blight, Phytophthora infestans (Mont.) de Bary, infections were found during the 1948 season in spite of diligent searches made by those engaged in research, inspection, plant production, plant buying, and others. This, of course, does not preclude the possibility or probability of the presence of late blight organisms and/or latent infections in the field; in fact, several reports were made of plant shipments arriving at destination showing considerable late blight infection.

GEORGIA COASTAL PLAIN EXPERIMENT STATION
TIFTON, GEORGIA

LATE BLIGHT IN ILLINOIS IN 1948

L. R. Tehon

Late blight on tomatoes was first observed by Mr. Boewe in Illinois on August 26th at Belleville and Collinsville, St. Clair County. The disease probably started during the first week in August. Canning company field men noticed the disease during the second week of August. There was excessive rainfall during the latter part of July and the first part of August in this region, with comparatively cool temperatures, especially at night. The disease spread more extensively and affected more fruit in the Collinsville area where a heavy rain occurred on August 16th than in Belleville where no rain occurred on the 16th.

The source of inoculum is not known. Late blight occurred first in tomato fields which were direct seeded and in fields set with home-grown plants. From there it spread later to fields set with southern-grown plants.

In the Collinsville area where the most rainfall occurred the disease spread to 35 of 80 acres on one farm. At Belleville probably 10 acres of 75 were heavily affected. It was also observed in staked tomatoes growing in shade in a garden near Belleville. Field men of the Suppinger

Canning Company thought the disease might be present at Waterloo, Monroe County, since weather there was similar to that at Belleville, but they have no positive report of its presence. The disease was present in some farmer's fields but we do not know the extent of infection.

During the first part of August there was an abundance of rainfall and temperatures were rather cool, especially at night. Then it turned hot and dry and the disease ceased its spread and apparently died out.

Late blight spread most just before the fruit began to ripen, probably from August 5 to August 20.

We do not think any control measures were used by any commercial growers.

Loss was limited to two areas in the state so far as we know. The loss probably was not over 10% in the affected fields. For the state, much less than 1%.

Summary: There probably was no active development from introduced tomato transplants in 1948 as infection seemed to appear first on home-grown plants.

The role of spore showers is not known. The source of infection is not known unless the disease were seed-borne.

No late blight was observed on potatoes.

No control program was used so far as we know.

We estimate the loss in tomatoes for the state as not to exceed .5%. Actually the loss occurred in two fairly localized areas, the Belleville-Collinsville area in St. Clair County, where we estimate the loss locally not to exceed 5%, and in an area in Warren County where again we estimate the local loss not to exceed 5%.

* * * *

Dr. M. B. Linn, in a letter dated October 19th, comments as follows:

"In Ogle County loss owing to late blight was estimated at 30 per cent in a late-planted five acre field of Garden State. This will not change the loss for the state as a whole but I thought the incidence was worth recording. I do not have a record of the date of the above infection." [From Agricultural Experiment Station, Urbana, Ill.]

STATE NATURAL HISTORY SURVEY DIVISION
URBANA, ILLINOIS

LATE BLIGHT IN INDIANA IN 1948

R. W. Samson

See report for INDIANA under section "Late Blight of Potato in 1948".

LATE BLIGHT IN IOWA IN 1948

W. F. Buchholtz

See report for IOWA under section "Late Blight of Potato in 1948".

LATE BLIGHT IN KENTUCKY IN 1948

W. D. Valleau

Tomato late blight was reported July 17, 1948 from Jefferson and Jackson Counties. The source of inoculum was not known.

So far as I know spread did not occur or was extremely slow because of dry weather. We had no further reports.

UNIVERSITY OF KENTUCKY
LEXINGTON 29, KENTUCKY

LATE BLIGHT IN MAINE IN 1948

M. T. Hillborn

See report for MAINE under section "Late Blight of Potato in 1948".

LATE BLIGHT IN MARYLAND IN 1948

C. E. Cox

Precipitation was above normal in Maryland from March through June. Rainfall in May was 0.03 inches below the all time record of May, 1924. During May temperature and hours of sunshine were below normal and cloudiness and relative humidity were above normal.

Late blight was first observed this season on June 3rd on tomatoes in Somerset County and on potatoes in Worcester County. This was 3 days earlier than in 1946. The next day late blight was found on tomatoes in Wicomico County and on June 7 in Dorchester County. In each case the infected tomato fields were among the earliest fields planted in their respective communities. Stem lesions on the tomatoes indicated long standing infection and suggested that the plants may have been infected when brought into maryland from the South. Circumstances surrounding the first observed infection in potatoes suggested that the pathogen had overwintered in home-grown seed potatoes.

The month of June was the wettest such month in ten years. Late blight spread rapidly. By mid-June late blight was almost universally distributed on the lower Eastern Shore and rather general over the lower two-thirds of the Shore. Fruit rotting was serious in some fields and a few fields were abandoned and plowed under. Wet weather prevented the use of ground equipment in the southern counties but much of the infected tomato and potato acreage there was dusted regularly by airplane. In the northern part of the area ground equipment was used more generally. Fungicides held the disease in check and with the advent of higher temperatures and lower relative humidities in early July, late blight became relatively inactive on the Eastern Shore. Following heavy rains in August blight became active again but was responsible for a smaller portion of the reduced yields than was flood damage and the Septoria leaf spot which became very destructive at that time.

Late blight appeared later in the season and did comparatively little damage in the northern counties of the Eastern Shore.

West of the Bay late blight was first observed on June 23 in Anne Arundel County. During the next two weeks it was observed in Harford, Baltimore, Montgomery, Prince Georges, and Garrett Counties but was confined to localized areas until after mid-July. The week of July 19 to 25 was one of high relative humidity with showers almost every day over Western Maryland. During that week blight was very active, spread rapidly, and was first found in Carroll and Washington Counties. The disease soon became generally distributed from Harford County westward through Washington County and remained active throughout the season. Many untreated fields in this area were almost a total loss while yields in treated fields were in general in proportion to the degree of blight control obtained by use of fungicides.

Late blight was more serious this year than in 1947 but less destructive than in 1946. On the Eastern Shore late blight caused an estimated loss of 20% of the potential yield while west of the bay the estimated loss was 40% of the potential yield.

The extent to which fungicides were applied varied greatly in different parts of the State, but a larger percentage of the acreage was treated this year than in 1947. Results obtained by following a regular schedule of application were superior to those obtained by growers who resorted to use of fungicides only after the disease appeared.

The majority of the treated acreage was dusted; exceptions occurring in Washington, Montgomery, and Howard Counties where spraying exceeded dusting. In the latter county a large part of the acreage was treated regularly by a custom spray operator. Dusting gave good results where applied in time and on a proper schedule. Airplanes were used extensively on the lower Eastern Shore but not elsewhere.

Fixed coppers were the most widely used fungicides. They gave excellent results when applied on a regular schedule. Two applications of Zerlate followed by three or more applications of fixed copper gave good results generally and especially in Carroll County where anthracnose is a problem. Bordeaux Mixture (8-8-100) as a spray was more effective than fixed copper as a spray or dust in salvaging fields in which late blight had become established before any fungicide was applied. Dithane was used to a limited extent with good results.

Wider spacing of plants to facilitate application of fungicides is becoming more generally adopted. Over half of the commercial acreage was so planted this year, up to 90% in some areas, and indications are that the practice will be more extensively used next year.

The average cost of applying fungicides to tomatoes in Maryland seems to be about five dollars per application per acre. Thus, the per acre cost of an adequate program of protection through the season would be roughly equivalent to the value of one ton of tomatoes. Many growers and canners are of the opinion that the cost is more than offset by increased yield and improved quality even in the absence of late blight. Some canners are undertaking to apply fungicides to their contracted acreage on a cost basis.

UNIVERSITY OF MARYLAND
COLLEGE PARK, MARYLAND

LATE BLIGHT IN MASSACHUSETTS IN 1948

O. C. Boyd

The first report of late blight on tomatoes was on August 19th in Hampden County and Plymouth County. In Plymouth County the grower first observed it about August 15th where the disease undoubtedly was introduced on plants from Virginia. Source in Hampden County in all probability from neighborhood blighted potato field. The disease, as on potatoes, went through only one pronounced period of development immediately following the wet period on August 12 - 13. This development was not widespread and extensive but limited to localized unprotected gardens and fields mostly in the Connecticut River Valley. The hot period of August 26-28 stopped the disease "cold" as it did the corresponding disease on potatoes.

All infestations I observed, except the one in Plymouth County, appeared to represent local origin from blighted potatoes; and in most of those cases, the fungus appeared to be in the transitory stage between the potato strain and the typical, virulent tomato strain -- not very destructive or highly sporulating on tomatoes

Loss - a trace.

Control: (of late blight of tomato)

MATERIALS USED AS DUSTS IN 1948

Fungicide	Formula	Percent growers using	Percent applied by Ground machine	Airplane	Results
Neutral coppers (various brands)	6-7% Cu	10	10		Good

Disease not rampant - easy to control.

MATERIALS USED AS SPRAYS IN 1948

Fungicide	Formula	Percent growers using	Percent applied by Ground machine	Airplane	Results
Bordeaux	4-4-50	40	40		Good
Neutral coppers	Direction of mgfr.	40	4L		Good

Disease not widespread - easy to control

EXTENSION SERVICE
MASSACHUSETTS STATE COLLEGE
AMHERST, MASSACHUSETTS

LATE BLIGHT IN MICHIGAN IN 1948

M. C. Strong

Nineteen forty-eight was an excellent tomato season in this state and large yields were reported, 12 to 15 tons per acre on the sand in southwestern Michigan and 15 to 25 tons per acre on the heavier soil ...

southeastern region. No late blight appeared in the southwestern area. In the southeastern tomato-growing region, late blight started on the leaves in the early part of September in some fields but was quickly checked by a period of hot weather. However, the fungus remained viable on the fruit and, with the advent of cooler weather, started sporulating on the fruit about September 20th, subsequently causing slight losses - not over 1 or 2 per cent of the crop. In two untreated fields the loss was about 80 per cent of the expected yield but these fields represented only about 2 per cent of the total acreage of that region. The source of the initial infection is not certain but I do not believe the disease was brought into the state on southern-grown plants. The plants from the south this year were about the best I have ever seen.

According to the State Bureau of Agricultural Economics 7,400 acres of tomatoes for processing were grown in Michigan this year. Of that acreage 4,100 acres were contracted by seven major canning companies. At a minimum cost to the grower five of these processing companies take care of applying any fungicidal treatment used for those growers who wish this service. The other two companies leave it to the grower to apply his own fungicidal treatments, but they had accurate information on the acreages involved, material used, etc. I have contacted the managers and field men of these companies whom I know can be depended on for accurate information and whom I am sure are familiar with late blight. On the basis of their reports to me I can make an accurate report on 4,100 acres of tomatoes.

For the rest of the Michigan tomato acreage, which represents market garden (7,400 acres) and small local canning acreage (3,300 acres), I have consulted with the county agricultural agents of the principal counties involved. They say only about 25 per cent of their growers use any fungicidal treatment on tomatoes. In southwestern Michigan, which is a fruit region, the growers who do apply fungicidal treatments use a spray because they have spray equipment. The material used is whatever they have on hand to spray fruit. Probably 50 per cent use Bordeaux. In the southeast counties most growers who treat tomatoes dust them with an alternating insoluble copper-zerlate schedule. A few used a dithane dust. No accurate information was available.

The following report compiled from the information furnished by seven major canning companies is on an acreage basis which, in my opinion, is more valuable than the percentage of growers using this or that treatment:

Company total tomato acreage	Acreage treated	Material used	Method of application	Results
1600	100	Dithane	Spray	Failed to control late blight unless applied at 5-day intervals
	300	Tribasic copper	Spray	Controlled blight when applied 7- to 10-day intervals
	500	"	Aeroplane dusted	Controlled blight
	200	"	Ground dusted	Controlled blight
1000	250	Bordeaux	Spray	No late blight present
	125	Zerlate	"	" " " "
	125	Fixed copper	"	" " " "
400	150	Dithane	Ground dusted	Late blight either negligible or control good
	50	Fixed copper	" "	
300	300	None		No late blight present
300	150	Alternating Zerlate and Cuprocide	Ground dusted	Slight late blight
250	200	Tribasic Copper	Ground dusted	Slight late blight, control good
250	150	Tribasic copper	Ground dusted	Late blight control good

MICHGIAN STATE COLLEGE
EAST LANSING, MICHIGAN

LATE BLIGHT IN MINNESOTA IN 1948

Carl J. Eide

No blight was reported on tomatoes except for a single specimen from Bemidji received in late September.

DEPARTMENT OF BOTANY AND PLANT PATHOLOGY
UNIVERSITY OF MINNESOTA
ST. PAUL 1, MINNESOTA

LATE BLIGHT IN MISSISSIPPI IN 1948

Douglas F. Bain

This report is restricted to the Crystal Springs (Copiah, Lincoln, and Hinds Counties) area and is not to be considered for the state as a whole.

The disease was first noticed in a field of Rutgers tomatoes a few miles northwest of Crystal Springs on May 11. The weather had been fairly dry, but not unduly so, with daily temperatures around 80° and nightly temperatures between 50°-60° - dews were heavy. There is no doubt that the disease came in on these plants from Texas. Almost simultaneously late blight showed up in fields in other parts of Copiah County as well as in Hinds County. These fields were set with plants shipped in from Texas, Florida, and Georgia (?). Fields set with home-grown plants were free of the disease at this early date. However, in instances where different parts of fields were set with out-of-state and home-grown plants, the disease spread into sections of local plants within about three weeks. Evidence indicated that the fungus was spread by growers. Hot, dry weather and warm, dewless nights set in shortly after late blight was found, consequently spread was not rapid. Copper A Compound was recommended as a spray and dust, but more dust was used because growers were not equipped for power spraying. It was difficult to tell just how effective the material was in most cases because weather conditions undoubtedly reduced spread considerably. Incidentally, spray was applied by small knapsack sprayers (this method was discouraged in favor of dusting) and dust was applied with rotary hand dusters. It is difficult to tell how many growers used control measures because such recommendations were not always followed through. However, figures given by local merchants show that over 800 pounds of Copper A *per se* were sold during the early tomato season. Little as this is, the writer is very much encouraged because prior to a year ago, no control measures had been used by the growers at all.

Spread of late blight from transplants was rapid at the time the disease was first found - there were diseased fruits, and the stem cankers were restricted to those plant which acted as a source for secondary infection. So far as the writer knows, the disease did not spread to potatoes - no late blight was found in potatoes in this area. Late blight this year was much more widespread than last year, and appeared in a dozen or more widely scattered fields almost simultaneously.

Loss, in general, cannot be estimated; however, it was not considered great except in a known dozen or so fields (averaging 4-5 acres) where over half the acreage was plowed under - over 50% loss to the growers concerned but less than an estimated 2% for the crop as a whole.

TRUCK CROPS BRANCH EXPERIMENT STATION
CRYSTAL SPRINGS, MISSISSIPPI

LATE BLIGHT IN NEW HAMPSHIRE IN 1948

M. C. Richards

We have few commercial tomato growers but all of them dust with neutral copper dusts. No losses were encountered by these growers. A few home gardeners sustained slight losses up to 10 per cent where no control measures were applied.

BOTANY DEPARTMENT
AGRICULTURAL EXPERIMENT STATION
UNIVERSITY OF NEW HAMPSHIRE
DURHAM, NEW HAMPSHIRE

LATE BLIGHT IN NEW JERSEY IN 1948

C. M. Haenseler

Average state losses owing to late blight of tomatoes are extremely difficult to estimate. The disease was probably somewhat more severe than in 1947 but losses were less than in 1946. Heaviest losses occurred in the central and in localized areas of the southern part of the state. A few fields were almost completely destroyed but in many other fields where blight broke out early in the season on both the stems and foliage the disease was arrested sufficiently by fungicides and favorable weather so that satisfactory yields were obtained in most cases.

In the southern portion of the state the losses were estimated at about 10 per cent. The northern half of the state likewise fared rather well and losses here were also fairly light. In the more central counties, on the other hand, there were certain areas where blight was very severe. Here heavy losses occurred on fields that were not adequately protected with fungicides. Since the central counties have a large tomato acreage, the prevalence of blight in this area probably raises the average state loss to something like 15 per cent.

There were many cases where blight was rather severe on foliage without affecting a large percentage of the fruits. The effect of the foliage blight on yield and fruit quality in the fields when the fruits largely escaped infection cannot be estimated so there may have been some losses owing to blight which were not readily determined.

Fungicides were used almost universally on tomatoes this year. Probably over 90 per cent of the canhouse acreage received a fungicide treatment at some time. It is believed, however, that not over 25 per cent of this treated acreage was sprayed or dusted frequently enough or thoroughly enough to give perfect blight control.

Without exception growers who did a good job of spraying or dusting with ground equipment held the disease in check and were satisfied with the results. Airplane dusting, on the other hand, proved satisfactory in some cases but failed completely in many others.

DEPARTMENT OF PLANT PATHOLOGY
RUTGERS UNIVERSITY
NEW BRUNSWICK, NEW JERSEY

LATE BLIGHT IN NEW YORK IN 1948

LONG ISLAND

by H. S. Cunningham

General report on weather conditions: Rainfall was approximately normal for the months of June and July. August and September were hot and dry. Rainfall records at Riverhead show the following: August 0.97; September 0.74.

Tomato late blight was first found at Medford (Western Suffolk County) on August 14th. Found at Riverhead a week later. These were isolated infections and, with the exception of the Medford field, confined to the fruit for the most part. No spread was noted from these infected areas.

No rain fell in the Riverhead area until the 10th of September and that was very light. Heavy dews occurred at times but conditions on the whole were unfavorable for the spread of blight.

Precipitation in western Suffolk was somewhat heavier, especially in local areas.

Where control measures were used the growers applied either Bordo, Tribasic copper, or Dithane as sprays. Where dust was used, it was largely tribasic. Disease incidence was so light that the value of any of these is problematical.

Loss from late blight on tomatoes was virtually zero.

NEW YORK STATE AGRICULTURAL EXPERIMENT STATION
RIVERHEAD, LONG ISLAND, NEW YORK

UP-STATE NEW YORK

by K. H. Fernow

Late blight on tomatoes was first reported on May 17th on southern-grown plants transplanted to greenhouse in Orange County. No information is available to indicate any marked spread of the disease to tomatoes or potatoes. Could be found in tomato plantings towards the end of August but no reports of damage. No observations on spore showers. Weather unfavorable for epiphytotic. Consequently no information on control. Losses negligible.

[See report for UP-STATE NEW YORK under section "Late Blight of Potato in 1948" for discussion of the season's weather conditions.]

NEW YORK STATE AGRICULTURAL EXPERIMENT STATION
ITHACA, NEW YORK

NORTHWESTERN NEW YORK STATE CANNING COUNTIES

by Otto A. Reinking

Late blight of tomato was first noted on August 27, 1948 in Wayne County. It was found on tomatoes in strips in field where spray booms failed to overlap. The source of the inoculum was not known.

The disease was later found in other parts of Wayne County and in Monroe and Ontario Counties in fields not sprayed. On September 24, 1948 it was noted in Brockport, Monroe County, in an unsprayed field. It had been there from the middle of September. October 12, 1948 - no spread into sprayed portion of field throughout rest of season in field reported to have the disease on August 27th in Wayne County.

In Wayne, Ontario, and Monroe Counties, where rainfall was more plentiful during the tomato season, the disease was only observed in non-sprayed fields. Spraying without a doubt kept down spread. Yields were high in these counties. No disease was reported in Orleans, Niagara, or Erie Counties. It was very dry in these counties during the growing season, yields were low and blossom end rot bad. Lack of tomato late blight could have been owing to the dry season. In those counties where blight was found it came late, starting in on August 27, 1948, with most disease reported from the middle of September. Spread apparently was slight and slow.

Control: Practically all control was done by spraying. Little airplane dusting, possibly not over 10 acres in the commercial canning areas. Some ground dusting was done but very little. The most common spray used was that receommended by the New York State Agricultural Experiment Station, the zerlate-bordeaux schedule. This spray was that recommended for control of all tomato diseases and not only the late blight. Schedule and formula as follows:

Zerlate	2 lbs. to 1CO gallons water
Zerlate	2 lbs. to 1CO gallons water
Bordeaux	8-4-100
Zerlate	2 lbs. to 10C gallons water
Bordeaux	8-4-100

One or the other of the following insoluble coppers was used throughout the season to some extent: COCS, Compound A, Microgel, or Tennessee Tribasic. Effective control of late blight was produced.

Dusts used: One or the other of the above insoluble copper dusts with 7 per cent metallic copper content. From 40 to 60 lbs. per acre applied. Some dusted with 10 per cent zerlate, along with insoluble coppers. Forty to sixty lbs. of each applied per acre.

Loss or importance: Late blight of tomatoes in the canning areas of northwestern New York State was about as important as during the years 1943-44-45. The disease was late in occurrence and only developed in unsprayed plots. It was primarily confined to Wayne, Monroe, and Ontario Counties, possibly 2 per cent loss occurring in the unsprayed fields. The other tomato counties further west along the lake shores had a dry season with no disease reported.

NEW YORK STATE AGRICULTURAL EXPERIMENT STATION
GENEVA, NEW YORK

LATE BLIGHT IN NORTH CAROLINA IN 1948

D. E. Ellis

Our commercial tomato acreage is very small and is limited largely to the Coastal Plains area, probably because late blight is so frequently a serious factor in the mountain area. Late blight was present in several eastern counties in June but the overall damage was probably quite low. I visited two or three small plantings which were from 50 to 90 per cent losses owing to the disease but, in general, most plantings were sufficiently late to escape serious damage. In Carteret County one canning company contracted for about 1,700 acres of tomatoes and all of their dusting was done by plane. This explains the 90% figure under airplane dusting in the table given below. Late blight, however, was not an important factor in this county, and I don't have any detailed record of the effectiveness of dusting in control of other foliage diseases.

In the mountain area late blight caused from 50 to 95 per cent losses in home garden plantings. Many growers dusted or sprayed with very good results but here, again, the estimates are purely guesses. I just had a report [middle October] from Cleveland, North Carolina, in the upper Piedmont of one grower who lost a one-half acre fall planting of tomatoes owing to late blight. He sprayed one or more times with Bordeaux Mixture but apparently it did little good.

Control:

Fungicide	Formula	Percent growers using	Percent applied by Ground machine	Airplane	Results
DUSTS					
Commercial:					
Fixed coppers	6 to 7%	50	10	90	Fair
Home Gardens:	metallic cu.				
Fixed coppers	" "	5	100	0	Good
SPRAYS					
Commercial:	1-2 lbs.				
Fixed coppers	metallic cu. per 100 gal.	0.1	100	0	Good
Home Gardens:					
Fixed coppers	" " "	2	100	0	Good

PLANT PATHOLOGY SECTION, DEPARTMENT OF BOTANY
NORTH CAROLINA STATE COLLEGE
RALEIGH, NORTH CAROLINA

LATE BLIGHT IN NORTH DAKOTA IN 1948

W. E. Brentzel

There was no development of late blight of tomatoes reported in this state. This disease did not appear on the Experiment Station grounds and our extension pathologist, Dr. Butcher, saw no outbreaks anywhere in the state nor heard of any. So I am concluding that late blight did not develop in tomatoes this year. Of course, in this connection, there is always a possibility of the disease having developed in some scattered areas without attracting our attention.

NORTH DAKOTA STATE COLLEGE
FARGO, NORTH DAKOTA

LATE BLIGHT IN OHIO IN 1948

J. D. Wilson

Late blight was reported first on tomatoes in Southern Ohio about May 1 where it came in on southern plants. It appeared in ground tomatoes at Marietta about July 10 and at intervals thereafter west of Columbus and then north to Lake Erie. Specimens came in from the vicinity of Wooster as early as August 1. The disease was widely spread throughout northwestern Ohio in fields of canning tomatoes by mid-August and would probably have been very destructive had not about fifteen days of dry and really hot weather occurred during the last half of August.

Most of the affected acreage was dusted two or three times with fixed copper or Zerlate, or both in an alternating schedule, the Zerlate being used to check anthracnose fruit rot which is usually, and was this year, quite serious in Ohio, especially on sandy soils. Most of the dusted acreage was treated by airplane. Perhaps 30 per cent of the canning acreage was dusted by one method or another, but the operation was discontinued after a few days of hot, dry weather had checked the further development of late blight.

A comparatively small percentage of the total acreage was sprayed (possibly 5%) and then mostly with Bordeaux which was applied in a desperation effort to check late blight in the few fields where it was causing loss before August 20. Fixed coppers were quite generally used as sprays or dusts in home gardens and loss from late blight was inconsequential. However, the disease did cause a considerable loss in untreated gardens in some portions of the state. Total loss from

late blight in tomatoes in Ohio probably did not exceed 2 percent in 1948.
OHIO AGRICULTURAL EXPERIMENT STATION, WOOSTER

LATE BLIGHT IN PENNSYLVANIA IN 1948

R. S. Kirby

Tomato late blight was first observed on May 11, 1948, in greenhouse. All plants were destroyed and no further spread found. It was found in the field on June 20th at Yardley, Bucks County, Pennsylvania.

Most inoculum came into the State on transplants in 1948. In 1947 most came from infected potatoes. In 1946 it came from infected transplants.

In the first field blight spread rapidly over the entire field and it became general over the state within three or four weeks. Cool, wet weather of June to August 23rd favored spread. Hot weather of August 25th to 27th checked blight and dry weather of August 25 to October 1 held it in check. In cool, wet weather of October, blight again became active.

Control:

Fungicide and Formula	Percent growers using	Percent applied by Ground machine	Percent applied by Air-plane	Results
SPRAY				
Zerlate 2 lbs. per 100 in 2 to 3 sprays, plus copper (either 2 lb. actual copper as Fixed Copper per 100 or 6-3-100 Bordo	85	100		Late blight: good+ Early blight: good Anthracnose: good
Dithane - 2 qts. D 14 + 1 lb. zinc sulphate or Parzate - 2 lbs.	10	100		Late blight: nearly as good as Zerlate-copper when applied often enough Early blight: good Anthracnose: good
DUSTS				
Zerlate dusts plus copper dusts	5	5		Late blight: medium Early blight: medium Anthracnose: medium

Loss in Pennsylvania in 1948 - 10%. Without spraying or dusting loss would have been at least 35%. Heaviest loss in south central - least in central.

Summary: When wet, cool weather occurs after infected tomato transplants are set in the field, the late blight fungus spreads rapidly and kills out the plants. Many acres have been killed out this way in 1946 and 1948. Again, the blight fungus lives on the tomato plants until favorable conditions occur when it spread to leaves, stems, and fruit. Infected transplants introduce the tomato strain which becomes destructive on tomatoes as soon as favorable weather occurs.

In 1948 the first blight found on potatoes (June 15th - Manheim) was the potato strain. This was able to make only small dark, almost non-fruiting, spots on a few lower leaves of tomatoes growing next to the potato field.

Blight found this year seemed to fit quite close to normal. It may be able to grow at slightly higher temperatures.

PENNSYLVANIA STATE COLLEGE
STATE COLLEGE, PENNSYLVANIA

LATE BLIGHT IN RHODE ISLAND IN 1948

J. B. Rowell

A trace of late blight of tomato was observed on August 16th in Kingston, Washington County. This did not increase and no further infestations of the disease were observed in this state.

AGRICULTURAL EXPERIMENT STATION
RHODE ISLAND STATE COLLEGE
KINGSTON, RHODE ISLAND

LATE BLIGHT IN SOUTH CAROLINA IN 1948

William M. Epps

Tomato late blight was first observed in Charleston County on May 11th. It was obvious that it spread to tomatoes from potatoes during the wet weather of May 3-6. Little loss occurred until the general rains of May 28-31. After June 1 the weather was generally favorable for blight development and little further spread occurred. Harvest began about June 1-10.

Tomatoes in Charleston and Beaufort Counties suffered only where no fungicide had been used. Unprotected fields lost heavily. In Orangeburg and other inland counties blight caused some defoliation and some losses owing to fruit rot. Tomatoes represent a secondary crop on farms in these inland counties. Few of the growers are equipped for fungicide applications and only a small percentage of the tomato crop is normally protected. The growers along the coast, on the other hand, dust or spray regularly. For the state as a whole probably 30% of the crop received fungicide application, about 5% by sprayer and the remainder by duster.. Sprays used more Dithane D-14 and fixed copper. Dusts used were almost exclusively fixed copper with some small acreage of Dithane Z-78. All proved effective. Losses probably amounted to about 20% for the state as a whole but varied greatly from farm to farm with almost complete crop failures on coastal farms where no fungicide was used and very little loss where a fungicide was applied.

Late blight did not appear in summer or fall tomato crops.

SOUTH CAROLINA TRUCK EXPERIMENT STATION
CHARLESTON, SOUTH CAROLINA

LATE BLIGHT IN SOUTH DAKOTA IN 1948

C. M. Nagel

See report for SOUTH DAKOTA under section "Late Blight of Potato in 1948".

LATE BLIGHT IN TENNESSEE IN 1948

E. L. Felix
J. J. Bird

Tomato late blight first appeared in June or early July in East Tennessee where it became widely distributed but caused little loss. Loss for the state - trace; loss on 60-70 acres in Overton County from late blight rot and defoliation 5-10%.

UNIVERSITY OF TENNESSEE
KNOXVILLE, TENNESSEE

LATE BLIGHT IN TEXAS IN 1948

G. H. Godfrey

No blight found throughout the season on tomatoes.

TEXAS AGRICULTURAL EXPERIMENT STATION
WESLACO, TEXAS

LATE BLIGHT IN VIRGINIA IN 1948

BLACKSBURG

by S. A. Wingard, R. G. Henderson, and S. B. Fenne

In eastern Virginia tomato late blight appeared on a few shipments of Georgia transplants, resulting in severe loss to those infected plants. There was practically no spread to adjoining fields. Hot, dry weather occurred about this time and late blight was not a problem in eastern Virginia until late in the season.

Late blight in the mountainous areas of Virginia was unusually severe in 1948 because of frequent rains and moderate to cool temperatures. Severe injury occurred on practically all tomatoes that were not sprayed or dusted properly. It is estimated that there was a 75% loss to the tomato crop in the mountain areas of Virginia. However, growers who followed the prescribed spraying or dusting program were fairly successful in controlling late blight.

VIRGINIA POLYTECHNIC INSTITUTE
BLACKSBURG, VIRGINIA

NORFOLK

by T. J. Nugent

On April 27th tomato late blight was found near Cape Charles, Virginia, on southern-grown tomato plants. Part of the growers who had set these plants plowed them under and reset their fields with other plants. Other growers attempted to reset the missing hills but found that other plants of the first setting continued to develop cankers and die. These growers were never able to get a good stand.

During May and June several tomato fields in the Cape Charles area and Northern Neck area showed some leaf infections and some of the early set fruit developed late blight fruit rot. Late blight was not a factor on tomatoes in Accomac County.

It was estimated that about 50 per cent of the growers used fixed coppers in the form of a dust. Most of the dusting was done with ground machines but some dusting was done by plane.

Little loss was experienced by the tomato growers from this disease except where southern-grown plants were infected at time of setting. Some loss from late blight fruit rot occurred early in Northampton County and in the Northern Neck area but during the peak of the harvest season late blight was not important.

VIRGINIA TRUCK EXPERIMENT STATION
NORFOLK 1, VIRGINIA

LATE BLIGHT IN WEST VIRGINIA IN 1948

C. F. Bishop

Tomato late blight (loss estimated at 25 to 30%) was not observed in West Virginia this year until July 14th. This date was about three to four weeks later than the records of certain previous years. However, the planting date of most tomatoes was also two or more weeks later this year owing to the unseasonably cool weather in early May.

This disease was first noticed in Randolph County (elevation 2,000 ft.) in 1948 at a point approximately 25 miles south of the location of the first reported occurrence in 1947. Spread of the disease was rapid in the higher altitudes. Weather records for West Virginia reveal that the rainfall during the growing season of 1948 was substantially above the average of preceding years. Daytime temperatures were moderately high, but night temperatures were usually low.

No definite case was recorded to show that infected tomato plants came in from other areas. All evidence seems to indicate that the inoculum source is local. My personal conviction is that the mountainous areas of West Virginia are the source of most of the inoculum. However, it is quite interesting to note that whenever late blight is severe in the Middle and North Atlantic States, it is also severe in the South.

This year control measures in the form of effective fungicides appeared to be the main reason why an epiphytotic did not result. It could be safely stated that at least 75% of the tomato growers practiced late blight control measures. In fact, some weird contraptions were used as spraying devices. One outfit, in particular, was of great interest to me. A discussion of it would be too lengthy here but suffice to say this outfit was used on 5 acres of staked tomates with approximately 0.25% late blight and all of this was found only on the foliage. Not one fruit was lost owing to late blight! From pictures taken October 8, 1948 of this field it can be seen that the tomatoes look better than most tomatoes do on the fourth of July.

Control:

Fungicide	Formula	Percent growers using	Percent applied by Ground machine	airplane	Results
DUSTS					
Yellow copper oxide	Met. Cu. 4.8%	25	100	0	Fair
Tribasic copper sulphate	" " 7%	40	100	0	Good
Copper-lime	Copper - 20% lime - 80%	10	100	0	Fair
SPRAYS					
Tribasic copper sulphate	53% Met. Cu. (4#/100 gals.)	50	100	0	Good
Bordeaux Mixture	4-4-50	50	100	0	Good

WEST VIRGINIA UNIVERSITY
MORGANTOWN, WEST VIRGINIA

LATE BLIGHT IN WISCONSIN IN 1948

R. E. Vaughan

Late blight on tomato was first observed in Wisconsin in 1948 on September 14th in a farm garden near Dodgeville, Iowa County. The plants were obtained from a local greenhouse and set in a new location. No potatoes nearby. The second observation on late blight on tomato was from Sturgeon Bay, Door County, on plants that were started at the Experiment Station, Madison, and sent to the Branch Station. No late blight whatever was found in the truck garden and tomato canning area in Milwaukee, Racine, and Kenosha Counties. The loss for the state as a whole should be = 0. No sprays or dusts were applied to tomato.

AGRICULTURAL EXTENSION SERVICE
UNIVERSITY OF WISCONSIN
MADISON 6 WISCONSIN

BLUE MOLD OF TOBACCO IN 1948

BLUE MOLD IN CANADA IN 1948

L. W. Koch

The presence of blue mold of tobacco in Ontario, Canada, was confirmed at least one day earlier during the past season in the new tobacco belt of Ontario (Norfolk County) than ever before. In the old tobacco belt of Essex County the disease developed a few days later which nearly equalled last year's record early occurrence. Earliest occurrences were carefully investigated. Temperatures during this period ranged from 46°-77°F. Various circumstances, including location of initial attacks in seedbeds, presence of weeks, and developmental stages of the host strongly indicated overwintering of the causal organism in most of these instances. Not only did they occur in widely-separated areas (200 miles) but also in areas where seedbed steaming is consistently practised, as well as areas where the seedbed muck is merely replaced annually. The usual source of overwintering material would appear to be dead tobacco plant parts remaining in the permanent seedbeds.

A few seedbeds in Essex County where control measures were not initiated until blue mold became severe were destroyed by the disease. In other cases of moderate or severe infection seedlings were retarded and transplanting delayed both in the old and new tobacco belts but overall damage to tobacco seedlings in Ontario owing to blue mold was less this year than last. During the latter part of the transplanting season the disease was prevalent throughout all Ontario tobacco-growing districts (except East of Toronto) although overall damage was consistently mild. The explanation would appear to be in the fact that approximately 95 per cent of Ontario tobacco growers used control measures in the form of Fermate or Karbam spray or dust, with some growers in the old tobacco belt using PDB crystals and also a few using the new aerosol type of bomb containing benzyl salicylate. Weather conditions throughout the critical period were not unfavourable for development of the disease.

Widespread damage to plants in the field during June and early July, particularly in the new tobacco belt, was greater than ever before. Similar damage was observed in the old tobacco belt although it was less prevalent, indicating the greater abundance of inoculum and host material in the flue-cured districts. In some fields even top leaves were affected and damage was consistently more severe where air drainage was poor.

The oldest Canadian tobacco-growing areas, namely those in Quebec, remain completely free from attack by this disease.

Control: Tobacco blue mold - Ontario, Canada

MATERIALS USED IN 1948

Material	Formula	% growers using	Results
Fermate - spray	2 lb.:40 gal.	65	Good
Fermate - dust	(Can. Ind. Ltd. Co.)	25	Good
PDB - crystals	3 lb.:100 sq. yds.	4	Good (where properly used)
Benzyl salicylate - (aerosol bomb)	(Innis, Speiden & Co.)	Less than 1	Uncertain - (minor injury)

A few tobacco seedbeds were destroyed completely by blue mold in certain Ontario localities where the disease had not previously been severe and, consequently, where control measures were not practised. Also, in some localities delayed transplanting was experienced owing to seedling attack. Damage in the field was more severe than ever before, with some crops manifesting severe leaf-spotting.

DOMINION LABORATORY OF PLANT PATHOLOGY
HARROW, ONTARIO, CANADA

BLUE MOLD IN CONNECTICUT IN 1948

P. J. Anderson

Blue mold damage was so light this year that it was almost negligible. Since the weather during the seed-bed period was cold and rainy and presumably favorable to development of mildew, we are inclined to believe that our freedom from damage was largely owing to the almost universal use of Fermate by growers as a spray in the seedbeds.

First cases were reported on May 24 (unsprayed beds). During the following three weeks it was found in a few scattered beds but in no case were the beds lost and there was no shortage of plants.

In our spray experiments on the Station Farm, the beds were inoculated regularly and the unsprayed checks became 95 percent infected. Adjacent bed sections sprayed with Fermate (one pound in 50 gals.) and with Dithane Z-78 (one pound in 48 gals.) remained entirely free of disease.

Although we have demonstrated now for several years that these two fungicides are equally effective, almost all growers use Fermate - possibly on account of the dark green color of the leaves. Phygon was tried again this year but caused severe leaf burning and had to be abandoned. Oxyquinoline benzoate (1/2 pound in 50 gals.) caused stunting of plants and leaf burning and has been dropped from further trials.

Field infection in June and early July occurred in some scattered Shade fields but was not considered of serious importance except on two or three plantations. Although we have not recommended spraying in the field, one grower, who had an early infection, sprayed one field with Fermate twice a week with a power sprayer. He reported that this field suffered no loss from blue mold while there was a considerable loss in his adjacent unsprayed field. As far as I know, this is the first attempt to control mildew in the field by spraying.

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION
NEW HAVEN 4, CONNECTICUT

BLUE MOLD IN FLORIDA IN 1948

BELLE GLADE

by David L. Stoddard

No blue mold found.

EVERGLADES EXPERIMENT STATION
UNIVERSITY OF FLORIDA
BELLE GLADE, FLORIDA

GAINESVILLE

by George F. Weber

Blue mold, Peronospora tabacina Adam, was first reported in the tobacco-growing areas of North Florida late in February, possibly earlier than usual. Application of fungicidal dust was made at that time.

Early in March pepper plants for the first time were observed infected by the fungus in Florida. Additional reports from scattered areas in the tobacco region showed the disease in scattered areas but usually isolated and not generally severe throughout the month of March. Field plantings from seedbeds in March and warm weather closed out the importance of this disease in Florida.

UNIVERSITY OF FLORIDA
GAINESVILLE, FLORIDA

QUINCY

by R. R. Kincaid

This is a summary report on tobacco blue mold for 1948 for cigar-wrapper tobacco in Gadsden County, Florida, based on conversations with growers and a limited number of plant bed observations.

The disease was first noticed near Gretna, Florida, February 23rd; weather mild and damp. The source of inoculum presumably oospores in soil; bed treated with Uramon and Cyanamid. Other cases appeared during March, widely distributed in the County [Gadsden]. Spread and activity appeared to be greatly reduced by the application of fungicide and somewhat by warm weather - March 17-24. As usual, the disease developed in this locality beginning two or three weeks before transplanting and continuing until checked by warm weather.

Control by Fermate dust (20% Fermate dust, 80% talc) used by roughly 75% of growers with satisfactory results when used on a preventive schedule as recommended (three times a week, dosage increasing with the size of the plants from 15 to 35 pounds per acre per application). Control with 10% Parzate dust in test plots in 1946 and 1947 appeared slightly better than with 20% Fermate; no results on disease control in 1948 because infection was slight.

Summary:

1. Old beds, treated with Uramon and Cyanamid, are generally used. Circumstantial evidence points to primary infection in a few cases, followed by infection by air-borne spores. During mild winters volunteer and overwintering plants occur, but their importance is not known.

2. Leaf spotting by blue mold in the field was very light in 1948 owing, presumably, to dry weather in May. In general, spots appear when cool weather follows rain; below 50 degrees, large (1/2 - 1 inch) spots with sporulation; 50 - 60 degrees, small spots, often very numerous. This phase of the disease is occasionally serious on early transplanted crops.

3. Control of the disease in cigar-wrapper tobacco plant beds is important especially to avoid delay in transplanting. Even with satisfactory control growers sow as a rule 100 square yards of plant bed

for each acre of shade. This is intended to insure an adequate supply of good seedlings at the most favorable time for transplanting. In 1948 delay in transplanting owing to blue mold was negligible.

4. Carry-over of Fermate dust in various diluents from one season to the next: In Diluex obvious deterioration (fading of color) in one year; in talc, very slight deterioration (first complaint came in 1948); in Pyrax, small small sample in screw-cap jar appears unchanged after five years.

NORTH FLORIDA EXPERIMENT STATION
UNIVERSITY OF FLORIDA
QUINCY, FLORIDA

BLUE MOLD IN GEORGIA IN 1948

J. G. Gaines

Earliest blue mold (*Peronospora tabacina*) symptoms in a commercial tobacco bed were observed February 6th in a Cook County new bed. Source of infection was thought to have been infected hold-over tobacco plants surviving in 1947 beds. The disease had been reported on hold-over plants in at least three Georgia counties during the last two weeks of January. There were several mild, cloudy days with high humidity during this period. As late as February 1st the largest plants were still in the four-leaf stage with stands incomplete in many locations. The unusually wet weather following seeding kept the soil cool, delayed germination and early growth. Because of the small plants heavy spore production and rapid spread were delayed until the end of February. At this time widespread light attacks occurred in those areas where primary infections had developed earlier in the season. Frequent heavy showers in March delayed further widespread development and reduced intensity of the disease in affected beds. As late as the first of April some few beds remained free of mold, but even these suffered a light attack during the succeeding two weeks. Thus, all tobacco beds throughout the entire tobacco-growing area of South Georgia became affected by mold during the period February 6 to April 15. At no time was a definite peak of activity reached and disease spread was slower than usual. Only a very small percentage of beds suffered appreciable plant loss and all of these had been affected early, when the plants were small. Overall plant loss from the unusually light attack was estimated at not over 3 percent of the plants. This was in contrast to 85 percent loss in 1947. Tobacco plants were more plentiful in 1948 than any other year since 1940. Wet weather delayed transplanting at least two weeks in low areas where it was not possible to prepare the land on time. The disease attack was so slight that affected beds rapidly recovered with little further delay. Bulk of the tobacco acreage was set before April 20. The few very slight field infections observed during May were of no consequence.

The almost negligible disease damage in 1948 was owing in part to unfavorable weather conditions for optimum disease activity and in part to widespread use by growers of ferric dimethyl dithiocarbamate sprays and dusts.

Control:

MATERIALS USED IN 1948

Fungicide	Spray Formula	Rate of Application	% growers using
Ferric dimethyl dithiocarbamate spray and dust (Fermate)	4 lbs.-100 gals. (spray) 15% (dust)	5 gals. per 100 yds 2-4 lbs. " " "	Spray & dust = 82%

Approximately three percent of the growers sprayed with Bismuth subsalicylate, Dithane Z-78 (zinc ethylene bisdithiocarbamate) and Dimole (Fermate - salicylic acid mixture). Growers obtained almost perfect commercial disease control with these materials as well as with ferric dimethyl dithiocarbamate sprays and dusts.

GEORGIA COASTAL PLAIN EXPERIMENT STATION
TIFTON, GEORGIA

BLUE MOLD IN KENTUCKY IN 1948

W. D. Valleau

Tobacco blue mold was first reported April 29, 1948 in Simpson County and during the next 10 days as far north as central Kentucky. It gradually spread until it was general but very mild over the entire tobacco-growing areas of the state. The season was dry for some time after sowing. When plants were 1/5 setting size there were frequent rains and wildfire became severe. As setting season approached there was an extended dry period.

So far as we could determine the source of inoculum was second year beds in which oospores initiated infection.

During the preplant-setting period rains were infrequent and the amount of inoculum was limited because the disease got off to a late start. Therefore, there was little injury except to shaded beds. The entire spread was during the month before setting.

Growers were prepared to use Fermate as a spray or dust and Dithane Z-78 as a dust but very little was used because of the extremely mild outbreak.

UNIVERSITY OF KENTUCKY
LEXINGTON 29, KENTUCKY

BLUE MOLD IN MARYLAND IN 1948

C. E. Cox

The tobacco-producing area in Maryland lies between Chesapeake Bay and the Potomac River and extends southward from a line drawn from Annapolis to Washington, D. C. The area is composed of five counties - Prince Georges, Anne Arundel, Charles, Calvert, and St. Marys.

Both temperature and rainfall were above normal during March and the first half of April. During the last half of April the temperature was below normal and both rainfall and relative humidity were above normal. Percentage of sunshine was below normal. There were damaging frosts on the 4th, 10th, 18th, and 22nd.

Blue mold was first observed on April 23rd in a single old bed in Anne Arundel County and in several beds in Calvert County. These are the two tobacco counties bordering on Chesapeake Bay. On April 27th the disease was reported in several plant beds in St. Marys County and on May 3rd was found in Prince Georges County. By mid-May blue mold was widely distributed throughout the area. The month of May was slightly cooler than normal with cloudiness and relative humidity above normal and sunshine below normal. Rainfall was greatly in excess of normal averaging only 0.03 inches below the record rainfall of May, 1924.

In spite of apparently ideal weather conditions for the disease, and between 60 and 90 percent of all beds in the area showing some blue mold infection, losses from the disease were considered light. This probably should be attributed to the immediate, widespread and continued application of Fermate.

The outbreak was considered the same or less serious than in 1947 or in the average year except in Calvert County where it was more serious than in the average year and much more serious than in 1947.

Blue mold was first observed in old bed sites throughout the area except in the two lower counties where no difference was observed in this respect.

It has been estimated that from 60 to 90 percent of the beds in the area were infected, many of them lightly. The higher percentages of infection were in Calvert and Anne Arundel Counties. From 50 to 85 percent of the beds (varying by counties) received some fungicide, but only 10 to 15 percent received regular applications. Of these beds treated about 75 percent were dusted and the remainder sprayed. Fermate was used almost exclusively and gave excellent to good results when used properly and in time. A very limited area was reported to have been treated with Dithane Z-78 dust with good results. Untreated plant beds were seriously damaged with few exceptions. In general, growers are satisfied that Fermate will control the mold but, nevertheless, many farmers are planting double the amount of beds needed before blue mold appeared and by this method have sufficient plants to set out their crops. In 1947 the area produced enough plants to set the acreage, but there was considerable movement of plants from farm to farm and from county to county. Growers who escaped or prevented losses from blue mold supplied plants for the less fortunate. It was after mid-June before all transplanting was completed. The delay was owing in part to blue mold and in part to wet weather which made it impossible to prepare the soil.

Blue mold appeared in the field after transplanting in Calvert County only and there the damage was slight.

Wildfire was more serious than for many years.

UNIVERSITY OF MARYLAND
COLLEGE PARK, MARYLAND

BLUE MOLD IN MASSACHUSETTS IN 1948

Oran C. Boyd

Blue mold first reported to me on May 20th from Franklin County in an old bed that had not been treated for the disease. Other scattered cases of primary infections soon followed. In view of what was considered a more favorable season than usual for such diseases, it was surprising to find blue mold no more prevalent and troublesome than it really was. There were not as many early-season cases (carryover in old beds) as in most past seasons, even in old beds that had not been dusted or sprayed.

However, as in most years, the disease did show up in many additional beds during and following the field-setting season -- cases representing secondary infections where bed protection was not maintained. Although the disease remained inconspicuous in the fields during the comparatively warm, dry months of July, quite a few scattered cases of activity on plants in the field were reported and observed during August up to the abnormally hot period of August 26 - 28.

Loss - not more than .5% to 1% of the plants in the beds and a trace in the field.

EXTENSION SERVICE
MASSACHUSETTS STATE COLLEGE
AMHERST, MASSACHUSETTS

BLUE MOLD IN MINNESOTA IN 1948

Carl J. Eide

No blue mold on tobacco in Minnesota.

DEPARTMENT OF PLANT PATHOLOGY AND BOTANY
UNIVERSITY OF MINNESOTA
ST. PAUL 1, MINNESOTA

BLUE MOLD IN NORTH CAROLINA IN 1948

Howard R. Garriss

Blue mold in North Carolina appeared on March 23rd in one bed in Columbus County and by April 2nd had spread to scattered locations throughout the county. At the same time three occurrences, confined to 2-3 small spots in beds, were observed in Bladen County near the Columbus County line. In early April, too, blue mold was found in Wake County.

By the middle of April blue mold was known to be present over the eastern half of the state with the exception of eight tobacco-producing counties in the northeastern section of the state /see map - Report No. 14, April 20, 1948/. Western county limits onthe occurrence of the disease in North Carolina were Counties Lee, Moore, Scotland, with unconfirmed reports as far west as Guilford County in the old belt. Northern limits were Martin, Edgecombe, Nash, Vance, and Guilford County.

In early June some fields of almost mature tobacco in the eastern area were severely damaged with blue mold. Reports of this occurrence came from Craven, Onslow, Duplin, Martin, and Beaufort Counties. The situation developed as a result of an extended period of cool, rainy weather and high humidity during the previous two and one-half weeks.

In summary, blue mold in North Carolina in 1948 occurred throughout the flue-cured and a part of the Burley area. In all cases it was more severe in beds on old sites. Stands were generally good throughout the flue-cured area and the disease was generally lighter this year than in 1947. There were no serious plant shortages or delays in planting.

Control: Fermate spray and dust were widely used and also some Dithane Z-78 especially in the eastern area. About forty-six percent of the growers used fungicides - Fermate spray at the rate of 4-100; dust 15%; Dithane Z-78 - 3-100 with excellent results when spray or dust material was properly applied. Also, good control of blue mold was obtained when treatments were begun ahead of the disease.

NORTH CAROLINA STATE COLLEGE
RALEIGH, NORTH CAROLINA

BLUE MOLD IN PENNSYLVANIA IN 1948

R. S. Kirby

Blue mold of tobacco was first observed in Pennsylvania in 1948 on August 4th in Lancaster County. Spread was slow. Anthracnose in many beds was so severe as to cover up downy mildew injury.

About 65% or over of the growers in Pennsylvania spray with Fermate and another 15% spray with Bordeaux - 8-4-100 - or fixed copper (2 lbs. actual in 100 gallons).

Loss - not likely over 1 to 2% in 1948.

PENNSYLVANIA STATE COLLEGE
STATE COLLEGE, PENNSYLVANIA

BLUE MOLD IN SOUTH CAROLINA IN 1948

T. W. Graham

Blue mold in South Carolina in 1948 caused little damage to tobacco plants as compared with 1947 and 1946. Although the disease appeared relatively early (March 15), it spread slowly and became general by April 15th. There was only a brief period during the week of April 11 when cool weather and rain allowed a mild peak of blue mold development. Continuous warm weather since that time checked blue mold activity so that damage to plants was of no serious consequence and most transplanting was completed during the last two weeks in April which is about normal for this area. The absence of favorable weather for blue mold is regarded as the principal factor in this year's light attack. Although there has been a marked increase in the number of growers using control measures during the past three years, this cannot be regarded as responsible for the reduced damage to tobacco beds this season. Although direct loss or damage by blue mold is hard to estimate, we usually regard the principal damage as that caused by delay in setting, usually 10 to 20 days in years of average severity. When the disease starts early on young plants, however, the entire beds may be destroyed so that reseeding is necessary. Such damage is always correlated with favorable weather for blue mold development although severity varies greatly from one locality to another depending largely on bed location. During a season of moderate to severe blue mold damage practically all untreated beds suffer from blue mold depending on weather conditions and size of plants when the disease appears. During 1948 very few beds suffered any delay in setting and no plant losses were reported.

We have not been able to spend enough time in surveys to get an accurate estimate of the percentage of growers treating their beds for blue mold. The only information we obtained in 1948 were from short surveys on April 9 and 19 when a total of 17,000 yards was observed and only 4,000 yards were being treated. Practically all the treating done in South Carolina is with 15% Fermate dust. Effectiveness of Fermate against blue mold has been proven without doubt by many growers when used either as a dust or as a spray.

We have not been able to get critical tests of the newer fungicides at the Experiment Station during the past two seasons. However, Dithane Z-78 and Karbam Black, in so far as we have tested them, show promise as being just as effective as Fermate. Parzate, although effective against blue mold, has caused some injury to plants. Bismuth subsalicylate has continued as one of the most effective fungicides against blue mold.

In regard to the relative importance of old beds in carrying the disease over winter, almost without exception, the initial appearance of blue mold is in old beds and from this we believe that blue mold overwinters locally, presumably as oospores and that initial infection is not dependent on wind-blown inoculum from areas south of us. Overwintering on volunteer tobacco plants or other hosts is not regarded as a factor in carrying the disease over winter in South Carolina as freezes are hard enough to kill out possible overwintering hosts.

Occasionally we have seen blue mold on field plants, but this is relatively rare and this kind of damage is of minor importance

PEE DEE EXPERIMENT STATION
FLORENCE, SOUTH CAROLINA

BLUE MOLD IN TENNESSEE IN 1948

GREENVILLE

by H. E. Heggestad

In 1947 and again in 1948 first appearance of blue mold was in old plant bedsites. The beds with early blue mold were either in a woods or in a protected spot near the woods. It is quite probable that we have sufficient inoculum built up locally in these old bedsites to account for later disease development. Certain beds in new sites usually show the disease about two weeks after its appearance in the old sites. Beds unprotected with fungicide at the station during 1947 and 1948 did not have the disease for more than three weeks after it was first observed in the county.

Field infection was not observed.

Most growers attempting control used fermate spray following formula recommendation by Dr. E. E. Clayton in "Blue Mold Control in Tobacco Beds", U.S. Dept. of Agricultura AIS-37 Issued December 1945, and slightly revised January, 1947. Generally growers delay treatment until the disease is reported in the county and in many instances treatment is applied only after the disease is present in their plant bed. Approximately 25 per cent of the growers attempted some control of the disease.

Because of extremely dry weather during the normal transplanting season very little loss of plants occurred even in untreated beds in 1948. One half inch or less of rain fell in any of the East Tennessee counties between May 8 and May 26. The burley belt of Middle Tennessee was nearly as dry during the same period, having one inch or less of rainfall. During the same period in 1946 and 1947 we had about 1.50 inches of rain and loss of several plant beds owing to blue mold. Usually farmers sow more bed space than necessary and sufficient plants have been available to set the crop in spite of losses due to blue mold.

TOBACCO EXPERIMENT STATION
GREENVILLE, TENNESSEE

KNOXVILLE

by E. L. Felix and J. J. Bird

Tobacco blue mold was first reported on April 28th in an old bedsite in Greene County, becoming widespread throughout East Tennessee and the Cumberland Plateau (Burley area). Although intermittently dry and wet, heavy dews apparently permitted survival of the mildew. Considerable loss for state, but no acute shortage of plants reported.

UNIVERSITY OF TENNESSEE
KNOXVILLE, TENNESSEE

BLUE MOLD IN TEXAS IN 1948

G. H. Godfrey

In early Spring blue mold was abundant on *Nicotiana repanda*. By May 18th none was to be found and it remained absent all summer. By October 15th, in spite of heavy rains, high humidity, and heavy dews, none made its appearance on the heavy stand in orchards on the Station in which the disease was abundant last winter.

TEXAS AGRICULTURAL EXPERIMENT STATION
WESLACO, TEXAS

BLUE MOLD IN VIRGINIA IN 1948

S. A. Wingard
R. G. Henderson
S. B. Fenne

Tobacco blue mold was generally severe in old plant beds. Fermate spray or dust proved to be very satisfactory; however, sprays appeared to be somewhat more effective than dusts. Parzate was used in about a dozen demonstrations and results were very satisfactory. In these demonstrations blue mold was controlled equally as well with Parzate as with Fermate. Some growers preferred the appearance of the plants sprayed with Parzate since, in their opinion, Parzate did not stimulate as tender a growth as Fermate. In many cases the loss from blue mold in unsprayed beds was very severe and some plant beds were a total loss. In beds properly sprayed, however, blue mold was very well controlled and ample tobacco plants were available in the proper season.

VIRGINIA POLYTECHNIC INSTITUTE
BLACKSBURG, VIRGINIA

BLUE MOLD IN WEST VIRGINIA IN 1948

C. F. Bishop

In 1948 blue mold was of moderate severity in the burley-producing tobacco areas in Mason, Cabell, Wayne, Putnam, Lincoln, and Logan Counties but did not cause serious losses primarily because of the excellent control program which was practiced. Blue mold appeared fairly early in scattered areas which enabled growers to prepare before their plants were attacked.

Control:

Fungicide	Formula	% growers using	Results
Fermate (spray)	2# per 100 gals.	40%	Good
Fermate (dust)	15% fermate	40%	Good

WEST VIRGINIA UNIVERSITY
MORGANTOWN, WEST VIRGINIA

DOWNY MILDEW OF CUCURBITS IN 1948

DOWNY MILDEW IN DELAWARE IN 1948

J. W. Heuberger
R. F. Stevens

Downy mildew of cucurbits appeared late, being first found on July 26th at Rising Sun, Delaware. Source of infection was presumed to be wind-blown spores. Infection was general on cucumbers by August 5th after five days of rain starting the first of August; on cantaloupes only light primary infection was present. By August 18th the disease was present all over the state but it never became a serious factor in production of cucurbits. A control program by 80 per cent of the growers was a major factor in holding downy mildew disease under control. Crop loss was less than 10 per cent.

Most growers dusted with Zerlate but some used Dithane Z-78; very little copper was used on the cucurbits.

AGRICULTURAL EXTENSION SERVICE
UNIVERSITY OF DELAWARE
NEWARK, DELAWARE

DOWNY MILDEW IN FLORIDA IN 1948

BELLE GLADE

by David L. Stoddard

I saw so little of downy mildew during the past season that a full report cannot be attempted. North of Pompano the disease was of no importance. Around Pompano and Ft. Lauderdale it was apparently in the near-epiphytotic stage but it is difficult to estimate the causes and damage resulting. Prices were so poor at the time that many farmers had virtually abandoned their fields. This probably played a part in the disease situation. As far as I know few fields were treated with a fungicide. I know of one case where a grower had good results from spraying five acres with Parzate (Z-100).

EVERGLADES EXPERIMENT STATION
UNIVERSITY OF FLORIDA
BELLE GLADE, FLORIDA

GAINESVILLE

by George F. Weber

Downy mildew, Peronoplasmopara cubensis (B. and C.) Rost. [Pseudoperonospora cubensis B. and C.], was observed in all squash and cucumber plantings in early February in frost-free areas in coastal South Florida. These were mostly small few-acre fields. By the end of the month it had appeared in Central Florida in destructive form. In March the advent of dry weather partially checked the spread and severity of the disease.

The first Florida reports for 1948 of this fungus on watermelons in South Central Florida were as of April 15th. After May 1st the disease was generally prevalent but not severe. At this time the cucumber season was past the peak and the disease was not important except as a source of inoculum for melon infections.

UNIVERSITY OF FLORIDA
GAINESVILLE, FLORIDA

HOMESTEAD

by George D. Ruehle

One grower who applied Dithane D-14-zinc sulfate-lime spray on a 3-5 day schedule obtained good control of downy mildew. Other unprotected plantings were abandoned to the disease during this period.

SUB-TROPICAL EXPERIMENT STATION
UNIVERSITY OF FLORIDA
HOMESTEAD, FLORIDA

DOWNY MILDEW IN KENTUCKY IN 1948

W. D. Valleau

No reports from the state in 1948.

UNIVERSITY OF KENTUCKY
LEXINGTON 29, KENTUCKY

DOWNY MILDEW IN MARYLAND IN 1948

C. E. Cox

Downy mildew of cucurbits would normally be expected to appear in Maryland from about July 10th to 20th. In 1948 rather extensive surveys of cucurbit plantings in the Salisbury area on July 23rd and in the

Hurlock area on July 26th revealed no downy mildew. On July 29th Dr. Russell A. Hyre of the U.S.D.A. found downy mildew in two cucumbers fields in southern Caroline County and in two fields in northern Dorchester County. He found none in other parts of those counties. While reports from County Agents and others indicate traces of downy mildew late in the season in various parts of the state, I did not observe the disease at all during 1948. In any case downy mildew never became widespread or destructive this year and was not a major factor in defoliation of cantaloups and cucumbers as it usually is. Losses from downy mildew were negligible. Macrosporium leaf spot was widespread and destructive on cantaloups and there was considerable anthracnose on all cucurbits observed. Angular leaf spot was destructive on cucumbers.

In the cantaloup-producing area centering around Salisbury it is estimated that 25 to 30 percent of the acreage was treated with a fungicide with about 20 percent receiving a regular schedule of application. In the Preston-Hurlock area almost 95 percent of the acreage received some fungicide and most of this acreage received a regular schedule of application. West of the Bay in the Anne Arundel County area an estimated 5 percent of the acreage was treated with a fungicide. Sixty to seventy percent of the treated acreage received a fixed copper, about 20 percent received Bordeaux Mixture, and the remainder Zerlate. About three-fourths of the fungicides were applied as dusts, the remainder as sprays. Practically no fungicide was applied to cucurbits other than cantaloups.

Zerlate did not give satisfactory control of Macrosporium leaf spot and fixed copper and Bordeaux gave only fair control.

Failure of downy mildew to develop normally in the areas to the South probably accounts for the almost total absence of the disease in Maryland. Weather conditions seemed to be favorable for development of downy mildew if sufficient inoculum had been present.

UNIVERSITY OF MARYLAND
COLLEGE PARK, MARYLAND

DOWNY MILDEW IN MASSACHUSETTS IN 1948

O. C. Boyd

Downy mildew did not make its appearance on cucumbers in Bristol County (where it usually shows up first) until the first week of September. County Agent Harris reported it there on the 9th after it had been present for a few days. The weather was abnormally dry in the southeastern part of the state throughout August and September. The disease appeared on remnants of cucumber plantings in the Connecticut Valley around September 10-15th, having made considerable headway by September 17th, date of first observation there.

Loss - trace, having arrived too late to cause damage even to the latest plantings of cucumbers. It was not reported on melons or squash.

Control: The disease "struck" so late in the season that no information was obtained on control by different materials.

EXTENSION SERVICE
MASSACHUSETTS STATE COLLEGE
AMHERST, MASSACHUSETTS

DOWNY MILDEW IN NEW YORK IN 1948

LONG ISLAND

by H. S. Cunningham

I personally did not see any downy mildew this season. If it occurred on Long Island no report was made of it as far as I am aware. Most growers sprayed or dusted as a protection against its appearance. Most of them use copper in some form either as a spray or dust. Some few are using Dithane.

NEW YORK STATE AGRICULTURAL EXPERIMENT STATION
RIVERHEAD, LONG ISLAND, NEW YORK

UP-STATE NEW YORK

by K. H. Fernow

Downy mildew was not reported in upstate New York.

NEW YORK STATE AGRICULTURAL EXPERIMENT STATION
ITHACA, NEW YORK

DOWNY MILDEW IN NORTH CAROLINA IN 1948

D. E. Ellis

Downy mildew, which apparently arrived in North Carolina about as early as last year, developed rapidly between June 8th (when we first observed it) and about June 22nd, causing rather serious losses to the cucumber crop in the south-central counties of the eastern part of the state. Between June 22 and July 15th, excessively hot, dry weather apparently held it in check and slowed its movement into counties farther north.

Dr. Person and I visited the Warren County cantaloup and cucumber (pickle) area July 23rd. Cucumber downy mildew was first found in this county on July 3rd. While cucumbers there showed generally heavy infection, we found only a few scattered lesions on cantaloup. Some of the cucumber receiving and grading stations were still operating. In 1947 they were forced to shut down about July 10 because of downy mildew.

Cantaloup harvest in the Ridgeway area (Warren County) approached its peak near the end of July. A very good crop of high quality cantaloupes was produced without serious damage from downy mildew.

In the Laurinburg (Scotland County) cantaloup area, drought did much more damage than downy mildew. At McCullers (Wake County), where it was very dry until near the end of July, we first observed the disease on July 17th, more than 30 days later than in 1947.

Control:

Host	Fungicide	Formula	Percent growers using	Results
Cucumber and Cantaloupes	Tribasic copper sulfate - used as dust	5% metallic cu.	15 - 20	Good

PLANT PATHOLOGY SECTION, DEPARTMENT OF BOTANY
NORTH CAROLINA STATE COLLEGE
RALEIGH, NORTH CAROLINA

DOWNY MILDEW IN PENNSYLVANIA IN 1948

R. S. Kirby

Downy mildew of cucurbits was first observed on August 21, 1948 in Lancaster County. The source of inoculum was likely wind-borne spores. The hot weather of late August seemed to check the disease. It spread slowly and increased in a few cases to 100% infection.

Control: Copper sprays and bis carbamates seemed to hold downy mildew in check. Likely over 75% of commercial cucumber and melon growers sprayed or dusted.

Loss - less than 5% (hot weather of late August killed many cucumbers and melons).

PENNSYLVANIA STATE COLLEGE
STATE COLLEGE, PENNSYLVANIA

DOWNY MILDEW IN RHODE ISLAND IN 1948

J. B. Rowell

Downy mildew of cucurbits was not observed nor reported in Rhode Island during 1948.

AGRICULTURAL EXPERIMENT STATION
RHODE ISLAND STATE COLLEGE
KINGSTON, RHODE ISLAND

DOWNY MILDEW IN SOUTH CAROLINA IN 1948

William M. Epps
Morris B. Hughes

CHARLESTON

Cucumber downy mildew was observed in South Carolina for the first time May 31, 1948. Two earlier reports from growers were received on May 11-12. The case reported from Charleston County proved to be angular leaf spot. That reported from Colleton County was not verified. In view of the general and unusual prevalence of angular leaf spot, it seems quite likely that this second case might also have proved to be this disease. Mildew spread rapidly in the cucumber crop, but the harvest season was about completed and loss was only about 10%. Most of the growers (about 70%) dusted with a 6% fixed copper dust, using ground dusters almost exclusively. Owing to the late appearance of the disease only slight yield increases were obtained from the use of dusts.

The fall cucumber crop in Charleston and Beaufort Counties was planted mostly to the downy mildew resistant Palmetto variety or unnamed sister lines. About 30% was planted to Marketer, the standard susceptible variety. Mildew appeared before the plants began to flower. All growers used fungicides so far as is known. A Zerlate dust was used on about 75% of the acreage. Two growers used a Zerlate spray. A small percentage of the acreage received a fixed copper dust. Dusts were applied by ground machines exclusively, except where wet soil necessitated the use of planes for one or two applications during mid-season.

Mildew was not significant in the resistant varieties and losses were negligible. In Marketer the disease was generally held under control satisfactorily until the windy wet weather of September 22nd to October 5th when dusts could not be applied satisfactorily. After this the vines declined rapidly and the yield was reduced by about 75%.

BLACKVILLE

Downy mildew was first observed at the Edisto Experiment Station near Blackville, South Carolina, on June 7th on a single cucumber plant. This disease had been reported several times in Barnwell County during late May but indications are that it was confused with angular leaf spot which was very widespread.

The period following June 7th was hot and dry with little or no dew. Daily maximums from June 4 - July 8th were from 84 - 102°F. In only five of these thirty-four days was the maximum temperature below 90°F. Only one rain sufficient to be of benefit (.75 inch) fell throughout the month of June and that not until the 21st.

Scattered lesions of the disease were evident on the various cucumber plantings at the Station but no appreciable damage occurred throughout the picking period. Angular leaf spot, however, was both widespread and serious. Some plantings were almost completely destroyed by this disease before any picking was done.

In cantaloupes, as in cucumbers, the late appearance of the disease, followed by a month of unfavorable weather, resulted in no appreciable damage to the crop. Quality and size were reduced from excessively dry weather but not from disease.

SOUTH CAROLINA TRUC EXPERIMENT STATION
CHARLESTON, SOUTH CAROLINA

DOWNY MILDEW IN TENNESSEE IN 1948

E. L. Felix
J. J. Bird

The only reported occurrence of downy mildew was on muskmelons in experimental plots at the Plateau Experiment Station, Crossville, where it appeared during wet weather about the middle of July. This disease disappeared on application of Copper A and the advent of dry weather.

UNIVERSITY OF TENNESSEE
KNOXVILLE, TENNESSEE

DOWNY MILDEW IN TEXAS IN 1948

WESLACO

by G. H. Godfrey

On May 18th there was no downy mildew on cantaloupes, even on susceptible varieties. By June 1st it was present but not severe on susceptible varieties.

On the Fall crop, planted July 23rd, in late September downy mildew first appeared in some abundance on susceptible varieties. On October 7th Imperial No. 45 killed by downy mildew. By October 15th other varieties, including several U.S.P.I. numbers undergoing test, killed or badly damaged. Some resistant strains were still holding up with 5 per cent or less damage.

TEXAS AGRICULTURAL EXPERIMENT STATION
WESLACO, TEXAS

YOAKUM

by A. L. Harrison

Downy mildew of cucurbits was not observed in the Yoakum area last spring because of the extremely dry season.

TEXAS AGRICULTURAL EXPERIMENT STATION
YOAKUM, TEXAS

DOWNY MILDEW IN VIRGINIA IN 1948

BLACKSBURG

by S. A. Wingard, R. G. Henderson, and S. B. Fenne

Downy mildew of cucurbits was of less importance this year than usual, chiefly owing to the fact that the disease appeared late in the season. While the disease on pickling cucumbers was rather severe, it appeared late to cause very much loss. Weather conditions were dry in the cucumber area during the infection period. Perhaps 10% of the growers dusted with copper. Because of unfavorable weather conditions for disease development, the profits from dusting were not great.

VIRGINIA POLYTECHNIC INSTITUTE
BLACKSBURG, VIRGINIA

NORFOLK

by T. J. Nugent

Downy mildew of cucurbits was relatively unimportant this year because of the fact that it became established so late in the growing season that little economic loss resulted.

This disease was first observed in the Norfolk area on cucumbers on July 21st, on cantaloupes August 2nd, and on watermelons on August 16th. This was considerably later than anticipated. Based on reports from further south, downy mildew was expected to make its appearance on cucumbers some time during the first week of July.

From June 28th to July 14th only 0.64 of an inch of rain fell in this area and the mean daily temperature ranged between 70 and 85°F. On July 14th more than 3 inches of rain fell and for the next ten days some rain fell every other day. The mean daily temperature ranged between 73 to 86°F. After this disease became established, it continued to spread despite the fact that only a trace of rain fell for a week and mean daily temperatures remained about the same. Indications are that this disease is unable to make broad jumps during dry conditions but once established in a locality morning dews will keep it spreading.

Probably ten percent of growers used a 5 to 7 percent fixed copper dust during the first three weeks in July. The season was advanced far enough by this time that control methods were discontinued. There was little to no economic loss from this disease in this area this year.

VIRGINIA TRUCK EXPERIMENT STATION
NORFOLK 1, VIRGINIA

DOWNY MILDEW IN WISCONSIN IN 1948

R. E. Vaughan

Downy mildew on cucumbers was not observed in 1948.

AGRICULTURAL EXTENSION SERVICE
UNIVERSITY OF WISCONSIN
MADISON 6, WISCONSIN

FUNGICIDE RESULTS - 1948

In the following Tables 1-4 data are presented on the material, type, and amount of fungicide(s) used by percent growers in each state, with method of application and results obtained. Proper and regular applications of these fungicides seemed to contribute much to the effectiveness of the material itself. In the case of potato and tomato late blight fixed coppers, Bordeaux, and the carbamate sprays and dusts gave varying results ranging from poor to good with, perhaps, the better results obtained with sprays. Blue mold control was obtained in satisfactory to excellent fashion with the use of dust or spray carbamates, and downy mildew, although not quite so serious a factor this year, with copper and carbamate sprays and dusts.

Table 1. CONTROL OF LATE BLIGHT ON POTATO: MATERIALS USED IN 1948

State or Province	Material and Formula	Percent growers using	Percent applied by Ground machines	Airplane	Results and Remarks
Ala.	Neutral copper (COCS and Copper-Hydro) 6% metallic copper - dust	20	85	15	Materials about equally effective. Fair to good disease control with yield increases of 5 to 20 per cent.
	Z-78 - 3.9% dust	10	85	15	
	"Dithane D-14" (spray)	2	100		Excellent disease control. Yield increase of 10 to 25 per cent.
Del.	Fixed Copper dust (Copper A; Tribasic) 5-7% Cu	25	15	10	Fair
	"Dithane Z-78" dust 6%	20	10	10	Fair
	"Dithane D-14" + zinc sulfate spray, 2 qts.-1-100 "Dithane Z-78" spray, 2-100 "Parzate" spray, 2-100	20	20		Good

State or Province	Material and Formula	Percent growers using	Percent applied by Ground machines	Airplane	Results and Remarks
Fla.					
Belle Glade	"Dithane Z-78" dust, 10%	80% acreage	0	all	Blight did not have an appreciable effect on yield.
	"Copper A" dust, 7% Cu	10% acreage	0	all	
Ft. Myers	Copper-lime dusts, 20-80	2	75	25	Poor
	"Copper A" dust	2	75	25	Poor
	Other dusts	1	all	0	Poor
	"Dithane D-14" + $ZnSO_4$+ lime spray 2-1 1/2-100	90	all	0	Good
	Bordeaux, 4-4-50 + sticker	5	all	0	Fair
Dade County	"Dithane"-zinc sulfate 2-1-100	95	all	0	Good
	Bordeaux spray	Few			Not good
	Fixed copper	Few			Not good
Hastings	"Parzate" dust 6%	1	all	None	Good where applied regularly and once a week or oftener. Not as good as Dithane D-14 + zinc sulfate.
	"Copper A" dust 6-9%	20	95	3	
	Basic copper sulfate dust - 6-10%	70			
	Copper-lime - dust 6%	4			
	"Dithane D-14" + zinc sulfate 2 qts.-1 lb.-100 gal.	5	all	None	Excellent where applied properly at 5 to 7 day intervals.

State or Province	Material and Formula	Percent growers using	Percent applied by Ground machines	Airplane	Results and Remarks
Ind.	"Dithane D-14" -spray	50	50		Good
	Bordeaux - spray	10	10		Good
	(mostly as weekly spray schedules - 9-14 applications during season)				
La.	"COCS", dust 12%	5	all	0	Good
	"Dithane Z-78" dust 6% + DDT	15	all	0	Good
	Bordeaux spray 4-4-50	10	all	0	Good
	"Dithane D-14" + zinc sulfate + lime spray 1 1/2-1-1/2-100	20	all	0	Good
Manitoba	Bordeaux spray	-	-	-	-
Md.	Bordeaux spray 8-8-100	30% acreage			Good
	Fixed copper spray 4-100	5% acreage			Good
	Fixed copper dust 5-7% (largely by plane on lower eastern shore)	20			Fair to Good
	"Dithane Z-78"	trace			Good
Mass.	Copper dusts (various), 6-7% Cu	5+	most	trace	Poor to fair
	Bordeaux spray, 10-5-100	40	all	0	Good
	Neutral Copper sprays, 6-7% Cu	15	all	0	Fair to Good
	"Dithane D-14", 2-3 qt.-100	20	all	0	Fair to Good

State or Province	Material and Formula	Percent growers using	Percent applied by Ground machines	Airplane	Results and Remarks
Minn.	Copper dusts	85	most	5	Fair
	Carbamate dusts	5	all	0	
	Copper sprays	5	all	0	Good
	Carbamate sprays	5	all	0	Good
New Brunswick	Sprays -	75% growers	all	0	
	Bordeaux spray, 4-2-40, or 4-4-40	50% acreage			Has given best results.
	Fixed Copper sprays	Most of rest of sprayed acreage			
	"Dithane" spray	small acreage			
	Dusts -	25% growers	all	0	
	Ready mixed Copper basic sulfate	Practically all of dusted acreage			
N. H.	Neutral Copper dusts, 5-7% Cu	50	all	0	Good
	Bordeaux spray or neutral coppers, 10-5-100, 26% Cu, 6-8-100	50	all	0	Good
N. J.	Copper spray, 4 lbs./100 gal. of a 50% Cu	35	all	none	Very good
	Organic sprays, various	5	all	none	Good

State or Province	Material and Formula	Percent growers using	Percent applied by Ground machines	Airplane	Results and Remarks
N. Y. Long Island	Sprays - Bordeaux, copper oxychloride sulfate, tri-basic copper sulfate, "Dithane"				Disease never serious in properly treated fields
	Dusts - Coppers as with sprays				
N. Dak. Red River Valley	Copper dusts	85	90	10	Questionable
	"Dithane D-14" spray	15	all	0.	
Nova Scotia	Dusts				Used only in small gardens
	Basicop spray, mfr.	40	all	0	Good when regularly applied
	Bordeaux spray, 4-2-40	30	all	0	
	Other fixed Coppers	30	all	0	
	"Dithane"	slight	all		
Ohio	Bordeaux spray	Most generally used in commercial			Good
	Fixed copper spray or "Dithane" spray	Gradually increasing			Good
	"Zerlate"	some			Not good
	"Parzate"	some			Good
	Dusting - mostly small gardens				
Ontario (Eastern counties)	Fixed Copper dusts	50	all	none	Good where properly applied
	Bordeaux spray, 10-10-100, 10-5-100	50	all	none	

State or Province	Material and Formula	Percent growers using	Percent applied by Ground machines	Percent applied by Airplane	Results & Remarks
Pa.	Bordeaux spray, 8-4-100	50	all	0	Very fine
	Fixed Copper spray, 2 lbs. metallic Cu per 100 gal.	25	all	0	Very good
	"Dithane D-14" + $ZnSO_4$, 2 qts.- 1 lb.	20	all	0	Good. If period between applications becomes too long, control decreases
	"Parzate", 2 lbs.- 100 gal.	5	all	0	
	Very little dusting				Not so good as sprays
Quebec	Dusts - "COCS"	1	all	0	Fairly good
	Sprays - Bordeaux, 4-4-40	50	all	0	Good
Prince Edward Island	Bordeaux, Tribasic copper sulfate, copper oxychloride sulfate, cuprous oxide ("Perenox"), "Dithane" (small amount), mostly spraying				Control with persistent program
R. I.	Neutral Copper dust, 6% Cu	20	all	0	Fair
	Bordeaux spray, 10-5-100	75	all	0	Good
	Neutral Copper (50%) spray, 4 lbs./100 gal.	4	all	0	Good
	Ethylene bis dithiocarbamates 2 lbs./100 gal.	1	all	0	Good

State or Province	Material and Formula	Percent growers using	Percent applied by Ground machines	Airplane	Results and Remarks
S. C.	Fixed Copper dust, 6% Cu	25	90	10	Satisfactory
	Practically no spraying				
S. Dak.					
Clark area	"Yellow Cuprocide" dust, 30 lbs.	60	50	50	Fair
	"Yellow Cuprocide" spray, 1.5 lbs.	15	all	None	Fair
Watertown area	"Zerlate" spray, 2 lbs.	25	all	0	Poor to fair
	"Yellow Cuprocide" spray, 1.5 lbs.	10	all	0	
	"Dithane" D-14 (spray) 4-1 1/2	5	all	0	
Tenn.	Sprays -				
	Tribasic coppersulfate, 4-100	10	all	0	Fair
	Bordeaux, 8-8-100	Few	all	0	Fair
	"Dithane D-14" -zinc - lime, 2 qts.- 1 1/2-100	Few	all	0	Fair
	Some alternate applications of last two				
	Very little commercial dusting				
Va.					
Blacksburg	Fixed copper dust, 5% Cu with 3% DDT	5			Favorable with all materials
	Bordeaux spray, 8-8-10	1-2			
	"Dithane Z-78"	trace			
Norfolk	Fixed copper dust, 5-7% Cu	75 - 90	95	5	Variable

State or Province	Material and Formula	Percent growers using	Percent applied by Ground machines	Airplane	Results and Remarks
W. Va.	Dusts --				
	"Yellow copperoxide", 4.8% Cu	20	all	0	Fair to poor
	Tribasic coppersulfate, 7% Cu	20	all	0	Good
	Copper lime, 20% Cu - 80% lime	5	all	0	Good
	Sprays --				
	Bordeaux 4-4-50	70	all	0	Good
	Tribasic copper, 53% Cu (4 lb./100 gal.)	20	all	0	Good
	"Dithane"-zinc-lime	1	all	0	Poor
Wis.	Tribasic copper and Copper A dusts	2	50	50	No blight present
	Sprays --				
	"Dithane D-14"	8	all	0	All sprays fair to good. Dusts and sprays all with DDT
	"Parzate 1 1/2"	2	all	0	
	Tribasic copper, 4 lb.	5	all	0	
	Bordeaux 8-12 + 8-12 + 100	40	all	0	

Table 2. CONTROL OF LATE BLIGHT ON TOMATO: MATERIALS USED IN 1948

State or Province	Material and Formula	Percent growers using	Percent applied by Ground machines	Airplane	Results and Remarks
Del.	Fixed Copper dust, (Tribasic; Copper A), 5-7% Cu	80	10	70	Fair
	"Dithane D-14" + zinc sulfate spray, 2 qts.-1-100; "Dithane Z-78" spray, 2-100; "Parzate" spray, 2-100	10	10	0	Good

State or Province	Material and Formula	Percent growers using	Percent applied by Ground machine	Airplane	Results and Remarks
Fla. Indiantown	"Copper A" dust, 7% Cu	30% acreage	0	all	75% loss
	"Copper A" spray, 5-100	30% acreage	all	0	Good
	"Dithane D-14" spray, 2-1 1/2-100	30% acreage	all	0	Good
Belle Glade	"Dithane D-14" spray, 2-1 1/2-100	100% acreage	all	0	Good
Bradenton	"Dithane D-14" + zinc sulfate + lime spray 2 qt.-1 lb.-100 gal.	75	all	0	Mostly used on seed beds. Good results from both.
	"Phygon" spray, 3/4 lb.	10	all	0	
Dade County	Copper dusts and sprays	Little	-	-	Did not give commercial control
	"Dithane D-14" + zinc sulfate + lime, 2-1 1/2-100	90	all	0	Fair to excellent depending on thoroughness of application
Ga. Greenwrap area	Tribasic copper spray, 4-100; Bordeaux 2-2-50	50	all	0	No blight in greenwrap area except slight amount in one location
Certified tomato plant growers	Tribasic copper dust	75			
	" copper spray	25			

State or Province	Material and Formula	Percent growers using	Percent applied by Ground machine	Airplane	Results and Remarks
Ind.	Fixed copper 7% dust	15	5	10	Unsatisfactor
	Fixed copper spray, 4-100	5	5		Fair
	"Dithane D-14" 2-1-100	5	5		Fair
	(ill-timed and insufficient number of applications).				
La.	"COCS" dust, 12%	25	all	0	Good
	"Dithane Z-78" dust, 6% + DDT	5	all	0	Good
	"Bordeaux spray, 4-4-50	35	all	0	Good
Md. Eastern Shore	Fixed Copper (Dust 5-7%)	70% acreage			Good
	Fixed Copper sprays (4-100)	8% acreage			Good
	Bordeaux (8-8-100) "Dithane Z-78" 2-100	2% acreage			Good
	"Dithane D-14" (2qt.-1-100 (about 40% of application on lower eastern shore by air-plane, practically none elsewhere).				
North and West of Bay	Fixed Copper (Dust 5-7%)	20% acreage			Good
	Fixed Copper (Spray 4-100)	20% acreage			Fair to Good
	Bordeaux spray 8-8-100 (some ready mixed)	20% acreage			Good

State or Province	Material and Formula	Percent growers using	Percent applied by Ground machine	Airplane	Results an Remarks
Mass.	Neutral Copper dusts (various), 6-7% Cu	10	all	0	Good from all materials but easy to control
	Neutral Copper sprays (various)	40	all	0	
	Bordeaux spray, 4-4-50	40	all	0	
Mich.	See separate table below for Michigan data				
Miss.	"Copper A" dust, 12-10-78	Less than 10	all	0	Obscured by weather
	"Copper A" spray, 4-96	Less than 10	all	0	
N. H.	Neutral copper dust, 5-7% Cu	All commercial growers	all	0	Good
N. J.	Copper dust, 7% Cu, (ground)	60	50		Good
	14% Cu, (air)				Fair to poor
	Organic dust (various) largely "Zerlate", mostly with Copper in program also	(20) included also with Cu users	50	50	Fair for blight
	Copper spray, 4 lb./100 gal. of a 50% Cu	20	all	None	Excellent to good
	Organic sprays (see dusts)	(7)	all	None	Fair

State or Province	Material and Formula	Percent growers using	Percent applied by Ground machine	Airplane	Results and Remarks
N.Y. Northwestern Canning Section	Insoluble Copper dust (COCS, Copper A, Microgel, Tennessee Tribasic), 7% Cu	2	99	2	Poor
	"Zerlate 2-100 -- Bordeaux 8-4-100 spray schedule	90	all	0	Excellent
	Insoluble Copper Spray (as above), 7% Cu	10	all	0	Excellent
	Also 10% "Zerlate" along with insoluble Copper dust	40 - 60 lbs. of each per acre	few		
Long Island	Sprays -- Bordeaux, "Dithane", or Tribasic Copper Dust -- largely Tribasic Copper				Weather unfav orable to disease
N. C.	Fixed Coppers 6-7% metallic Cu - dust				
	Commercial	50	10	90	Fair
	Home gardens	5	100	0	Good
	Fixed Coppers - 1-2 lbs. metallic Cu per 100 gal.				
	Commercial	0.1	100	0	Good
	Home gardens	2	100	0	Good
N. Dak.	Tribasic Copper dust	1	all	None	Fair
	Tribasic Copper or Bordeaux spray	5	all	None	Fair

State or Province	Material and Formula	Percent growers using	Percent applied by Ground machine	Airplane	Results an Remarks
Nova Scotia	Dusts used only in small gardens				
	Bordeaux spray 4-3-40	Most general	all	0	Excellent
	Fixed Copper spray	--	all	0	Excellent
Ohio	Dust - Copper or "Zerlate" or mixed schedule	Most of affected acreage	Most		Dry weather checked disease
	Bordeaux spray	5			
	Fixed copper spray or dust				Used in home gardens
Pa.	Sprays - "Zerlate" 2 lbs. per 100 in 2 to 3 sprays + Copper (2 lb. metallic Cu as fixed Cu per 100 or 6-3-100 Bordo)	85	all	0	Good
	"Dithane D-14" + zinc sulfate 2 qts.-1 lb. or "Parzate" 2 lbs.	10	all	0	Nearly as good as "Zerlate - Copper when used often enough
	Dusts - "Zerlate + copper	5	5	95	Medium
S. C.	Fixed Copper dust, practically no spraying, 6% Cu	15	90	10	Fair to good

State or Province	Material and Formula	Percent growers using	Percent applied by Ground machine	Percent applied by Airplane	Results and Remarks
Tenn.	Fixed Copper dust, 7% Cu	10	Hand machined	0	Poor - possibly application
	Bordeaux spray 8-8-100	Few	"	0	
	"Dithane D-14" - zinc - lime, 2 qts.-1 1/2-100	Few	"	0	
Va. Blacksburg	Fixed Copper dust, 5% Cu	15	all	0	Satisfactory if properly used but poor in general. Frequent applications necessary.
	Bordeaux spray, 4-4-100	Trace	all		Very good
	Fixed copper spray, 1 lb./100	"	all		Very good
	"Dithane Z-78" spray	Trace	all		Very good
	"Parzate" spray	"	all		Very good
Norfolk	Fixed Coppers 5-7% Cu	50	90	10	Blight of no importance except early in season
W. Va.	Dusts --				
	Yellow copper oxide, 4.8% Cu	25	all	0	Fair
	Tribasic copper sulfate, 7% Cu	40	all	0	Good
	Copper-lime, 20% Cu-80% lime	10	all	0	Fair
	Sprays --				
	Tribasic copper sulfate, 53% Cu (4 lb./100 gal.)	50	all	0	Good
	Bordeaux 4-4-50	50	all	0	Good

State or Province	Material and Formula	Percent growers using	Percent applied by Ground machine	Airplane	Results and Remarks
Wis.	Tribasic Copper, 4 lb.	5	all	0	
	Bordeaux 8-12 + 8-12+ 100	40	all	0	

Michigan

MATERIALS USED BY CANNING COMPANIES IN TOMATO LATE BLIGHT CONTROL IN MICHIGAN

Company total tomato acreage	Acreage treated	Material used	Method of application	Results
1600	100	Dithane	spray	Failed to control late blight unless applied 5 day intervals
	300	Tribasic copper	spray	Controlled blight when applied 7 to 10 day intervals
	500	Tribasic copper	Aeroplane dusted	Controlled blight
	200	Tribasic copper	Ground dusted	Controlled blight
1000	250	Bordeaux	spray	No late blight present
	125	Zerlate	spray	No late blight present
	125	Fixed copper	spray	No late blight present
400	150	Dithane	dust (ground)	Late blight either negligible or control good
	50	Fixed copper	dust (ground)	Late blight either negligible or control good
300	300	None		No late blight present

Continued

Company total tomato acreage	Acreage treated	Material used	Method of application	Results
300	150	Alternating Zerlate and cuprocide	Ground dusted	Slight late blight
250	200	Tribasic Copper	Ground dusted	Slight late blight; control good
250	150	Tribasic Copper	Ground dusted	Late blight control good

Table 3. CONTROL OF TOBACCO BLUE MOLD: MATERIALS USED AND EFFECTIVENESS IN 1948

State or Province	Material and Formula	Percent growers using	Results
Conn.	"Fermate" 1-50	90	Excellent
	"Dithane Z-78" 1-48	1	Good
	"Phygon" 1-50	Tests	Severe leaf burning
	Oxyquinoline benzoate 1/2 - 50	Tests	Stunting and leaf burn
Fla.	"Fermate" dust (20% "Fermate", 80% talc)	75	Satisfactory when used as recommended
	"Parzate" dust, 10%	Tests	Infection too slight to judge
Ga.	"Fermate" spray, 4 lbs.-100 gal., and dust, 15%	82	Almost perfect commercial control with all materials.
	Bismuth subsalicylate spray "Dithane Z-78" spray "Dimole" ("Fermate" - salicylic acid mixture)	3	

State or Province	Material and Formula	Percent growers using	Results
Ky.	Prepared to use "Fermate" spray or dust or "Dithane Z-78" dust		Very little used because of very mild attack
Md.	"Fermate" (15% dust)	70	Excellent
	"Fermate" spray (2,4-100)	5	Excellent
	Other organics	Trace	Mostly tests; results variable, mostly good
Mass.	"Fermate" spray 2-100	75	Good
	"Fermate" dust 20%	5	Good
	Paradichlorobenzene used occasionally along with "Fermate" to eradicate the fungus from infected beds		Good
N. C.	"Fermate" spray 4-100 "Fermate" dust 15% "Dithane Z-78" 3-100	46	Excellent where applied properly
Ontario	"Fermate" spray 2-40	65	Good
	"Fermate" dust (Mfr.)	25	Good
	Paradichlorobenzene 3 lb.-100 sq. yds.	4	Good (where properly used)
	Benzyl salicylate (aerosol bomb)	Less than 1	Uncertain (minor injury)
Pa.	"Fermate" spray	65 or more	
	Bordeaux 8-4-100 Copperspray (2 lb. Cu-100 gal.)	15	
S. C.	"Fermate" dust 15%	95	Good to excellent

State or Province	Material and Formula	Percent growers using	Results
Tenn.	"Fermate" spray 2-4/100	Most	Fair
	"Fermate" dust 15%	Some	?
Va.	"Fermate" spray 3-100	50	Good
	"Fermate" dust 15%	10	Good
	"Parzate" dust and spray	Trace	Good
W. Va.	"Fermate" spray 2-100	40	Good
	"Fermate" dust	40	Good
Wis.	"Fermate" spray in experimental spraying	7 farms	Disease was not found in survey of tobacco area.

Table 4. CONTROL OF DOWNY MILDEW OF CUCURBIT CROPS: MATERIALS USED IN 1948

State	Fungicide and Formula	Percent growers using	Results
Del.	"Dithane Z-78" dust, 6%	5	
	"Dithane Z-78" spray, 2-100	5	Downy mildew not much factor in 1948
	"Zerlate dust", 8-10%	70	
	"Zerlate spray", 2-100	5	
Fla. Bradenton	Copper dusts, 7% Cu	20	Poor
	"Parzate" dust, 5% active in pyrophyllite	15	Poor
	"Dithane D 14" + zinc sulfate + lime spray, 2-1-1/2-100	50	Both sprays good where application thorough
	"Zerlate" spray, 2-100	15	
Dade Co.	"Dithane D-14" + zinc sulfate + lime, 2- 1 1/2-100	one grower	Good

State	Fungicide and Formula	Percent growers using	Results
Ga.	Bordeaux spray, 2-2-50 Tribasic Copper, 4-100	Very few	
La.	"Fermate" dust, 10-100	5	Good
	Copper dust, 7% Cu	50	Good
	Bordeaux spray, 4-4-5	40	Good; moderate injury
Md.			
Lower Eastern Shore	Fixed coppers (5-7% dust)	15% acreage	Downy mildew was not a problem in 1948. Macrosporium leaf spot was widespread. Copper compounds gave fair to poor control and Zerlate poor control of this disease.
	"Zerlate (10% dust)	trace % acreage	
Central Eastern Shore	Bordeaux (6-3-100) spray	55% acreage	
	Fixed copper (4-100) spray	10% acreage	
	Zerlate (2-100) spray	20% acreage	
	Fixed copper dust (4-7% "Zerlate" dust 10%	10% acreage	
N. C.	Tribasic Copper sulfate 5% metallic Cu	15 - 20	Good
Pa.	Copper sprays and bis carbamates		Good. Probably over 75% of commercial growers sprayed or dusted.
Tenn.	On muskmelon - "Copper A" spray, 2-100	Plots	Obscured by weather
Va.			
Blacksburg	Fixed Copper dust, 5% Cu	10	Good
Norfolk	Fixed Copper dust, 5-7% Cu	10	Mildew too late to determine.

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SUPPLEMENT 179

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The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

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