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THE PLANT DISEASE REPORTER

Issued By

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 178

THE WARNING SERVICE IN 1948
TOBACCO BLUE MOLD - POTATO AND TOMATO LATE BLIGHT - CUCURBIT DOWNY MILDEW

Supplement 178 December 30, 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.

PLANT DISEASE REPORTER SUPPLEMENT

Issued by

THE PLANT DISEASE SURVEY
DIVISION OF MYCOLOGY AND DISEASE SURVEY

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

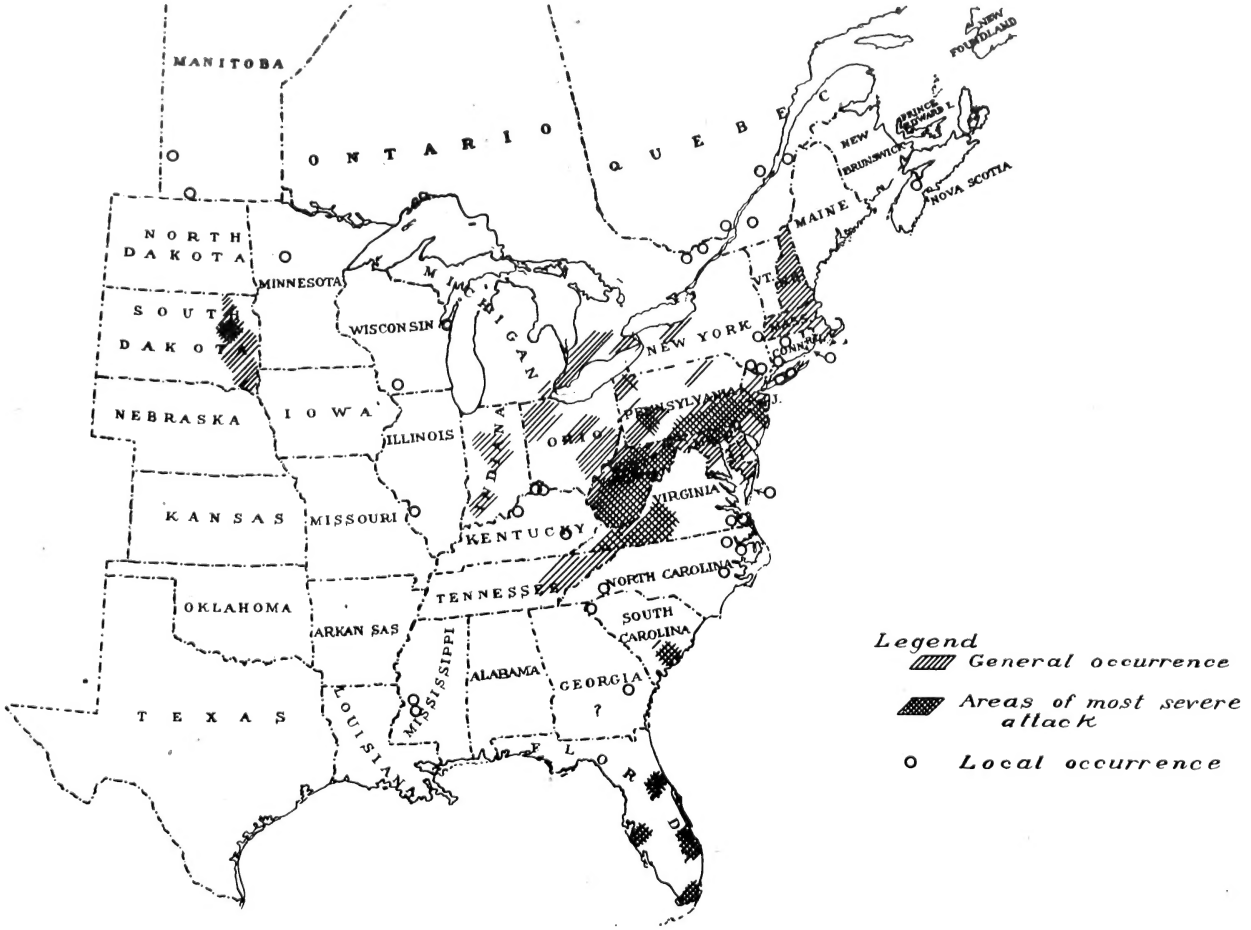

Fig 1. DISTRIBUTION and IMPORTANCE of TOMATO LATE BLIGHT in 1948

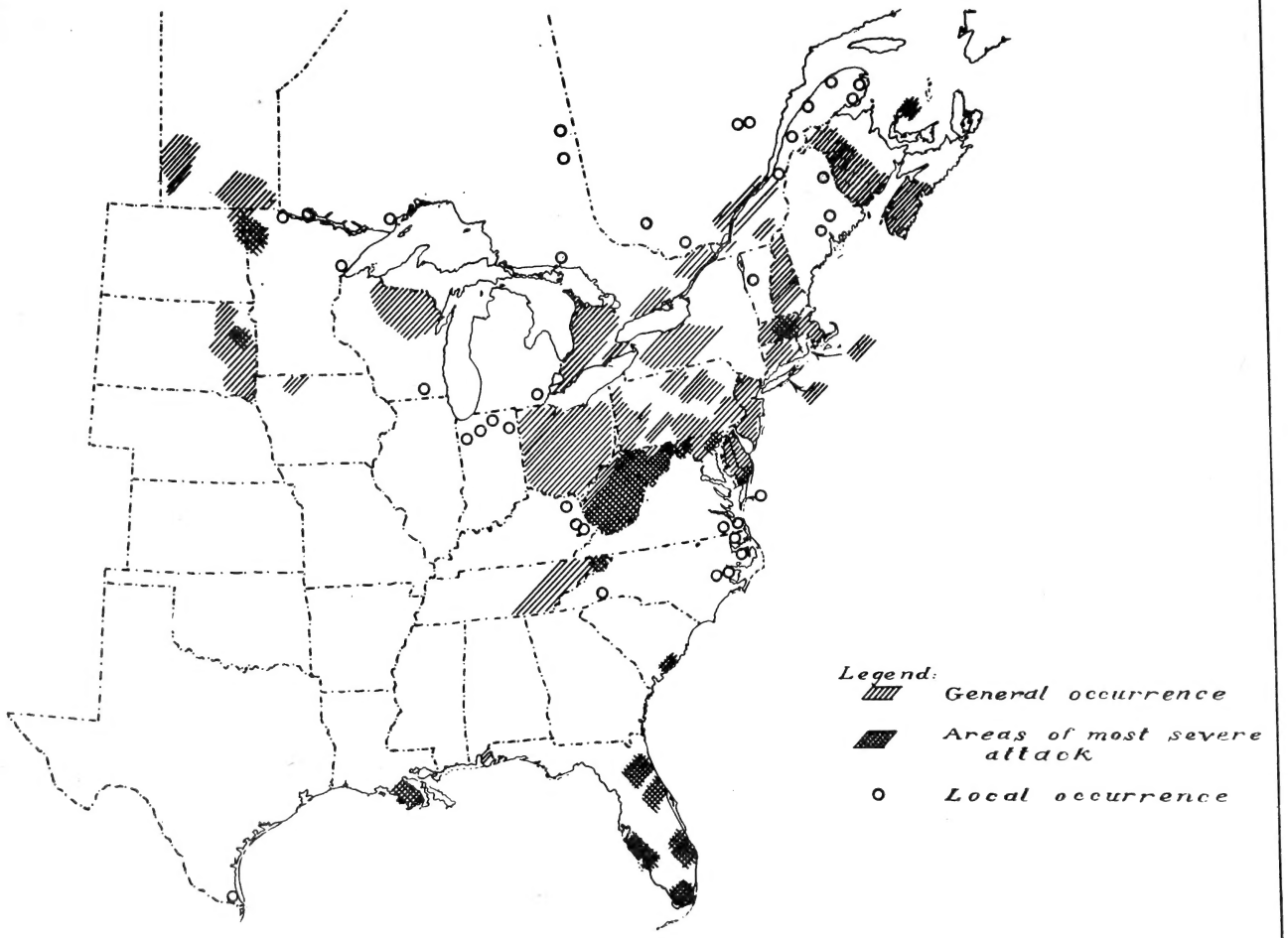

Fig 2. DISTRIBUTION and IMPORTANCE of POTATO LATE BLIGHT in 1948

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 developed 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 wet, 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

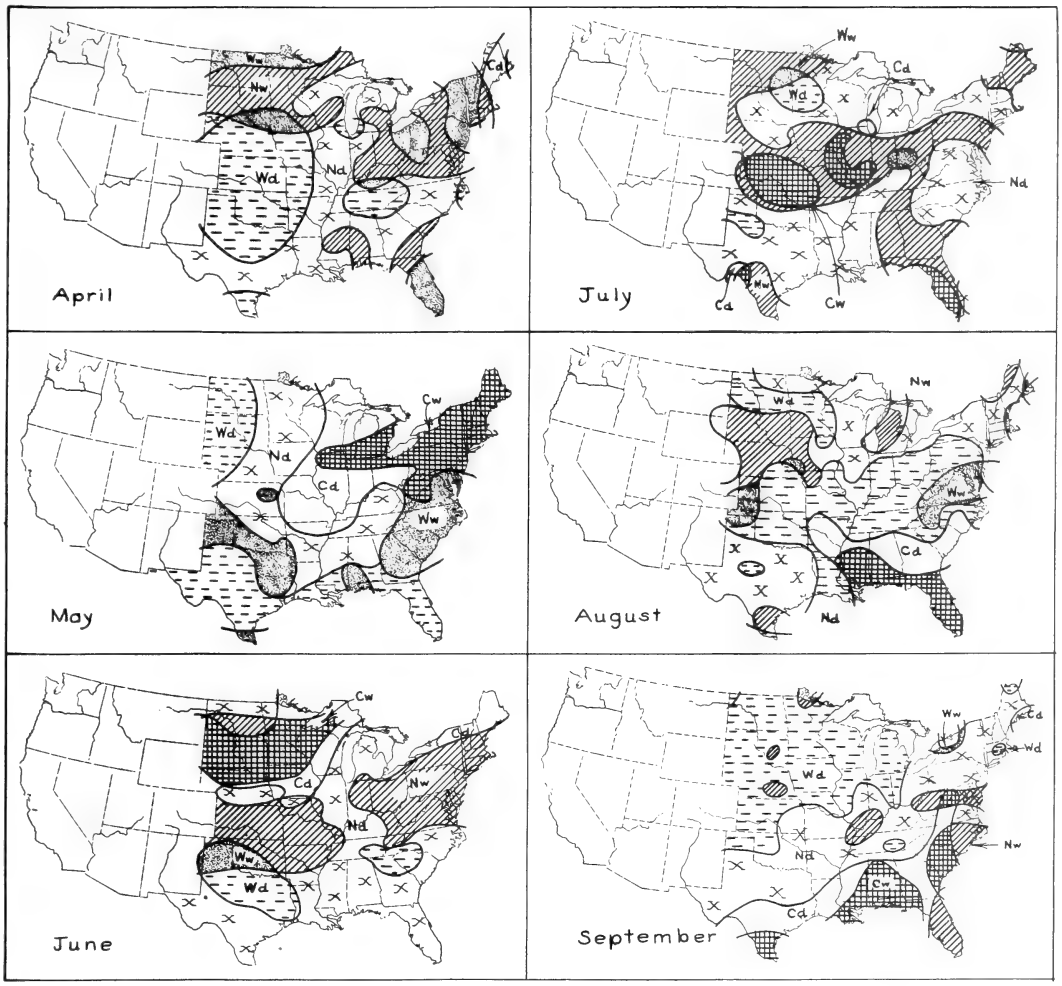

Fig. 5 - MONTHLY WEATHER CONDITIONS - April through September 1948

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

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 wereequal 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	Percent applied by 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	Percent applied by 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 2L 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 foreport 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
Parzate – 2 lbs. per 100 gallons	5	100		) and poorer.

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 ground machine	Percent applied by* air-plane	** Results	Acres involved**
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	2000
Yellow cuprocide (spray)	1.5"	10	100		to fair	
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%.

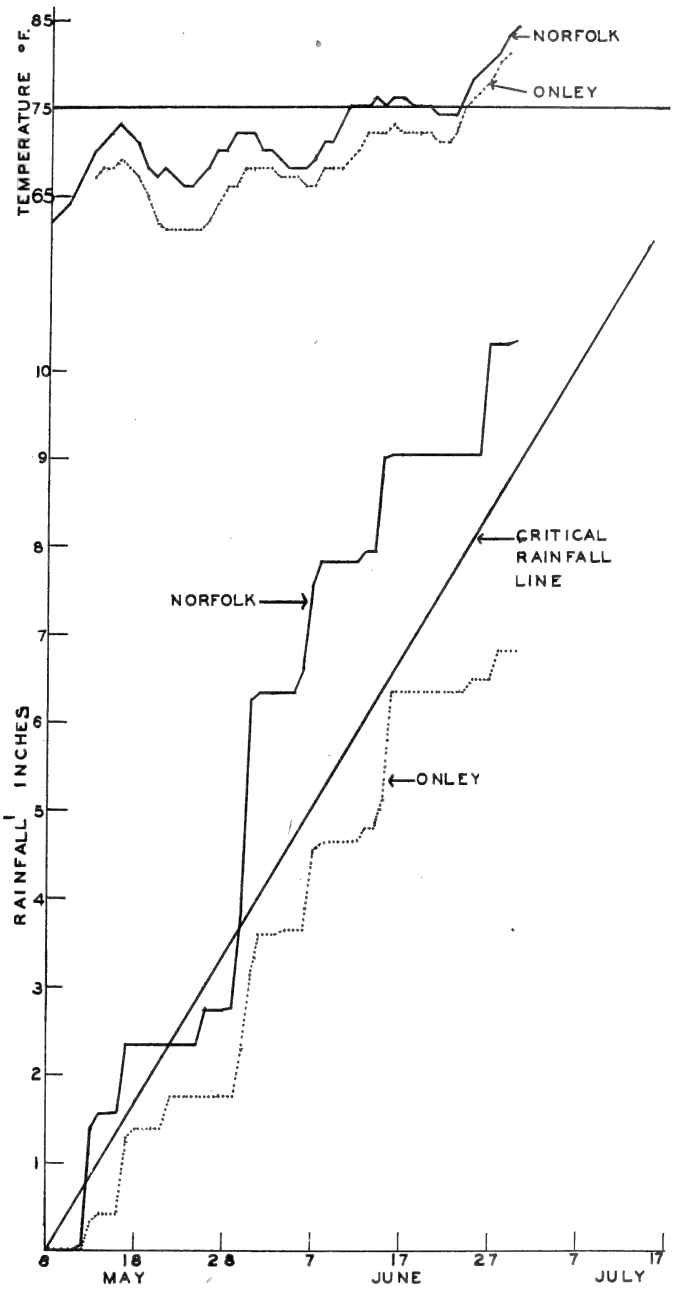

Fig. 6. The cumulative rainfall and temperature conditions in 1948 for Norfolk and Onley, Virginia, compared with conditions considered as critical for Late Blight

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 inititated 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."

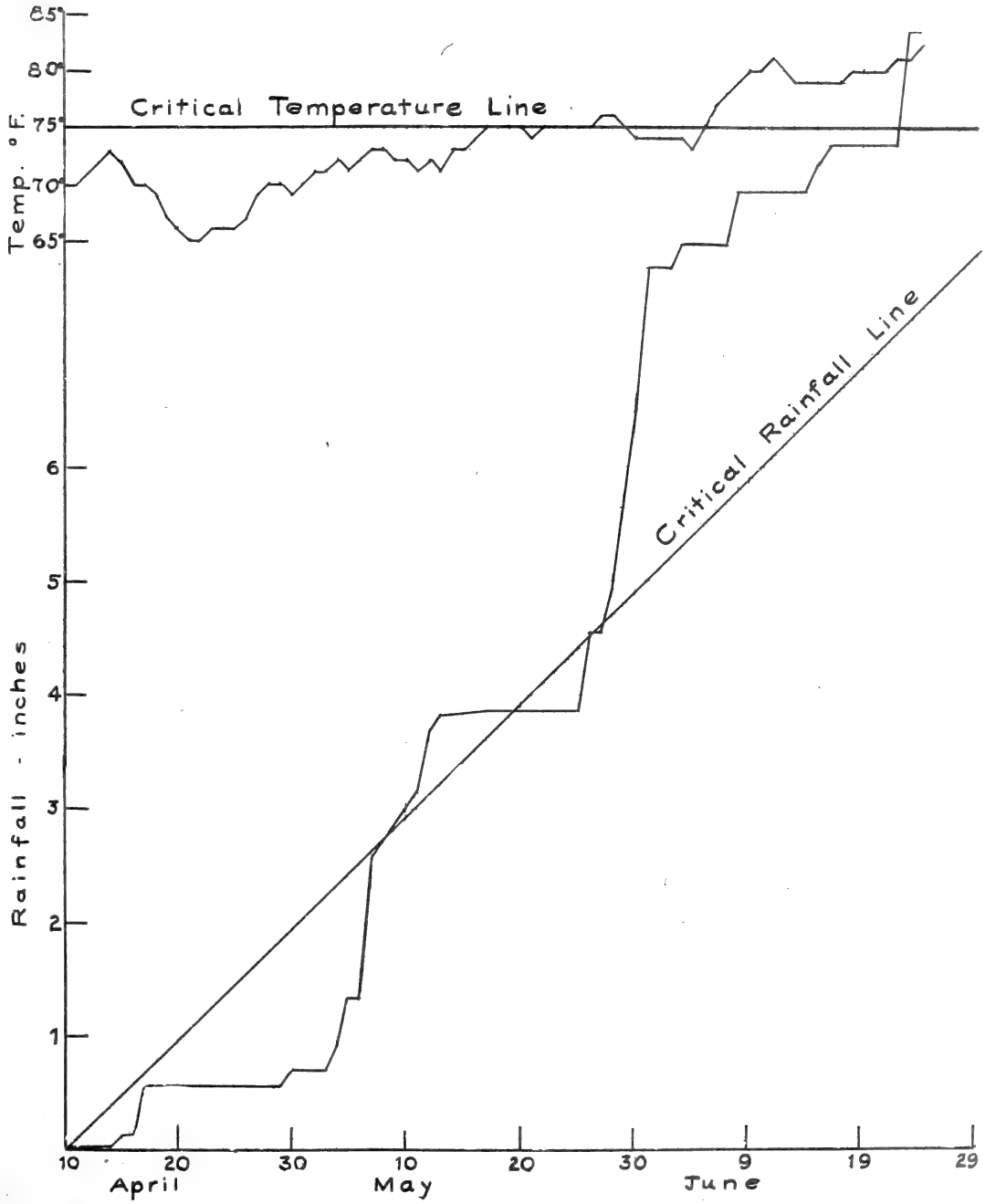

Fig 7. Forecasting Chart for the Charleston, South Carolina, area for 1948

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	airplane	Results
DUSTS					
Indiantown CuA	7% Cu	30	0	100	75% loss

Fungicide	Formula	Percent growers using	Percent applied by Ground machine	Percent applied by 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

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 soils in the

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 100 gallons water
Zerlate	2 lbs. to 100 gallons water
Bordeaux	8-4-100
Zerlate	2 lbs. to 100 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 CARCLINA 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% metallic cu.	50	10	90	Fair
Home Gardens:					
Fixed coppers	" "	5	100	0	Good
SPRAYS					
Commercial:					
Fixed coppers	1-2 lbs. 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 CARCLINA STATE COLLEGE
RALEIGH, NORTH CARCLINA

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 : Air-machine: 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	Percent applied by 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. Cxyquinoline 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 W. 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	Percent applied by 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	Percent applied by 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			
	Basic copper sulfate dust - 6-10%	70	95	3	
	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	Percent applied by 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
	"Dithene 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	Percent applied by 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	Percent applied by Airplane	Results and Remarks
N. Y. Long Island	Sprays - Bordeaux, copper oxychloride sulfate, tribasic 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	Percent applied by Airplane	Results and Remarks
S. C.	Fixed Copper dust, 6% Cu Practically no spraying	25	90	10	Satisfactory
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	Percent applied by 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	Percent applied by 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	10	10	0	Good
	"Dithane Z-78" spray, 2-100				
	"Parzate" spray, 2-100				

State or Province	Material and Formula	Percent growers using	Percent applied by Ground machine	Percent applied by 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	Percent applied by Airplane	Results and Remarks
Ind.	Fixed copper 7% dust	15	5	10	Unsatisfactory
	Fixed copper spray, 4-100	5	5		Fair
	"Dithane D-14" 2-1-100 (ill-timed and insufficient number of applications).	5	5		Fair
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 airplane, 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	Percent applied by Airplane	Results and 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) 14% Cu, (air)	60	50		Good 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	Percent applied by 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 unfavorable 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 and 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	Percent applied by 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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