SUMMARY OF RECENT PROGRESS IN PREDICTING LATE BLIGHT EPIDEMICS IN UNITED STATES AND CANADA

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Detailed histories of late blight, Phytophthora infestans (Mont.) de Bary, forecasting have been summarized by Miller and O'Brien (9,10), Bourke (1), Miller (8) and Cox and Large (4).

Presently, regional late blight epidemic prediction is underway at three centers in the United States (University Park, Pennsylvania; Raleigh, N.C. and Ames, Iowa). Some late blight warnings are issued regularly during the growing season in Canada. All the aforementioned predictions and warnings are recorded periodically during the growing season in the Plant Disease Situation, a letter issued by the Crops Research Division of the United States Department of Agriculture.

Some local late blight forecasting was conducted in Minnesota, Nebraska and New York during 1960.

Progress in forecasting late blight epidemics in the various regions is summarized herein.

NORTHEASTERN STATES

Hyre (5,6,7) in forecasting for the Northeastern States and 2 Canadian provinces uses a modification of Cook's "moving" temperature and rainfall method.

Generally, Hyre forecasts late blight after 10 consecutive blight favorable days. A favorable day occurs when the 5-day mean temperature is less than 78 F and the 10-day rainfall is ≥ 1.20 inches. Any day was considered unfavorable if the minimum temperature was less than 45 F. However, one day unfavorable because of temperature was not allowed to interrupt the count of consecutive favorable days. It was simply omitted. The disease was expected one or two weeks after it was forecast. Once the blight fungus was established, 10 favorable days were no longer required for its spread. The requirements for further spread were not stated.

The above method operated as follows: temperature and rainfall data collected from first-order stations in each of the Northeastern States by the U.S. Weather Bureau were sent to regional headquarters at Newark, Delaware. The weekly analyses were made there and mimeographed forecasts disseminated weekly to the national office at Beltsville, Maryland, and to key pathologists in each of the states in the region. The forecasts

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included information pertaining to late blight incidence in the region, solicited from the key pathologists, growers, canners and other interested parties. The key pathologists disseminated the information at their discretion. At the national level, the forecasts were included in the weekly Plant Disease Situation which is sent to designated key plant pathologists in the United States and Canada.

In 1958, Hyre\(^3\) issued forecasts for 9 locations in the Northeastern states. Blight predictions were accurate for 6 of the 9 locations. In the other 3 cases, the results were uncertain and indefinite.

In 1959, Hyre\(^4\) made weekly forecasts for 9 locations. His predictions were accurate for 8 locations. This was 89% accuracy. Apparently the disease sometimes appeared as much as a month after it was predicted (5).

In the Northeastern States (several Canadian stations included) in 1960, 14 weekly late blight forecasts for tomatoes and potatoes were made. On potatoes, the forecasts were rated correct in 5 principal production areas and uncertain in 3. On tomatoes, they were incorrect in the one area in Ohio. Hyre noted the difficulties encountered in evaluating forecasting methods and specifically referred to such unknowns as inoculum and the application of protective sprays.

Thurston, Knutson, and Eide (13) tested Hyre's criteria in Minnesota. Analysis of 4-years' data, indicated that the criteria would have predicted blight incidence accurately.

**NORTH-CENTRAL STATES**

`Late blight "gardens":`

Late blight "gardens" have been a part of the late blight forecasting in the North-Central states since 1948. During 1948-1955, inclusive, weather-late blight studies were conducted in foliage-inoculated gardens of 1/20 acre in Iowa, Indiana, and Minnesota, to relate disease spread to meteorological conditions in an attempt to identify blight-favorable conditions on a hygrothermograph chart. The potato or tomato plants were inoculated when they were 12 inches high and the development of the blight fungus was followed throughout the life of the garden and the temperature and moisture conditions related to spread were recorded. In some gardens, the plants were killed and in others weather conditions arrested the fungus.

During the period 1956-1960, late blight epiphytotics were induced and documented in "tuber inoculated gardens" of approximately 1/20 acre. Young shoots arising from potato seed pieces hypodermically inoculated with an aqueous suspension of *Phytophthora infestans* sporangia were observed periodically for blight symptoms. Each seed piece was punctured twice. Usually, positive late blight symptoms appeared within 10-30 days on the survivors with an average of 17 days after emergence, depending upon weather conditions.

The late blight "gardens" served as observation points for anticipating disease development in the surrounding areas. In general, when the disease appeared in the "gardens", it was in the same stage of development in

\(^3\)Mimeographed release from Russell A. Hype, 1958.