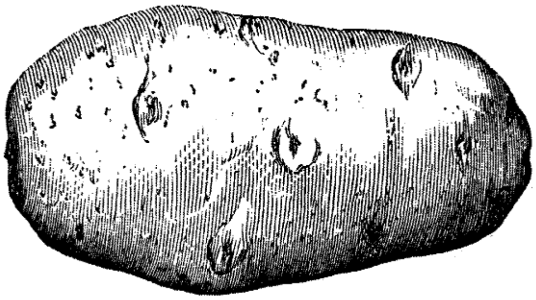
Potato Facts



Late Blight Prediction in Maine

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Potato late blight is one of the most destructive foliar diseases on potatoes and has been reported for more than 150 years. Few plant diseases have resulted in the widespread misery and despair produced by potato late blight. Potato late blight is caused by *Phytophthora infestans*; a fungus-like organism that overseasons in infected tubers, cull piles, and in infected volunteer plants.

Potato late blight is a community disease and continues to pose a threat. All potato growers should monitor their fields continually for this disease. The main sources of initial inoculum are cull piles or infected seed. The most effective—as well as cost-effective— way to control this disease is through control of initial inoculum. For this reason, growers should give careful attention to all sources of inoculum including seed, cull piles, rock piles, and other sources of volunteer potatoes. The ability of the pathogen to travel long distances dictates that a protectant spray program is needed.

Late blight control in Maine depends on proper application—timing, rate, and coverage—of protectant materials. The use of predictive models can permit late blight control with fewer, timelier chemical applications, which will help control costs and reduce chemical inputs to the environment.

Assessing the potential for late blight

Fungicide applications to control late blight should be based on weather conditions, not on a calendar. In most years, a calendar-based program applying fungicides weekly may start fungicide applications earlier than needed. In many years, portions of the growing season may need fungicide applications more frequently than once per week, while other portions of the growing season may need fungicide applications less frequently than once per week. Application of late blight control materials should be based on a predictive model in order to be efficient and effective.

In Maine, the potential for late blight to appear is predicted with severity values. Severity values are based on weather conditions and accumulate when they are

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appropriate for the development of the pathogen. The environmental conditions conducive to late blight development are generally mild and wet.

The computer model "NoBlight" was developed in Maine and is used to guide the initiation and subsequent applications of fungicides for control of potato late blight in Maine. NoBlight is based on "Blitecast," which uses Wallin's model of severity value accumulation. Wallin severity values are derived from various combinations of the hours with a relative humidity of 90 percent or greater and the average temperature during those periods. The duration of continuous periods of relative humidity of 90 percent or greater is tracked and the average temperature during these periods is calculated. Severity values are assigned based on these measurements and calculations, and are accumulated in the manner demonstrated in Table 1. The first occurrence of late blight is predicted seven to ten days after 18 severity values have accumulated. The NoBlight model initiates accumulation of severity values starting at 50 percent plant emergence. NoBlight, like Blitecast, weights relative humidity more heavily than rainfall in predicting the timing of the applications. Close study of Table 2 will reveal that the spray interval becomes shorter with the accumulation of 1.18 inches of rain over the previous seven days under the same number of accumulated severity values.

NoBlight differs from Blitecast in the accumulation of severity values based on relative humidity. NoBlight does not stop accumulating conducive conditions where the relative humidity drops below 90 percent. NoBlight uses 76.5 percent relative humidity to discontinue accumulation of conducive infection conditions. Usually, this adds a half hour or more onto the typical Wallin hours. Typically, this is a dewy morning period in Maine summers. More importantly, this does not discontinue the accumulation of conducive conditions when the relative humidity drops to 88 percent for a period of time. In effect, the severity values accumulated by NoBlight are more conservative that the Wallin severity values.

As can be seen from Table 1, three separate six-hour periods of relative humidity greater than 90 percent will not accumulate any severity values. However, an 18-hour period of relative humidity greater than 90 percent will accumulate severity values, depending on the average temperature during that period (3 severity values at 65°F, 2 at 56°F, 1 at 50°F, and 0 at 40°F or 85°F).

Once 18 severity values have accumulated after emergence, a fungicide application is recommended. After that time, the recommended application interval is based on additional severity value accumulation during the previous seven days in the manner described in Table 2. Fungicide treatment for the prevention of late blight should begin immediately if the disease is developing from seed or has otherwise been sighted in the field or nearby fields.

As with any model, NoBlight is no better than the data it analyzes. The value of a predictive model is to provide the user with a reliable estimate of when conditions are conducive for late blight development and when conditions are not conducive for late blight development. The model provides some guidance on when a grower can stretch spray intervals with minimal risk, as well as when the spray interval needs to be reduced because the crop is at risk.

Table 1. Calculation of Severity Values

Temperature °F	Hours of 90% or higher relative humidity (RH)				
45–54	<15	16–18	19–21	22–24	25–27
55–59	<12	13–15	16–18	19–21	22–24
60–81	< 9	10–12	13–15	16–18	19–21
SV	**0**	**1**	**2**	**3**	**4**

At 45–54°F, >27 hrs. 90% RH

$$SV = \frac{\text{Total hours} - 1}{3} - 4$$

At 55–59°F, >24 hrs. 90% RH

$$SV = \frac{\text{Total hours} - 1}{3} - 3$$

At 60–81°F, >21 hrs. 90% RH

$$SV = \frac{\text{Total hours} - 1}{3} - 2$$

Table 2. Calculation of Spray Intervals Based on Severity Values

7-Day Severity Value Accumulation	7-Day Severity Value Accumulation	Spray Interval
(< 1.18 inches of rain)	(≥1.18 inches of rain)	
≥6	≥5	5 day
≥5 <6	≥4 <5	7 day
>4 <5	>3 <4	10 day
≤4	≤3	10–14 day