EXAMPLES OF PLANT DISEASE

FORECAST SYSTEMS

Generally, it is useful to have the maximum amount of

information that is available about a disease before

venturing to predict its development. In many cases,

however, one or two of the factors that affect disease

development predominate so much that knowledge of

them is often sufficient for the formulation of a reasonably

accurate forecast. Thus, forecasting systems of

several plant diseases use the amount of the initial inoculum

as the criterion. Such diseases include Stewart’s wilt

of corn, blue mold of tobacco, fire blight of apple and

pear, pea root rot, and other diseases caused by soilborne

pathogens such as *Sclerotium* and cyst nematodes.

Forecasting systems of diseases such as the late blight of

potato, *Cercospora* and other leaf spots and the downy

mildew of grape use the number of infection cycles or

the amount of secondary inoculum as the criterion.

Forecasting systems of still other diseases, e.g., apple

scab, black rot of grape, cereal rusts, *Botrytis* leaf blight

and gray mold, and sugar beet yellows, use the amount

of the initial inoculum and the number of infection

cycles or the amount of secondary inoculum as criteria.

**Forecasts Based on Amount of Initial Inoculum**

In Stewart’s wilt of corn [caused by the bacterium

*Erwinia (Pantoea) stewartii*], the pathogen survives the

winter in the bodies of its vector, the corn flea beetle.

Therefore, the amount of disease that will develop in a

growing season can be predicted if the number of

vectors that survived the previous winter is known, as

that allows an estimation of the amount of inoculum

that also survived the previous winter. Corn flea beetles

are killed by prolonged low winter temperatures. Therefore,

when the sum of the mean temperatures for the

three winter months December, January, and February

at a given location is less than -1°C, most of the beetle

vectors are killed and so there is little or no bacterial

wilt during the following growth season. Warmer

winters allow greater survival of beetle vectors and proportionately

more severe wilt outbreaks the following

season.

In the downy mildew (blue mold) of tobacco (caused

by the oomycete *Peronospora tabacina*), the disease in

most years is primarily a threat to seedbeds in the

tobacco-producing states. When January temperatures

are above normal, blue mold can be expected to appear

early in seedbeds in the following season and to cause

severe losses. However, when January temperatures are

below normal, blue mold can be expected to appear late

in seedbeds and to cause little damage. If the disease is

expected in seedbeds, control measures can be taken to

prevent it from becoming established, and subsequent

control in the field is made much easier. Since 1980, a

supplementary blue mold warning system has been

operated in North America by the Tobacco Disease

Council and the Cooperative Extension Service. The

warning system keeps the industry aware of locations

and times of appearance and spread of blue mold and

helps growers with the timing and intensity of controls.

In pea root rot (caused by the oomycete *Aphanomyces*

*euteiches*) and in other diseases caused by soilborne

fungi and some nematodes, the severity of the disease in

a field during a growing season can be predicted by

winter tests in the greenhouse. In these tests, susceptible

plants are planted in the greenhouse in soil taken from

the field in question. If the greenhouse tests show that

severe root rot develops in a particular soil, the field

from which the soil was obtained is not planted with the

susceptible crop. However, fields whose soil samples

allow the development of little or no root rot can be

planted and can be expected to produce a crop reasonably

free of root rot. With some soilborne pathogens,

such as fungi *Sclerotium* and *Verticillium* and the cyst

nematodes *Heterodera* and *Globodera*, the initial inoculum

can be assessed directly by isolating the fungal sclerotia

and nematode cysts and then counting them per

gram of soil. The greater the number of propagules, the

more severe the disease produced.

In fire blight of apple and pear (caused by the bacterium

*Erwinia amylovora*), the pathogen multiplies

much more slowly at temperatures below 15°C than at

temperatures above 17°C. In California, a disease outbreak

can be expected to occur in the orchard if the daily

average temperatures exceed a “disease prediction line”

obtained by drawing a line from 16.7°C on March 1 to

14.4°C on May 1. Therefore, when such conditions

occur, application of a bactericide during bloom is indicated

to prevent an epidemic.