**Forecasts Based on Amounts of Initial and**

**Secondary Inoculum**

In apple scab (caused by the fungus *Venturia inaequalis*),

the amount of initial inoculum (ascospores) is usually

large and is released over a period of 1 to 2 months

following bud break. Infections from the primary

inoculum must be prevented with well-timed fungicide

applications during blossoming, early leafing, and fruit

development; otherwise, the entire crop is likely to

be lost. After primary infections, however, secondary

inoculum (conidia) is produced, which multiplies itself

manyfold with each succeeding generation. The

pathogen can infect wet leaf or fruit surfaces at a range

of temperatures from 6 to 28°C. The length of time that

leaves and fruit need to be wet, however, is much shorter

at optimum temperatures than at either extreme (9

hours at 18–24°C versus 28 hours at 6 to 28°C). By

combining temperature and leaf wetness duration data,

the apple scab forecast system can predict not only

whether an infection period will occur, but also whether

the infection periods will result in light, moderate, or

severe disease (Fig. 8-24). Such information, collected

and analyzed by individuals or by weather-sensing

microcomputers, is used to make recommendations to

growers. The latter are advised of the need and timing

of fungicide application and about the kind of fungicide

(protective or eradicant) that should be used to control

the disease.

In wheat leaf and stem rusts (caused by fungi *Puccinia*

*recondita* and *Puccinia graminis*), short (1–2 week)

forecasts of subsequent disease intensity can be obtained

by taking into account disease incidence, stage of plant

growth, and spore concentration in the air.

In many insect-transmitted virus diseases of plants

(e.g., barley yellow dwarf, cucumber mosaic virus, and

sugar beet yellows), the likelihood, and sometimes the

severity, of epidemics can be predicted. This is accomplished

by determining the number of aphids, especially

viruliferous ones, coming into the field at certain stages

of the host growth. A number of the aphids caught in

traps placed in the field are tested for virus by allowing

them to feed on healthy plants or by analyzing them for

virus serologically with the ELISA technique or with

nucleic acid probes. The more numerous the viruliferous

aphids and the earlier they are detected, the more

rapid and more severe will be the virus infection. Such

predictions can be improved by taking into account late

winter and early spring temperatures, which influence

the population size of the overwintering aphid vectors.