Natural exposure may not provide reliable disease exposure, if the disease does not occur in epidemic proportion every year. Although natural exposure is essential in the long run to demonstrate whether strains exist that will overcome the resistance, the range of virus strains that occur in a particular region may be limited. Furthermore, natural exposure in small plots is not reliable for viruses whose epidemiology depends on a few initial infection centers in the field and efficient plant-to-plant dispersal from those infection centers. With such viruses, entire plots may escape exposure if an initial infection is not established in the plot. Natural exposure should involve large plots, should be conducted at multiple locations, should be limited to the few lines in final evaluation for commercialization, and may be associated with yield testing.

A problem in natural exposure trials for a vectored virus is that the susceptible control plots may provide a source of disease pressure to the resistant test lines that would never be encountered in a commercial situation or in a solid stand of the resistant line. This exposure may be limited, depending on mobility of the vector, using border rows of immune plants or a barrier screen. If the problem cannot be controlled, it is best to eliminate the susceptible control plots and compare the performance of resistant lines with susceptible control plots that receive commercial vector control practices, or with a standard for susceptible control plants established at a safe distance from the test plots.

Data taken in natural exposure trials should focus on a comprehensive view of the extent to which the resistance is likely to reduce the influence and cost of disease on the commercial crop. Performance of the transgenic lines should be compared with that of the parental line grown under the best of current disease control practices. The incidence and severity of virus disease, appearance of resistance-breaking strains, undetected defects, like an unusual susceptibility to a different disease, and ability to match yield and quality standards of the parent cultivar are important characteristics to record.

3.3.3.5. Virus Spread Tests

If most infection within a field is disseminated from relatively few infection centers within the field itself, resistance to spread of virus from one plant to another could provide practical resistance. If the virus depends on mechanical transmission for dissemination, resistance to its spread can be tested in small plots by measuring the rate of virus spread in both directions from a centrally infected plant in a row. The influence of various machines and of workers that spread viruses mechanically as they operate in the field is easily measured in this manner. If the virus is vector-dependent, and the vector is relatively mobile and spreads the virus intermittently from one plant to another some distance away, resistance to spread of virus cannot be tested in small plots. However, if