Resistance based on some form of repression of transmission can usually be demonstrated by showing that the plant is susceptible when an alternative means of transmission is used.

3.3. Plant Testing

The objective in field testing is to identify lines that retain or improve the original parental qualities and are also resistant to the virus disease.

3.3.1. Field Screen Tests

To save time and resources, it is important to eliminate lines that are obviously susceptible, or that have disqualifying type and yield defects, as early as possible in the resistance selection process. A field screen test involving in vitro-propagated plants is recommended for this purpose, since it is easier to handle the large numbers of plants required in a field test than under controlled conditions, and results are more reliable. This test usually involves intentional inoculation with the homologous virus, but natural exposure could be used in instances when exposure is reliable. Major quantitative deviants are often apparent by their lack of vigor during in vitro propagation and in soil pots, and these can be eliminated before they reach the field. Large-scale field replication is not required with artificially inoculated tests (2 replicate plots with 10 plants/plot is usually sufficient), and most decisions to eliminate or retain a line are made by visual observation without the aid of statistical comparison. Virus titer and presence or absence of virus among plants of selected lines may be determined as a selection tool, using a range of diagnostic assays.

3.3.2. Selection for Agronomic Performance

Selection for agronomic performance should proceed concurrently with selection for resistance. This subject is described in Chapter 51.

3.3.3. Virus-Resistance Efficacy Tests

3.3.3.1. Preliminary Decisions

1. Determine the degree of resistance desired: Practical field immunity (disease is precluded) is a qualitative characteristic that may be illustrated with a single plant. The test for immunity must provide an exposure that eliminates any practical possibility that a susceptible plant would escape infection. Thus, it is more efficient to concentrate on small numbers of plants if this level of resistance is required.

   A different approach is required when resistance is less than immunity. Replication and statistical design are important. Furthermore, the severity of virus exposure must be adjusted, so that practical levels of resistance will be tested, but not overwhelmed by excessive inoculation pressure.