

realignment of the genetic code as new genes are inserted. Such changes are common and may be subtle among transformed plants. Another type of change is caused by the direct expression of the inserted gene (4). Rigorous selection among hundreds of transformants may be required to identify lines that are virus-resistant and that also conform to or exceed standard characteristics of the parent cultivar. Selection for resistance and agronomic performance should proceed concurrently.

In contrast to resistance, agronomic performance involves many characteristics, including such qualities as type, yield, foliage appearance, time to maturity, surface appearance, color, smell, taste, texture, shape, size, cooking and processing quality, brusibility, storability, and shipping quality. The relative importance among these characteristics depends on the crop and the use for which it is intended. Some agronomic qualities are objective and qualitative, are easily assessed in small tests, and often conform closely with that of the parent cultivar (5). Others, particularly yield, are quantitative, and some, like taste, are both quantitative and subjective. These may require extensive testing for accurate assessment.

2. Materials

Agronomic performance is markedly affected by subtle differences in growing conditions and must be tested under field conditions. Thus, the first and most important requirement for the assessment of agronomic performance is a satisfactory field site. It should present conditions representative of those under which the crop is grown commercially, but this presents a problem, because the virus disease is a production problem in the area for which the new resistant line is intended, and presence of the disease in the susceptible parental line may prevent a valid comparison between the transgenic and parental lines. The best solution is to locate agronomic performance trials in the production area and provide the healthy parental control by using pesticides to prevent infection. When that is not possible, it may be necessary to locate the trials in an area where the disease is not a problem and accept the fact that performance may not be the same there as in the production area. Performance in agronomic trials may be ignored among all lines that fail in the resistance trials.

Culture, cultivation, and harvest machinery are required for field testing. Standard machinery developed for small farms and market gardeners is often adequate or easily modified for small-plot work. Planting and harvest machinery capable of dealing with many small plots without mixing between plots or even between individual plants is often extremely desirable, but very difficult to acquire, adapt, or construct. It is frequently faster, neater, and more reliable to plant and harvest by hand than to use machinery designed for commercial