

Field Testing Resistance of Transgenic Plants

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1. Introduction

This chapter describes methods to detect and assess commercial resistance to virus disease that may be conferred on existing plant cultivars by their transformation with genes derived from viruses (1). The principles and general guidelines for selection among plants altered by transformation are the same as those established for classical breeding (2). However, the approach is different, since transformation alters one or, at most, a few characteristics in an established cultivar; but breeding creates an entirely new cultivar.

A number of factors give rise to the need for field testing of transgenic plants. Although it is true that some viral genes will confer transgenic resistance, and this resistance may be added to a cultivar as a single characteristic, it is not true that resistance is achieved in every transgenic plant line. In fact, expression of resistance may be rare among lines transformed with a viral gene, and degree of resistance conferred by a gene can vary continuously from no resistance to complete protection from disease. Furthermore, somoclonal variability in cultivar characteristics may be very common and subtle among transformed plants. Somoclonal variability in virus susceptibility may also occur in the absence of any viral gene (3). Therefore, rigorous selection among hundreds of transformants may be required to identify lines that are resistant and that also conform to or exceed standard agronomic characteristics of the parent cultivar. Selection for agronomic performance, described in Chapter 51, should proceed concurrently with resistance selection, described in this chapter.

Field testing required to determine whether interactions occur between the transgene and its homologous virus, or with other viruses when they infect the transgenic crop, is also covered in this chapter.