The Opportunities and Challenges of Genetic Engineering for Improvement of Perennial Tree Fruit - Plum Pox Virus Resistant Plums as a Case Study

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Tree fruit breeding is an inherently long-term process. The average generation time can range from 2 to 20 years depending on the species. While the production of large numbers of progeny favors the appearance of rare but desired recombinants, large tree size limits the number of progeny that can be planted and maintained. Significant genotype x environment interactions require multiple test sites for selections, which in turn require vegetative propagation and years of tree growth to resume evaluations. Breeding for disease resistance adds unique challenges related to variability in virulence of pathogen genotypes, environment x pathogen, and pathogen-vector x host interactions. Disease resistance of a clone has practical, economic value only if fruit quality (consumer acceptance), yield, and shipping and storage characteristics are equal, if not superior, to currently grown cultivars.

An important approach to resistance breeding is the use of gene transfer, which is a useful tool to be combined with other plant improvement technologies. The potential for genetic transformation and, in particular, the use of gene-silencing technology, for the control of plum pox virus in transgenic plums (Scorza et al., 2001. Transgenic Res.10:201-209) will provide an example of the opportunities and challenges of this technology for virus disease resistance development in woody perennial tree fruit species.

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