11. Viral Resistant Citrus

Texas citrus production is concentrated in the Lower Rio Grande Valley (LRGV). Approximately 98% of citrus grown in Texas' LRGV is planted on sour orange rootstock because sour orange is tolerant of the adverse soil conditions of that area. Sour orange rootstock, however, is susceptible to citrus tristeza virus (CTV), including the severe strains that cause quick decline. Citrus tristeza virus is the most devastating disease of citrus worldwide. There is no remedy for an infected tree other than to remove it. Both grapefruit and sweet orange cultivars are susceptible to CTV if planted on sour orange rootstock. Seventy percent of Texas citrus production is grapefruit.

Severe strains of CTV are present in Texas already, but not in areas of commercial citrus production. Rather they are in residential areas in the eastern part of the state, where soil conditions allow rootstock other than sour orange to be planted. These CTV-infected dooryard trees do not show symptoms, but they do serve as reservoirs for further spread of the disease. Spread of CTV has not reached commercial citrus production in the LRGV largely because an efficient vector of CTV is not yet present in Texas.

The brown citrus aphid is the most efficient vector of CTV, particularly severe strains. Currently the brown citrus aphid is found in Mexico and Florida, and is expected to reach Texas. When the brown citrus aphid arrives in Texas, it will likely move severe strains of CTV from symptomless dooryard trees in the east to susceptible commercial orchards in the LRGV, potentially destroying the Texas citrus industry. Insecticide use against brown citrus aphid populations will not help control CTV spread because they do not completely eradicate aphid populations.

Planting citrus varieties resistant to CTV is the key to preventing virus infection. Natural CTV resistance exists in citrus relatives, but cannot be incorporated into commercial citrus varieties through traditional breeding techniques without also incorporating horticultural qualities that make the resulting fruit inedible. Researchers at Texas A&M University are using biotechnology to insert CTV coat protein genes into commercial citrus varieties to produce pathogen-derived resistance. In 2000, transformed grapefruit shoots grafted onto sour orange rootstock were planted in a field trial, and preliminary data indicate they have CTV resistance. The field trials are expected to bear fruit in a few years, at which point fruit quality will be tested. With development of CTV resistant citrus fruit cultivars, Texas growers will be able to continue using sour orange rootstock in the presence of brown citrus aphid without risking devastation from severe strains of CTV.

Potential Impacts of Viral Resistant Transgenic Citrus
Prevent the loss of Texas's citrus industry, with 622 million pounds annual production and $48 million annual value.

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