NEW SOURCES OF COLD HARDINESS FOR CITRUS BREEDING

In an assessment of natural hazards on world crop production, an average of more than $100 million per year is lost in the continental United States due to freeze damage to 22 major crops. The greatest loss is in citrus production and amounts to about one-third of the national average. A severe freeze occurred in 1962 which cost Florida more than one-third of its total production, in excess of 10 million boxes (41 kg.) of fruit and one-fourth of its 52 million trees. Similar losses occurred again in 1977 and, most recently, in 1981 and 1982. These losses impact negatively not only on the present and future economic stability of an industry, but also in meeting the dietary needs (supply and nutrition) of an expanding world population, which is facing ever-increasing uncertainties in adequate nutrition and subsistence levels.

Citrus grown in subtropical climatic zones are subject to exposure to severe freezes. Production losses can be staggering, extending into 3 or more years after initial impact, and making total recovery a slow and laborious process. The capacity of citrus to survive freezing temperatures does not begin to approach the –50°C killing temperatures of northern woody plants. Survival is largely a combination of ice avoidance, tolerance of tissues to ice, and the capacity of freeze-injured trees to recover. Trees in Florida do not have a 'true winter dormancy' as such, but more of a quiescent stage of growth which is more cold hardy if winter hardening has occurred. Because major damage can occur to trees of commercial cultivars exposed to temperatures below –6.7°C, protection technologies are needed to stabilize existing industries. With the cost of energy ever increasing, making it an almost prohibitive approach the –50°C killing temperatures of northern woody plants. Survival is largely a combination of ice avoidance, tolerance of tissues to ice, and the capacity of freeze-injured trees to recover. Trees in Florida do not have a 'true winter dormancy' as such, but more of a quiescent stage of growth which is more cold hardy if winter hardening has occurred. Because major damage can occur to trees of commercial cultivars exposed to temperatures below –6.7°C, protection technologies are needed to stabilize existing industries. With the cost of energy ever increasing, making it an almost prohibitive

C. reticulata (a mandarin) as 1 parent, have yielded several moderately cold-hardy clones with excellent fruit characteristics. Several, including 'Sunburst' mandarin hybrid (Fig. 1D), have been released recently for commercial propagation. However, the degree of cold hardness attainable within the Citrus genus is limited. Conversely, intergeneric crosses between E. glauca, P. trifoliata, and Citrus sp. offer citrus breeders opportunities for selection of individual clones that possess new and unique recombinations of character traits derived from widely separated genera. They may provide the cold-hardy citrus clones being sought. In addition, this broader genetic base may also increase the protection against diseases and other climatic stresses.

Roger Young, Herbert C. Barrett, C. Jack Hearn, and Donald J. Hutchison
U.S. Department of Agriculture, ARS, Horticultural Research Laboratory, 2120 Camden Road Orlando, FL 32803