WALNUT IMPROVEMENT PROGRAM - 1995

Gale McGranahan, Chuck Leslie, Edwin Reidel, Mary Lou Mendum, Patty Lucker, Jim McKenna, and cooperators Dave Ramos, Abhaya Dandekar, John Miccetich, George Bruening, Pat Vail, and Ahdib Rowhani

ABSTRACT

This report covers our progress in five projects in the Walnut Improvement Program: 1) Walnut Breeding and Evaluation, 2) Backcross Breeding for Hypersensitivity to Blackline Disease, 3) Genetic Engineering: Introduction of Foreign Genes and Testing of Transgenic Plants, 4) Somatic Embryogenesis from Chandler 5) Field Applications of Immunocapture PCR for Detection of Cherry Leafroll Virus, and 5) Germplasm Collection in China.

Materials in the breeding program in 1995 included standards (n=12), selections (n=8), about 200 introductions from 16 different countries, and over 2,000 seedlings from the crosses. Introductions include 187 genotypes of established trees and 16 new seed collections from China, 57 seedlings from Kyrgyzstan and material from India, Pakistan, Korea, France, and eastern Europe. The report includes tables describing our breeding scheme as well as fall and spring evaluations.

Backcross breeding is progressing very satisfactorily with over 200 BC2 trees, 98 BC3 trees and 440 seed from BC3 crosses this year. We are using Woeste's K15 marker as an initial screen for hypersensitivity and approximately half of the seedlings tested so far are hypersensitive. The report details the breeding scheme and provides exact numbers.

Our major progress in genetic engineering is finally transplanting the transgenic clones to the field under APHIS permit in Davis and in Fresno. Transgenic plants containing a new Bt construct have been regenerated and transformations are in progress with the rice Xa21 from Pam Ronald and the snowdrop lectin from Abhaya Dandekar.

A new method for detecting CLRV was tested and found to be efficient, very sensitive, and relatively inexpensive. The method known as immunocapture PCR was developed by Rowhani et al. Using it we were able to screen the seedlings and introductions in the breeding program for CLRV. They were all negative. We also screened 9 tolerant rootstock, which had been inoculated with the virus in the process of evaluation. Although attempts had been made to cut out all the diseased material we found that the virus was present in shoots from most of the rootstocks, although all but two also had at least one uninfected shoot. We plan to use this method for materials in the breeding program in the future.

A major accomplishment this year is that we have been able to initiate somatic embryos from Chandler anther tissue. Although they appear normal and contain the normal diploid number of chromosomes, we will not be able to confirm their trueness-to-type until they are in the field producing Chandler nuts. They are already being used in transformations.

Our germplasm collecting expedition in China was moderately successful. We brought back 16 accessions of seed. Our objective was to collect blight resistant and short season types, but it appeared that what was identified as blight resistant was probably resistant to anthracnose instead.