BREEDING PIERCE'S DISEASE RESISTANT TABLE AND RAISIN GRAPES

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Reporting Period: The results reported here are from work conducted from December 31, 2001 to November 1, 2002.

INTRODUCTION

This project is a collaborative effort between UC Davis and the USDA/ARS- Fresno, and is focused on breeding new PD resistant cultivars of table and raisin grapes. The project also integrates efforts to develop genetic maps for resistance to *Xylella fastidiosa* (*Xf*) in segregating populations containing resistance from *Muscadinia rotundifolia* and from southeastern US (SEUS) *Vitis* species. The preliminary goal of these mapping efforts is the development of strongly linked DNA markers to expedite breeding and the eventual goal is characterization and location of *Xf* resistance genes leading to genetic transformation efforts.

OBJECTIVES

1. Develop PD resistant table and raisin grapes by crossing a variety of *Xylella fastidiosa* resistance sources with large berried and seedless *V. vinifera* table and raisin grapes.

RESULTS AND CONCLUSIONS

Greenhouse Evaluations of Xf resistance:

There are now 60 PD resistant cultivars from the southeastern US (SEUS) at UCD and 13 at the USDA-Fresno. We tested and added 10 new accessions this year after finding them to be highly resistant to *Xf*. Sixty-five F1 progeny from SEUS resistance sources by Ramming advanced seedless *vinifera* were screened. Seven of these seedlings were backcrossed to advanced seedless table grapes in 2002. This winter we will be testing SEUS germplasm from Fresno and include promising selections from their disease resistant table grape program (focused on powdery mildew) with potentially PD resistant parentage.

During summer 2001, replicated cuttings from 130 seedlings were made from a 2000 cross of a female *Xf* resistant *V. rupestris* x *M. rotundifolia* (8909-15) x B90-116 (Ramming advanced seedless selection) – population 0023. This population is being used for the mapping of both genetic markers and phenotypic traits. The most resistant of these F1 progeny were used in the crosses this year described below.

2002 Crosses:

UCD – Twelve crosses were made with 4 F1 *V. rupestris* x *M. rotundifolia* (rup-rot) selections with excellent *Xf* resistance by 5 USDA table and raisin parents to produce 1,613 seeds. Twenty-five crosses were made using 10 SEUS (5 newly evaluated) *Xf* resistant parents x advanced *Xf* resistant and *vinifera* parents to produce 33,306 seeds. Two other crosses were made to expand the two mapping populations that are based on a seedless female parent – one from a SEUS resistance source (5025), and the other on rup-rot (5014). Embryo rescue techniques at Fresno obtained 92 and 68 ovules respectively.

USDA-Fresno – Crosses were made to seedless *vinifera* parents in 2002. Twenty-nine crosses were made with 19 advanced seedless table and raisin grape selections using 16 *Xf* resistance sources, most of which were F1 selections from advanced seedless *vinifera* x rup-rot selections. 6,171 ovules were extracted from these crosses and 1,198 embryos are establishing. This material will make great advances towards commercial quality.

2002 Plantings and Evaluations:

UCD – 2,145 seedlings were planted from crosses made in 2001. These seedlings were produced by crossing 6 SEUS resistance sources with 9 advanced USDA seedless table and raisin grape selections. Based on the early planting date, excellent growth (virtually all have produced a short 75 cm cordon on the wire), and the success we had this year pushing the 2000 seedlings, we expect many of these to flower in 2003.

About 20% of the 1,150 seedlings from SEUS resistance sources produced from the 2000 crosses and planted in 2001 were evaluated for fruit quality and 15 with good quality were greenhouse screened for PD resistance. The best of these will be crossed to advanced *vinifera* selections in 2003. The quality of the 2000 seedlings was better than expected. Some of the seedlings have fruit that is partially seedless, with firm flesh, and markedly improved berry size and skin thickness.

USDA-Fresno:
In 2001, 14 crosses were made with 3 seeded female parents (2 *vinifera* and 1 SEUS PD resistant) by 10 males (most SEUS PD resistant selections). Fifty-eight seedlings were planted. The majority of the 2001 crosses were to seedless female parents and the progeny were embryo rescued. There were 27 crosses with 9 advanced seedless females x 17 different sources of PD resistance from the SEUS. About 3,345 ovules were cultured, 1,220 embryos were rescued and 415 seedlings were planted in the field. These progeny are expected to start blooming in 2003 and should make excellent progress towards our goal of PD resistance in a high quality vinifera table and raisin grape background.

PD Field Trial:
In 2001, we established a replicated field trial at a PD infected vineyard in Yountville using 13 SEUS PD resistant selections and 9 resistant and 7 susceptible rup-rot selections. Each plant was inoculated in May and June 2002 by needle inoculation. The SEUS selections were chosen because most displayed severe PD symptoms after greenhouse testing, although they are considered highly resistant in the SEUS. Observations of leaf scorch, cane lignification and impact on vigor were made in Fall 2002. The observed range of responses correlated well with *Xf* titer results from previous greenhouse testing. The plants will be evaluated Spring 2003, to determine whether *Xf* is lost over winter due to lack of downward spread followed by pruning, and to determine the extent of PD symptoms.

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Epidemiology of Pierce's Disease