TITLE: Development and Evaluation of Crown Gall-Free (Agrobacterium vitis) 'White Riesling', 'Chardonnay' and 'Cabernet franc' Grapevines

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PROGRESS REPORT - 2006

A. Goal

Winter injury and subsequent development of the crown gall disease is widely prevalent in eastern U.S. viticulture. The technology described above provides an opportunity to significantly reduce the impact of winter injury on cold tender cultivars. The economic impact could be enormous in terms of stable production of premium wine grapes in cool climates.

B. Objectives

(1) To develop propagation material of the wine cultivars 'White Riesling', 'Chardonnay' and 'Cabernet franc' and the rootstock Couderec 3309 that is indexed to be free of the pathogen *Agrobacterium vitis*.

(2) To evaluate the performance of the above-mentioned propagation material over a 5-year period in several eastern U.S. viticultural regions.

C. Procedures

Three important *Vitis* vinifera cultivars in eastern U.S. viticulture and one dominant rootstock will be utilized in this experiment. The scion varieties are 'Chardonnay', 'white Riesling' and 'Cabernet franc'. The rootstock cultivar is Couderec 3309 which has also been identified as being resistant to *Agrobacterium vitis* infection. The initial propagation wood for this work will be obtained from the Foundation Plant Material Service at the University of California at Davis. This material is virus indexed. Cuttings will be forced to produce shoot growth. Shoot tips will be excised for tissue culture. Tissue-cultured vines will then be developed under greenhouse conditions. These vines will be established in a mother vineyard at the Southwest Michigan Research and Extension Center on viticulturally-virgin land that is isolated from other vineyards. At the end of the first year of growth in the mother vineyard, vines will be re-indexed for viruses and indexed for *Agrobacterium vitis* using funds from other sources. Vineyard equipment dedicated to this planting will be used to prevent possible contamination of the site.

Wood from these vines will then be used to bench graft vines of the three scion varieties to the C3309 rootstock. Grafting equipment will be thoroughly cleaned and the heads will be autoclaved prior to performing the grafting procedure. The vines will be grown on a viticulturally-virgin site. These vines will then be used on trials in several states to evaluate their productivity over a 5-year cropping period. The occurrence of vine winter injury episodes will be recorded during this time and vines will be rated annually for the

incidence of crown gall. The performance of these vines will be compared to a nearby planting of commercially available planting stock of the same scion/rootstock combinations.

This project will take 11 years to complete as follows:

Year 1 - Tissue culture and greenhouse growth of new vines.

Year 2 - Establishment of mother vineyard.

Years 3 & 4 - Growth of vines in mother vineyard, index vines, begin propagation procedures.

Year 5 - Bench graft propagation of vines from plant material in mother vineyard.

Year 6 - Establishment of plantings in regional locations.

Year 7 - Growth of young vines in regional locations.

Year 8 - Year 1 evaluation of regional plantings.

Year 9 - Year 2 evaluation of regional plantings.

Year 10 - Year 3 evaluation of regional plantings.

Year 11 - Year 4 evaluation of regional plantings.

Year 12 - Year 5 evaluation of regional plantings.

This project will determine if the above protocols can maintain AV-free material. If so, private propagators may find it desirable to initiate such programs.

D. <u>Accomplishments/Benefits to date</u>:

Approximately 500 vines of the Cabernet franc variety grafted to the rootstock C3309 had been propagated in the summer of 2004. In the spring of 2005 those vines were distributed to cooperators in five states (Table 1). For each location twelve vines for each of two treatments were planted in a randomized complete block design. One treatment consisted of vines whose root systems had been soaked for eight hours in an aqueous suspension of the F 2/5 strain of *Agrobacterium vitis*. The second treatment involved vines whose root systems had been soaked in clear water for eight hours. The vines were kept segregated, wrapped carefully, shipped via overnight express and planted immediately.

In some situations a third treatment involving vines obtained from commercial nurseries of the Cabernet franc variety on the C3309 rootstock were also planted.

F 2/5 inoculations were made possible because of a culture of F 2/5 strain *Agrobacterium vitis* was supplied by Dr. Tom Burr. The necessary permitting from APHIS was obtained for its shipment from New York to Michigan. This initial culture was then recultured in cooperation with Dr. Annemiek Schilder, plant pathologist at Michigan State University.

Cuttings of the AV-free C3309 rootstock and the AV-free Chardonnay scion wood were collected, stored and bench grafted in May 2005. They were then grown during the summer of 2005 in an isolated, viticulturally-virgin site at the MSU Southwest Michigan Research and Extension Center. Those vines were dug, washed free of soil, pruned, wax-dipped, packaged and stored in November, 2005. They were sent to cooperators in five states in May, 2006 (Table 2).

White Riesling and C3309 rootstock material was gathered in November, 2005 and bench grafted in May, 2006. These vines were grown in an isolated vineyard in 2006, dug that fall and are being sorted for shipment to cooperators in May, 2007.

First ratings of vine survival and the development of crown gall on vines in this experiment were assessed in the fall of 2006. Approximately three-fourths of those evaluations have been summarized to date (Table 3). They indicate no loss of vines to winter injury and/or crown gall and a need for modest replanting of vines.

Therefore, by the summer of 2007 all three cultivars in this experiment will have been planted and the period of evaluation will proceed into its second year.

Table 1. Evaluation of Crown Gall-Free Grapevines

2005 Plantings of Cabernet franc/C3309

State	Number of Plantings
Indiana	2
Michigan	6
New York	2
Ohio	2
Pennsylvania	1
	13

Table 2. Evaluation of Crown Gall-Free Grapevines

2006 Plantings of Chardonnay/C3309

State	Number of Plantings
Indiana	2
Michigan	5
New York	1
Ohio	2
Pennsylvania	1
	11

Table 3. Results

Total crown gall-free vines planted in 2005 and 2006		576
Vines that didn't grow well and need replanting	3	
Vines with crown gall		0
Vines killed from winter injury		0

SUMMARY OF EXPENDITURES

Project billed salaries and wages	$3,048.37
Project billed fringe benefits	$451.63
Project billed materials	$500.00