

SUMMARY OF THE RESEARCH PROGRAM OF

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Breeding grape rootstocks demands a knowledge of *Vitis* taxonomy and evolution, of the genetics and mechanisms of resistance to soil-borne pests and diseases, and of the pests and diseases the breeding program is designed to combat. My research program is approaching rootstock breeding systematically so that we can better understand the problems and solve them more efficiently. My talk for the RAVE 91 program will discuss the resistance traits we are now studying and those we are beginning to examine in anticipation of future needs.

Current and Future Directions for Rootstock Breeding

The current B type phylloxera crisis focused the viticultural industry's attention on rootstocks in the same way the invasion of Europe by phylloxera did over 100 years ago. The vast majority of the rootstocks viticulturists now use were produced before the 1920's. Yet we are faced with new and continually evolving problems. My research program is examining resistance to phylloxera, fanleaf degeneration and nematodes, and anticipating future needs such as drought resistance. We hope to better understand the genetics and mechanisms of these traits and to efficiently breed rootstocks tailored to specific problem sites in California vineyards.

Phylloxera resistance is a black box, little is known about its mechanisms or genetics. We know that North American *Vitis* species possess varying levels of resistance, and that phylloxera resistance is easily incorporated into rootstocks. I have made factorial crosses within *Vitis riparia*, *V. rupestris*, and *V. berlandieri* to enable us to study phylloxera resistance. The knowledge gained from these studies will allow efficient incorporation of phylloxera resistance with other resistance traits such as fanleaf degeneration.

Fanleaf degeneration is a disease complex caused by grapevine fanleaf virus (GFLV) and the feeding of its vector, the dagger nematode (*Xiphinema index*). A fanleaf degeneration resistant rootstock must combat not only *X. index* and GFLV, but also phylloxera since the two problems exist together. Resistance to dagger nematode is known, but not characterized, however it is not sufficient to prevent transmission of GFLV. We are now studying dagger nematode resistance in *Vitis* species and in accessions of *Muscadinia rotundifolia*. Sources of GFLV resistance have been identified and we are also studying its genetics and mechanisms. We hope to eventually produce a rootstock resistant to fanleaf degeneration and phylloxera.

In the past many Central Valley growers have not used rootstocks, since with adequate irrigation and deep coarse-textured soils grape root systems can out-grow and avoid pest damage. However, soil-borne pest pressures are increasing and the era of own-rooted vines in the Central Valley will soon be over. Hastening this demise is the confinement of root systems as a result of drip irrigation and political and environmental water restrictions. We are beginning to research resistance to various nematodes, and hope to study the effect of multiple pests on potential rootstocks bred for Central Valley vineyards.

We are screening seedlings from a series of crosses between *Vitis* species (primarily *V. rupestris*) and *M. rotundifolia*. They have been replicated and are being screened for resistance to phylloxera, rootknot and fanleaf at the same time. Since *M. rotundifolia* roots so poorly, they will also be screened for propagatability. We expect to find resistance to many of the above problems in these seedlings.