

Crown Gall-Free Grapevine Development at SWMREC

by

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A frequent and devastating secondary effect of winter injury to grapevines is the development of the disease known as Crown Gall. A little more than 25 years ago researchers began to recognize that the bacteria, which cause this disease, are not ubiquitous in soils, as previously believed. Rather the bacteria that infect grapevine tissues are a specific species, which is now called *Agrobacterium vitis*. Furthermore, the tumorous growths occurring in grapevine tissues are caused by a specific strain of *Agrobacterium vitis* called Biovar 3. Methods of detecting this disease (called indexing), have shown that these bacteria are frequently found in the conducting tissues of healthy-appearing vines and that Crown Gall is frequently introduced into a new vineyard through planting stock.

Amazingly, the occurrence of these bacteria in a grapevine is not sufficient to cause this disease to produce galling. Other factors come into play. One is susceptibility. Grape varieties and rootstocks vary in their sensitivity to become infected by this disease. A part of this variability may be the cold hardiness of a variety. Even though the Crown Gall bacteria may exist in vine conducting tissues, they are incapable of infecting healthy cells. Here's where winter injury plays a role. When cells of a vine become winter injured (but not killed outright) the bacteria causing Crown Gall are able to inject DNA into this cell. When this happens, the cell no longer divides to produce normal vine tissues. Rather it grows and multiplies into callus tissue. The genetic change in these cells is permanent. The bacteria need not be present for those cells to replicate over and over into callus. When the callus becomes large enough for us to see it, we call it galling. Over time, perhaps even years, the spread of the galling may completely disrupt the conducting tissues in a trunk or arm of a vine, thus resulting in physiological girdling of the vine. When that happens, death to all parts of the vine above the galling is the final chapter.

To combat this problem a project at SWMREC has developed Crown Gall-free grapevines. Beginning about six years ago, tissues from the very tip of grapevine shoots were cultured in the lab of Dr. Jim Hancock in the MSU Department of Horticulture. Over a period of three years these tissues were grown into full-sized grapevines. They were planted in a remote, viticulturally-virgin site at SWMREC and repeatedly indexed by Dr. Tom Burr at the Cornell University Geneva Experiment Station to verify that they remained free of the Crown Gall disease. Tissue from these vines were bench grafted (Figure 1) and grown in a remote nursery at SWMREC for the first time in 2004 (Figure 2). These special grapevines will be used to research important questions. How long can these grapevines remain free of this disease when planted on old and new vineyard sites? Will the absence of Crown Gall in these grapevines greatly reduce the impact of winter injury on relatively cold tender wine grape varieties? Thanks to funding from the USDA Viticultural Consortium, the

Michigan Grape and Wine Industry Council and the MSU Agricultural Experiment Station this work continues.



Figure 1.



Figure 2.