

Segregation of necrotic spotting on leaves in a grape rootstock population

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Segregation of necrotic spotting on the leaves was observed in a grape rootstock breeding population developed for nematode and phylloxera resistance. Necrotic spotting on plant leaves is associated with responses to pathogen attack, response to chemicals (such as pesticides or plant growth regulators), and with physiological disorders and spontaneous lesion mimics. This population was not inoculated with fungal or bacterial leaf pathogens nor treated with plant growth regulators and the development of necrotic spotting. Segregation of necrotic leaf spotting to un-spotting individuals in the population was 1:1, which implies simple genetic control of the trait.

Materials and Methods

A grape rootstock population was developed by controlled pollination between the rootstock 106-8 Mgt and the USDAARS rootstock selection 4-13B. 106-8 Mgt, a rootstock for phylloxera protection, is derived from a cross of *Vitis riparia* x (*V. cordifolia* x *V. rupestris*). 4-13B, the male parent of the population, is a Dog Ridge x *V. rupestris* hybrid (David Ramming, personal communication) and is resistant to aggressive root-knot nematodes. The cross was made in 2001. Seeds were collected and stratified, then planted in 2002. Seeds were germinated at 29.3 °C and transferred into individual pots in a greenhouse upon germination. They were grown in 4:1 volume:volume Cornell peat-Lite mix:medium sand and fertigated with Miracle-Gro Excel brand 21-5-20 All Purpose water soluble fertilizer. Sulfur was applied for powdery mildew control. About 4 weeks after seeding, plants were inoculated with 1500 J2 stage *Meloidogyne arenaria* root-knot nematodes. The seedlings were screened for interveinal necrotic spotting at the time of nematode resistance screening, about 11 weeks after seeding.

Results and Discussion

Leaves of 90 seedlings were examined. Spots were round and approximately 1-3 mm in diameter and were observed primarily in the interveinal regions of the leaves (Figure 1). Necrotic spots were observed on 43 seedlings, while 47 seedlings did not exhibit necrotic spots (Figure 2). The observed ratio is consistent with a 1:1 ratio (chi-square test).

What is the nature of the necrotic spotting observed to segregate in this population? Plant growth regulators were not applied in the cultivation of this population and the necrotic spotting observed is inconsistent with the grapevine phytotoxic response to sulfur applications for powdery mildew management, which manifests as interveinal bleaching (Pearson et al. 1988). The necrotic spotting, while distinctive and noticeable, apparently did not impact plant growth or nematode resistance and selections from the necrotic spotting and un-spotting groups were made as candidate rootstocks. Mitchell et al. (1994) reported differential responses to *Septoria ampelina*, a fungal pathogen of grapevine foliage that causes Septoria leaf spot, across cultivars from diverse genetic backgrounds, although the responses they reported reflected continuous variation rather than discrete classes as observed here and *S. ampelina* lesions on grape leaves typically are angular (McGrew and Pollack, 1988b). It could be that this population segregates for a necrotic spotting response to *S. ampelina*. Rupestris speckle is a physiological disorder with symptoms that resemble Septoria leaf spot, including necrotic lesions (McGrew and Pollack, 1988a). Rupestris speckle particularly is reported from grape varieties and germplasm with *V. rupestris* ancestry. The female parent of this population is one quarter *V. rupestris*, while Dog Ridge, the paternal grandmother, is *V. x champinii*, a natural hybrid with the putative parental species *V. rupestris* and *V. mustangensis*. The incitement of rupestris speckle is undetermined; it could be spontaneous or it could be associated with some unknown agent. It may be that this population is demonstrating segregation for rupestris speckle.

Figure 1. Leaf top (upper) and bottom (lower) from an individual seedling showing interveinal necrotic spotting.

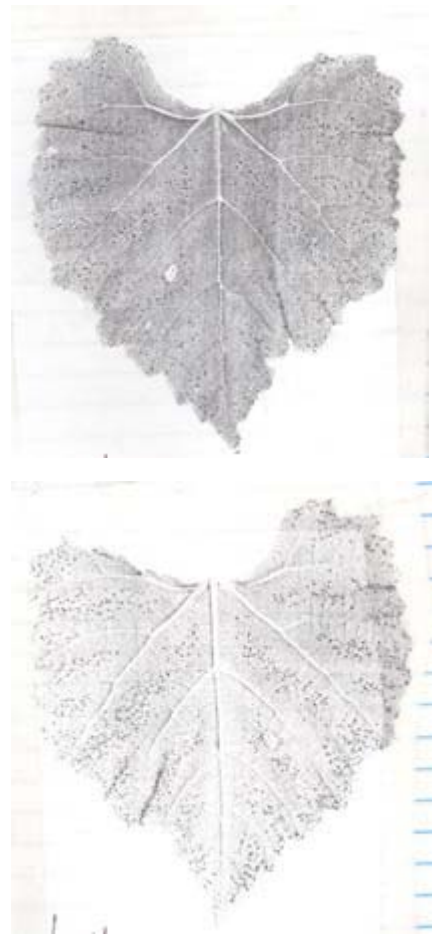


Figure 2. Leaves of typical un-spotted (upper) and necrotic spotted (lower) seedlings.



Acknowledgements

Many thanks to Mary Lauver and Debra Johnston for their outstanding care and experimental cultivation of the plants population, to David Ramming, USDA ARS Crop Diseases, Pests and Genetics Research Unit, Parlier, California, for providing access to 4-13B, and to M. Andrew Walker, Department of Viticulture and Enology, University of California, Davis, for providing access to the 106-8 Mgt.

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