VR 039-16 Grape Rootstock

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Fanleaf degeneration is one of the most serious grapevine diseases. Caused by grapevine fanleaf virus (GFLV), it is compounded by the feeding damage of *Xiphinema index* Thorne and Allen, the nematode vector. The disease progresses rapidly, and yields of infected vines eventually decrease up to 80% (Martelli and Savino, 1988). Efforts to control the vector with nematicides were not completely successful, as explained in a review by Raski et al. (1983). These and similar results led to the initiation, more than 20 years ago, of a breeding program at the Univ. of California, Davis, to develop a grapevine rootstock resistant to fanleaf degeneration. This rootstock breeding program continues with the goal of combining sources of resistance to GFLV with sources of resistance to *X. index*. We report on VR 039-16, an interim release from that program.

Origin

VR 039-16 was selected from the cross *Vitis vinifera* L. cv. Almeria × *V. rotundifolia* Michx. Male No. 1 made in 1948 by H.P. Olmo at the Univ. of California, Davis. This and other *V. vinifera* × *V. rotundifolia* (VR) hybrids were initially used to study cytogenetic relationships between *V. vinifera* and *V. rotundifolia* (Patel and Olmo, 1955), and later were screened for use as phylloxera (*Daktulosphaira vitifoliae* Fitch)-resistant rootstocks (Davidis and Olmo, 1964). VR hybrids were included in a 1979 field screening for rootstocks resistant to fanleaf degeneration. VR 039-16 excelled in this trial (Walker et al., 1989) and was patented (Lider et al., 1988) and released.

Description

VR 039-16 is a sterile F₁ hybrid. The flowers appear staminate with rudimentary pis-

tils; however, pollen and ovules are non-functional. The mature leaves have three to five lobes, dentate margins with teeth of various sizes, and a narrow to closed U-shaped petiolar sinus (Fig. 1). They are glossy yellow-green and glabrous, with the exception of tufted hairs at the intersection of the main veins on the lower surface. Shoot tips are slightly curved, covered with downy white tomentum, and have red margins. As the young leaves develop, they become almost glabrous, with few tufted hairs on the upper surface. Tendrils are long, bifid, and discontinuous. Mature wood is tan with persistent bark and prominent lenticels. The nodes have a diaphragm.

Performance data

VR 039-16 has been grafted with *V. vinifera* 'Cabernet Sauvignon', 'Carignane', and 'Chenin blanc', and no signs of graft incompatibility have been detected during 11 years.

Scions grafted on VR 039-16 are vigorous, have high yields, and display field resistance to the effects of fanleaf degeneration.

VR 039-16 has performed well in a site contaminated with GFLV/*X. index* complex and phylloxera in the Napa Valley, Calif., since 1979 (Walker et al., 1989). We compared the performance of 'Cabernet Sauvignon' grafted on VR 039-16 and three susceptible rootstocks at this site (Table 1). 'Cabernet Sauvignon' on VR 039-16 remained free of fanleaf degeneration until 1987, as determined by enzyme-linked immunosorbent assay (ELISA) (Clark and Adams, 1977). Yields of the one infected replicate of 'Cabernet Sauvignon' on VR 039-16 were suppressed in 1988 and 1989 (4.7 and 8.0 kg/vine vs. an average for all four replicates of 8.6 and 11.4 kg/vine), but not as drastically as the yields of 'Cabernet Sauvignon' on susceptible stocks. However, vine replication was not adequate for statistically significant conclusions. 'Cabernet Sauvignon' on susceptible rootstocks expressed severe symptoms of fanleaf degeneration, as evidenced by reduced yield, and was rapidly infected by GFLV. Recently planted trials with VR 039-16 will establish the degree of resistance that VR 039-16 possesses against fanleaf.

Davidis and Olmo (1964) reported that VR 039-16 and some other VR hybrids were resistant to phylloxera. Unpublished data from potted vines in the greenhouse (M.A.W.,

Fig. 1. Mature leaf of grapevine (*Vitis*) rootstock VR 039-16.

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Table 1. Fruit yields and results for ELISA tests for 'Cabernet Sauvignon' scions on four rootstocks planted in a site in the Napa Valley, Calif., infected with fanleaf degeneration.²

Year and rootstock	Yield/vine (kg)	Pruning wt (kg)	ELISA results ¹
1984			
VR 039-16	10.4	4.7	All vines virus free
AXR#1	8.7	2.6	1-, 1+, 2++ vines
Harmony	5.0	2.9	1-, 4++ vines
St. George	3.4	1.4	All vines ++
1985			
VR 039-16	12.2	4.3	All vines virus free
AXR#1	6.7	3.0	2+, 2++ vines
Harmony	3.7	2.1	1-, 4++ vines
St. George	2.2	1.4	All vines ++
1986			
VR 039-16	16.0	6.2	All vines virus free
AXR#1	6.7	3.0	1+, 3++ vines
Harmony	4.3	3.0	All vines ++
St. George	3.2	2.3	All vines ++
1987			
VR 039-16	9.4	6.7	All vines virus free
AXR#1	7.1	2.5	All vines ++
Harmony	3.6	2.5	All vines ++
St. George	2.7	2.4	All vines ++
1988			
VR 039-16	8.6	Not taken	1+, 3- vines
AXR#1	1.8	Not taken	All vines ++
Harmony	1.3	Not taken	All vines ++
St. George	1.1	Not taken	All vines ++
1989			
VR 039-16	11.4	5.8	1+, 3- vines
AXR#1	2.2	2.3	All vines ++
Harmony	1.3	2.4	All vines ++
St. George	1.6	2.5	All vines ++

¹Values given are means of three to five single-vine replicates.

²ELISA values -, negative; +, moderate virus level; ++, high virus level.

unpublished data) and from laboratory studies with excised roots (Granett et al., 1987) confirm that phylloxera do not feed upon or colonize VR 039-16. Granett et al. (1987) also determined that VR 039-16 had excellent field resistance to phylloxera. Studies by McKenry and Kretsch (1989) state that VR 039-16 has a high degree of resistance to *X. index* and phylloxera; however, it was less resistant or susceptible to other plant parasitic nematodes.

Vitis rotundifolia roots very poorly from dormant cuttings (Goode et al., 1982), and

dormant cuttings of VR hybrids are more difficult to root than standard grape rootstocks. However, bench-grafting and propagation success approached 95% when indole-3-butyric acid (100 ppm soak for 24 h) and conditions conducive to callus formation (14 days in the dark at 25C and 70% relative humidity) were used to prepare dormant cuttings before grafting (L.A.L., unpublished data).

Uses

There is urgent need in the viticultural in-

dustry for a rootstock resistant to fanleaf degeneration. VR 039-16 was released as an interim solution to fanleaf degeneration resistance from an ongoing grape rootstock breeding program. It is recommended for use only on sites with the GFLV/X. *index* complex and is currently the best solution to this disease. VR 039-16 is patented (Lider et al., 1988) and widely available from California grape nurseries.

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