

### Inheritance of Tolerance to a Pepper Virus in Florida

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#### ABSTRACT

The tolerance of 'Avelar', a pepper (*Capsicum annuum*) cultivar from Brazil, to a disease caused by a virus tentatively designated "pepper mottle virus" was found to result from a single (homozygous) recessive gene. Tolerant plants remained symptomless for ca. 4 weeks after inoculation but later developed a mild mottle on the inoculated and lower systemically infected leaves. Susceptible plants developed severe mottle symptoms within a week. Segregation for susceptibility in test progenies to pepper mottle virus and uniform resistance of similar resistance in earlier studies to tobacco etch and potato Y virus was considered additional evidence that pepper mottle virus is distinct from both of these viruses.

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Additional key word: PVY group.

Bell pepper (*Capsicum annuum* L.) production in Florida has been reduced significantly in recent years due to virus diseases of the potato virus Y (PVY) group (3). Surveys established widespread prevalence of tobacco etch virus (TEV) and PVY in addition to a disease caused by a virus originally described as an atypical strain of PVY (PVY-S) (4, 5). Until further studies are completed, this virus is tentatively referred to as pepper mottle virus (PMV) in this paper.

Because pepper breeding lines homozygous for the  $y^a$  gene (1, 2) for resistance to common isolates of TEV and PVY (4) are susceptible to PMV, a search for resistance to PMV was initiated. The Brazilian pepper cultivar 'Avelar' (Av) exhibited tolerance to this virus in both field and greenhouse observations. This report summarizes

independent studies at Belle Glade and Gainesville to transfer the tolerance of Av to PMV to existing pepper breeding lines and to determine the mode of inheritance of such tolerance.

All the virus cultures used in these studies were originally isolated from naturally infected plants growing in the Delray Beach, Florida, farming area. Stock virus cultures were maintained in susceptible pepper cultivars and/or tobacco (*Nicotiana tabacum* L.). Test progenies consisted of all of the plants obtained from individual fruits.

The tolerant Av plants were crossed with plants of the PMV-susceptible cross Florida 23-1-7 × Yolo Y (23Y), and breeding lines Florida 9-8-3 (9-8) and Florida 23-1-7 (23). Plants of the F<sub>1</sub> generation of the crosses Av × 23Y or the reciprocal were back-crossed with Av and 23Y. F<sub>3</sub> progenies were obtained from self-pollinations of tolerant F<sub>2</sub> plants from the crosses Av × 23Y and Av × 9-8.

Plants were inoculated in the three- to four-leaf stage. The leaves were dusted lightly with Carborundum and rubbed with a finger or a sterile polyurethane foam pad dipped in crude sap from infected plants. All test plants were grown in the greenhouse and sprayed routinely for insect control. Final disease readings were made 5 weeks after inoculation.

Plants of the susceptible cultivars 23Y, 9-8, 23, and all F<sub>1</sub> progeny, developed severe symptoms within a week after inoculation. Avelar plants exhibited no symptoms within a month after inoculation but later developed a blotchy mottling on the lower inoculated and systemically infected leaves, although the virus could be recovered from inoculated plants earlier. No additional susceptible plants were detected following reinoculation of some tolerant plants from Av × 23Y, F<sub>2</sub>.

The inheritance of tolerance from Av to PMV was determined by inoculation of F<sub>1</sub>, back-cross, F<sub>2</sub> and F<sub>3</sub> progenies of Av crossed with 23Y, 9-8, and 23. Results of these inoculations are summarized in Table 1 from which it was concluded that tolerance of PMV in Av and its progenies resulted from a single recessive gene.

Avelar progeny plants tolerant to PMV were also resistant to infection by TEV and PVY. This adds additional credence to the belief that PMV is distinct from either TEV or PVY.

Two years of field observations in the Delray Beach area have established that the tolerance of Avelar to PMV infection is sufficient to protect plants through a single

TABLE 1. Segregation of 'Avelar' progenies inoculated with pepper mottle virus

Progenies	No. lots	Number of plants susceptible/tolerant	Seg. ratio	$\chi^2$	P
F <sub>1</sub> Av × 23Y <sup>a</sup>	2	17/0	1:0	0.000	.99
Av × 23 <sup>a</sup>	2	17/0	1:0	0.000	.99
BC (23Y × Av) Av	3	101/96	1:1	0.126	.70-.80
(Av × 23Y) <sup>a</sup> 23Y	5	360/0	1:0	0.000	.99
F <sub>2</sub> Av × 23Y	5	370/106	3:1	1.89	.10-.20
Av × 23	3	208/56	3:1	2.02	.10-.20
F <sub>3</sub> Av × 23Y	4	0/301	0:1	0.000	.99
Av × 9-8	17	0/1,240	0:1	0.000	.99

<sup>a</sup>Includes reciprocal by hybridization.

growing season and permit production of fruit free of disease symptoms. Resistance to TEV and PVY and production of nonpungent fruit of moderate size, make Avelar quite useful in breeding programs to develop disease-resistant peppers.

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