

Susceptibility of Grape Cultivars and Selections to Oxidant Injury

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Oxidant stipple, a manifestation of ozone injury in grapevines, has been shown to occur in the grape growing regions near the Great Lakes (3). Although exact economic losses due to air pollution injury have not yet been assessed for grapes, a wide range of cultivar variation exists with some exhibiting severe foliar injury. Such differences were first reported for some cultivars of *Vitis vinifera* (2). Certain environmental and cultural factors, i.e. nitrogen status of the vine, rootstock, soil management, soil moisture, also influence the incidence of this disorder

(unpublished data).

Symptoms of oxidant stipple on grapevines are characterized by interveinal necrotic flecks on the upper surface of the basal (most mature) leaves. Although initial stippling may occur as early as 10 days before bloom on susceptible cultivars, advanced stages of injury (consisting of browning of the leaf surface) becomes evident from 60 to 100 days after full bloom. Premature senescence and abscission of affected leaves results in severe cases.

Table 1. Percent oxidant stipple of certain American grape cultivars in New York State and Ontario, Canada. 1973.†

Very Mild 0-5%	Mild 6-25%	Moderate 26-50%	Considerable 51-75%	Severe 76-100%
Delaware*	Niagara	N.Y. Muscat	Concord*	Veeport*
Himrod	Agawam	Catawba*	Lady Patricia	Bath
Iona	Athens	Norwood	Wayne	Elvira
Seneca	Lake Emerald	Schuyler	Erie	Moored
Dutchess*	Golden Muscat	Van Buren		Brighton
Canada Muscat*	Naples	Alden		Keuka
Hanover	Steuben	Concord		Fredonia
Kendaia	Vinere	Seedless		Eclipse
	Yates			Kensington
	Buffalo			Urbana
	Interlaken			Ripley
	Seedless			Mills
	Salem			Clinton
	Vincent*			Sheridan
	McCampbell			Portland
	Cayuga White*			C. 3309*
	Alwood			Ives*
	Romulus			

*Rated in both 1972 and 1973.

†Listed in increasing order of susceptibility in each column.

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Table 2. Percent oxidant stipple of certain selections from the breeding programs of the N.Y. State Agricultural Experiment Station at Geneva, N.Y., and Vineland Station, Ontario, Canada. 1973.†

Very Mild 0-5%	Mild 6-25%	Moderate 26-50%	Considerable 51-75%	Severe 76-100%
Vidal 256	N.Y. 31987	N.Y. 30454	V. 37014	N.Y. 45916
V. 54077	V. 50061	N.Y. 35814	N.Y. 32037	N.Y. 34840
N.Y. 14528	N.Y. 45198	N.Y. 45625	N.Y. 34981	N.Y. 36037
N.Y. 25542	N.Y. 17324	N.Y. 34824*	N.Y. 49404	
N.Y. 34338*	N.Y. 44968	N.Y. 29805*	V. 35081	
N.Y. 36268	N.Y. 33472	N.Y. 45010		
N.Y. 36297	N.Y. 34988*			
N.Y. 36661	N.Y. 36125*			
N.Y. 36806	N.Y. 34803*			
N.Y. 38167	N.Y. 14302			
N.Y. 42355				
N.Y. 42603				
N.Y. 44897				
N.Y. 32042				
N.Y. 34791				

*Rated in both 1972 and 1973.

†Listed in increasing order of susceptibility in each column.

In 1972 and 1973, grape cultivars and selections were surveyed for oxidant stipple in New York State and Ontario, Canada. In 1972, mature grapevines of 25 cultivars were scored in experimental vineyards at Geneva and Fredonia, N.Y. In 1973, 134 cultivars and selections were evaluated at Geneva, Fredonia, and Vineland, Ontario, although not all were rated at each location. One to 12 replicate vines were examined for each cultivar. The percent ozone-induced leaf injury of the basal 6 leaves per shoot was recorded on September 18, 1972, and from September 15-18 at all locations and again on October 6, 1973, at Geneva. The cultivars were grouped into the following categories: 0-5% = no visible injury to very mild injury, 6-25% = mild injury, 26-50% = moderate injury, 51-75% = considerable injury, and 76-100% = severe injury.

Naturally occurring levels of total oxidants (principally ozone) as high as 28 ppm in 1972 and 1973 were recorded in New York State (1).

A wide range of susceptibility to oxidant injury was found in the American type grapes (Table 1). For example, 'Delaware' showed no visible signs of injury while 'Ives' was the most sensitive cultivar, exhibiting early defoliation in both years. 'Couderc 3309,' a phylloxera-resistant rootstock, was also very susceptible to oxidant injury.

Selections from the N.Y. State Agricultural Experiment Station grape breeding program (directed by Dr. John Einset) also showed a wide range of susceptibility to oxidant injury (Table 2). These were crosses between *Vitis vinifera* and American types consisting of first and second generation seedless selections, with seedless *V. vinifera* as a first generation parent. Also included were wine selections consisting of crosses between French hybrids and American types and some between French hybrids and *V. vinifera*. These selections were found in all categories of oxidant injury.

Table 3. Percent oxidant stipple of certain French hybrid grape cultivars in New York State and Ontario, Canada. 1973.†

Very Mild 0-5%	Mild 6-25%	Moderate 26-50%
LeCommandant (BS 2862)	Seibel 10868	Rosette (S. 1000)*
Joannes Seyve 12-428	Verdelet (S. 9110)	Aurore (S. 5279)*
Landot 4511	Chelois (S. 10878)*	Cascade (S. 13053)*
Colobel (S. 8357)	Humbert 3	Rougeon (S. 5898)*
Seyve-Villard 172	Bertille-Seyve 2846	Foch*
Seyve-Villard 23-512	Vignoles (Ravat 51)*	Leon Millot*
Seibel 10076	Rayon d'Or (S. 4986)	Joannes Seyve 26-627
	Chancellor (S. 7053)	Baco Noir
	Seibel 14117	Chambourcin (JS 26-205)
	Seyve-Villard 18-307	Ravat Blanc (Ravat 6)
	Valerien (SV 23-410)	Seyve-Villard 12-203
	Seyval (SV 5-276)*	
	Seibel 8229	
	LeGeneral (BS-5563)	
	Joannes Seyve 23-416	
	Landal (Landot 244)	
	Tehere Dore (Ravat 578)	
	Seibel 7136	
	Seibel 13047	
	Villard Blanc (SV 12-375)	
	Villard Noir (SV 18-315)	
	DeChaunac (S. 9549)*	
	Seibel 13666	

*Rated in both 1972 and 1973.

†Listed in increasing order of susceptibility in each column. No French hybrids were classified in the "considerable" or "severe" injury categories.

As a group, the French hybrids were more resistant to oxidant injury than the American types growing in the same locations (Table 3).

No consistent inheritance patterns for oxidant stipple resistance could be detected.

These ratings are only estimates of relative susceptibility of grapes to the air pollutant. Symptom severity may vary according to local climatic and cultural conditions, however. For example, we have found a wide range in symptom expression in 'Concord' vines due to differences in rootstock, fertilization and soil moisture. These factors apparently do not greatly influence resistant cultivars such as 'Delaware.' The oxidant stipple scores for

1972 and 1973 were similar in the 25 cultivars compared in those years. Oxidant stipple scores among locations were in the same injury categories; therefore, separate tables for each location were not presented.

Literature Cited

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