

Occurrence and Spread of Grape Corky Bark and Stem Pitting in Mexico

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ABSTRACT

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Hybrid LN-33 and 49 grape (*Vitis vinifera* L.) cultivars that were free of virus diseases were obtained from the University of California, Davis, and planted in Aguascalientes, Mexico, in 1968. Typical symptoms of corky bark and distinct stem pitting were observed in all LN-33 vines examined in September 1978 and also in commercial vineyards, mainly in the cultivars Cardinal, Malaga Champagne, Exotic, Tokay, San Emilion, and Chardonnay. In the spring of 1979, healthy LN-33 vines at Davis were inoculated with buds from affected vines from Mexico and developed distinct symptoms within 4 mo.

Grapevines are cultivated in approximately 7,000 ha in the state of Aguascalientes, Mexico, mainly for brandy and table grapes. Most plants are on their own roots. Most of the vineyards are replanted after 8-10 yr because they become uneconomical.

A foundation vineyard was planted in 1968 with disease-free grapevines at the agricultural experiment station at Pabellon, Aguascalientes. Some of the plants started showing rolling and reddening or yellowing of foliage in 1970, and almost every plant showed symptoms by 1978. The purpose of this work was to study the disease at Pabellon and to determine its relationship to known diseases in grapevines.

MATERIALS AND METHODS

The 49 grape (*Vitis vinifera* L.) cultivars (and hybrid LN-33) planted at the foundation vineyard at Pabellon, Aguascalientes, were obtained as certified virus-free cuttings from the University of California, Davis. Twenty cuttings of each cultivar were planted in single rows. All plants were individually examined for symptoms in September 1978. Commercial vineyards of different ages and with different cultivars were also examined for symptoms in the fall of 1978 and again in the spring of 1979.

Cuttings of 12 cultivars in Aguascalientes were reindexed at Davis by chip bud grafting on healthy LN-33 indicators in 1979.

RESULTS

Based on foliar symptoms between 1970 and 1977, the plants at Pabellon appeared to be affected by leaf roll. Red cultivars showed leaf rolling and reddening of leaves with veins still green, and white cultivars showed leaf rolling and a yellow silvery discoloration. Some plants, however, showed only reddish brown leaves without green veins and sometimes even without leaf rolling.

Of 18 LN-33 plants examined, nine were dead and the rest showed reddish brown leaves without green bands along the veins. The basal internodes of shoots from surviving vines were swollen and had split bark (Fig. 1) and irregular

maturation, all symptoms of corky bark disease in LN-33. In addition, the trunk bark of affected plants was thickened and had vertical cracks externally (Fig. 2) and pits and grooves internally (Fig. 3). The cambial contour was wavy. Suckers commonly developed in the trunk base of affected plants. All grapevines in the foundation vineyard were examined for corky bark symptoms, at least in the foliage; the results are shown in Table 1.

Buds from Cabernet Franc, Gamay Beaujolais, and Malbec vines that had symptoms of corky bark in Aguascalientes transmitted the disease to healthy LN-33 at Davis 4 mo after they were budded in 1979. Two vines that were symptomless in Mexico did not transmit corky bark in the Davis indexing block in 1979. One of seven vines from randomly selected rootstocks at Aguascalientes, none of which showed obvious corky bark symptoms, transmitted the disease, showing that corky bark can be latent. Nematodes in Pabellon were *Xiphinema americanum*, *Macroposthonia xenoplax*, *Pratylenchus penetrans*, and *Meloidogyne* spp. The grape aphid (*Macrosiphum euphorbiae*) has occasionally been observed.

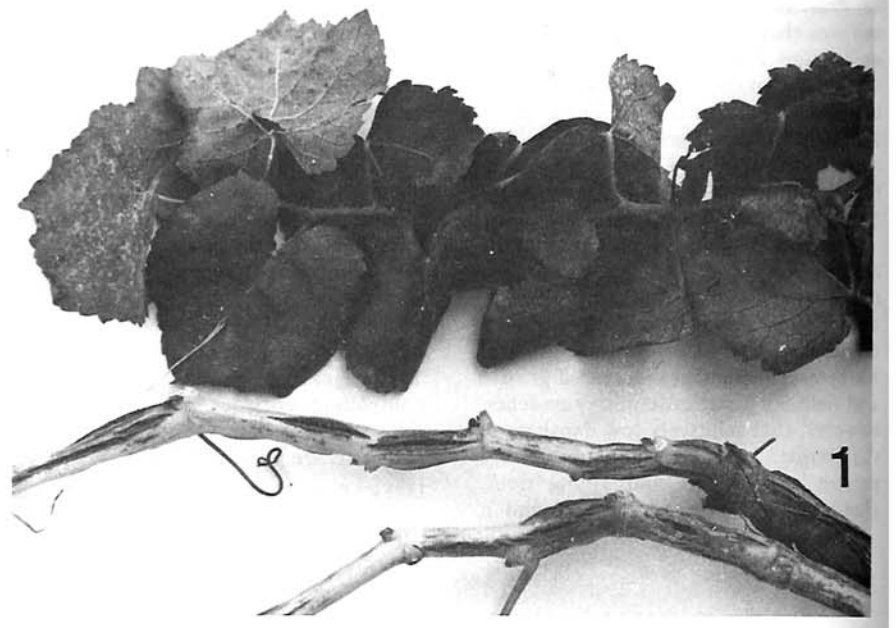


Fig. 1. Symptoms of corky bark on LN-33. Leaves are totally reddish brown. Basal internodes are swollen and have split bark.



Fig. 2. Trunk of LN-33 with thickened bark.

The incidence of corky bark and stem pitting symptoms is high in Aguascalientes, where most vineyards are replanted after 8-10 yr. Even a 5-yr-old Cardinal vineyard had 100% corky bark and stem pitting, and vines were pulled out because of low vigor and production. A 6-yr-old San Emilion vineyard also was replanted in 1978, presumably for the same cause, since San Emilion (Ugni Blanc) is one of the most sensitive cultivars to corky bark and stem pitting. The high incidence of corky bark and stem pitting therefore appears to play a primary role in the short productive life of vineyards in Aguascalientes.

DISCUSSION

The indicator plant LN-33 showed typical symptoms of grape corky bark (2) in Aguascalientes. At Davis and elsewhere in California, LN-33 vines have remained disease-free since the selection was first planted in 1953. Its infection with corky bark at Aguascalientes indicates that transmission occurred. Apparently this is the first evidence that corky bark spreads naturally. The vector in Aguascalientes has not yet been found. In other regions, the disease spreads only with infected propagative material.

Surviving LN-33 plants in Pabellon had pitting and longitudinal grooves in the trunk and in the basal internodes of the shoots (Fig. 3). Such symptoms have been described as legno riccio, rugose



Fig. 3. Stem pitting symptoms in the trunk of Cardinal vines.

wood, wood pitting, and stem pitting (6). We propose the term "madera rugosa" to describe this symptom in Spanish.

In California (7,10) and Italy (4,6), stem pitting has been associated with grape fan leaf virus, which is transmitted by *Xiphinema index* (9). Plants with stem pitting in Pabellon do not show any symptoms of fan leaf and *X. index* has not been found; the stem pitting apparently is not associated with grape fan leaf virus. In Goheen and Luhn's study (5), none of 21 plants with fan leaf produced stem pitting on *V. rupestris* 'St. George' or LN-33, although 18 plants free of fan leaf produced stem pitting.

Typical grape corky bark and stem pitting were observed on the same plants in Aguascalientes. The corky bark was in the cortex or bark, and the stem pitting in the wood cylinder under the bark. It is possible that both symptoms are closely related in Aguascalientes and that they are expressions of the same disease. The association of corky bark and stem pitting has been previously proposed (3,5,8).

Cardinal, Malaga Champagne, Exotic, Tokay, San Emilion, and Chardonnay were the most sensitive cultivars to corky bark and stem pitting symptoms in commercial vineyards in Aguascalientes. Plants with corky bark always had stem pitting, but not all plants with stem pitting had corky bark. If both are expressions of the same disease, stem

Table 1. Corky bark ratings in the foundation vineyard planted in 1968 at Pabellon

Cultivar	Mean ^a
LN-33	4.00
Pinot Noir	4.00
Gewurztraminer	4.00
Gamay Beaujolais	3.95
Pinot St. George	3.91
Semillón	3.90
Rish Baba	3.88
Chasselas Doré	3.75
Loose Perlette	3.75
Malbec	3.75
Melón	3.75
Pinot Blanc	3.75
Alicante Bouschet	3.64
Burger	3.62
Ruby Cabernet	3.62
Thompson Seedless	3.47
Mission	3.42
Queen	3.40
Cabernet Franc	3.38
Black Monukka	3.30
Sauvignon Vert	3.22
Cardinal	3.21
Flame Tokay	3.18
Early Burgundy	3.07
White Riesling	3.05
Moscatel de Alejandria	2.92
Muscat Hamburg	2.88
Ribier	2.83
Palomino	2.81
Black Corinth	2.76
Red Malaga	2.76
Carignane	2.73
Barlínka Seedling	2.70
Black Prince	2.70
Dattier Beyrouth	2.70
Emerald Riesling	2.68
Ruby Red	2.68
Zinfandel	2.63
Orange Muscat	2.61
Red Veltliner	2.55
Petit Sirah	2.53
Chenin Blanc	2.45
Tinta Madeira	2.38
Royalty	2.30
Peperella	2.11
Italia	2.05
Malvasia Bianca	2.00
Grenache	1.94
Salvador Negro	1.18

^aAverage of ratings from 20 vines of each cultivar on a scale of: 1 = healthy, 2 = probably healthy, 3 = probably diseased, 4 = obviously diseased.

pitting seems to be the more sensitive and the first to appear. Cardinal has also been reported with stem pitting symptoms in Italy, where this disease is widely distributed (1).

This is believed to be the first report that grape corky bark and stem pitting diseases occur and spread naturally in Aguascalientes, Mexico.

ACKNOWLEDGMENTS

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