

Boron Deficiency of Grapes

soil application at one ounce of borax per vine supplies enough boron for normal growth after midwinter pruning

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Vines develop abnormal growth if they bud out early following midwinter pruning—in certain vineyards in southern California—apparently because of insufficient boron at time of budding out.

This abnormal growth—formerly designated as grape bud mite injury—has been noted in San Bernardino County vineyards on vines of Mataro, Muscat of Alexandria, Burger, and White Malaga. Cane symptoms are similar on all varieties. Severely affected shoots have shortened basal internodes and a breaking of lateral buds that results in a brushlike—witches broom—growth and lack of crop. Late season growth is normal. These cane symptoms alone are not specifically diagnostic of boron deficiency.

Leaf symptoms differ with variety. Basal leaves are usually distorted in shape. In some varieties—as in Muscat of Alexandria—they are of normal color but with irregular margins. In other varieties—as in White Malaga—they are irregularly shaped and crinkled.

Leaf symptoms on the Mataro variety—which has been closely studied—are quite distinctive; the same symptoms have been found on Mataro vines in Sonoma County. When severely affected, the basal leaves are somewhat fan shaped, with margins more sharply and less regularly serrate than normal; the veins are prominent, with chlorosis and occasionally flecks of dead tissue between the veins. Less affected leaves have partially abnormal margins, and only a part of the interveinal areas may show symptoms. In mild cases, symptoms may be present on basal leaves without attendant cane symptoms, although the crop is reduced.

Some years these cane and leaf symptoms occur on almost every vine in the vineyard, with yields far below normal. Other seasons—in the same vineyard—only occasional affected shoots will be found, with yields in the normal range.

Experiments over a five-year period have demonstrated that this seasonal variation is influenced by pruning time in spur-pruned varieties. Vines pruned in late March, for instance, bud out late, grow normally and bear normally. Vines pruned during midwinter periods—early January, especially—bud out early, grow abnormally, have fewer fruit forms per vine and resultant low yields. This re-



Response to borax application. Untreated vine on left. Treated vine on right.

sponse to pruning time, however, has been observed only in vineyards in which abnormal growth occurs; normal vineyards are not known to respond to pruning time.

Experiments with borax were made in a 7' x 7' unirrigated, own-rooted plot in a Mataro vineyard in San Bernardino County. The soil in this vineyard is a Hanford sand. The treated area received two soil applications of borax at one ounce per vine. The first application was on January 19, 1952. No information is available on the results of the first year treatment because it was not then known that severe symptoms may be consistently produced only by early January pruning and all vines in this trial were pruned in February. Very few symptoms were present in 1952 and no further observations were made until the 1956 season.

The second treatment was made on November 2, 1955, and was followed by a midwinter pruning—January 9, 1956—on all vines, treated and untreated. All vines leafed out early. Growth on treated vines was practically normal; the fruit forms were larger and there were over

twice as many per cane as on the untreated vines. Severe symptoms occurred only on the untreated vines.

Because the vines used for records included those on the border of the treated area, slight leaf symptoms—an average of one distorted leaf per shoot—were found in the treated plot. Vines completely within the treated area showed only $\frac{3}{10}$ of one distorted leaf per cane, while vines whose roots were less completely within the treated area showed $1\frac{1}{10}$ distorted leaves per cane.

Analyses of leaves taken from early spring shoots showed the boron content to be 78.5 ppm—parts per million—on treated vines and 23.0 ppm on untreated vines—the latter being in the deficiency range for this element.

Boron deficiency in grapes has previously been reported from South Carolina, Australia, Germany, and Japan. It has been studied—in sand or water culture solutions—in the eastern United States and in Germany where the symptoms encountered were similar in many respects to those found here. On some varieties when boron was deficient, millerandage—setting of seedless fruits—occurred.

Since boron—in excessive amounts—may cause severe injury to vines, it should not be applied in larger amounts than indicated here. Until further information is available, applications should be limited to a relatively small number of vines.

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Effect of Soil Application of Borax on Leaf Symptoms and Number of Fruit Forms, Mataro Grapes, Alta Loma*

Percentage of distorted leaves and fruit forms						
		Number of distorted leaves	Number of fruit forms	Size of fruit forms		
				%		
		Per 100	Shoots	Large	Medium	Small
Plus borax	98**	93**	22	26	52
Un-treated	405	41	1	18	81

* Records taken May 16, 1956.

** Difference highly significant as compared with untreated.