

Big Valley grapes exhibit potassium deficiency symptoms

Several Big Valley chardonnay and, to a lesser extent, cabernet sauvignon vineyards exhibited unusually severe potassium deficiency symptoms during the 1993 season. Affected vineyards were mainly, though not exclusively, south of Highway 29.

The problem was noticeable in July and worsened considerably by harvest (late October). Delayed maturity due to the heavy crop and cool weather probably exacerbated the situation by increasing late season vine stress.

A diagnostic tour of Big Valley vineyards by Lake County farm advisor Rachel Elkins revealed no comparable problems in other varieties. "A tentative conclusion is that chardonnay appears to be particularly sensitive to K, an observation confirmed by other North Coast UC extensionists."

The problem in affected cabernet vineyards seems more due to heavy crop

stems and canes. Depending on variety and planting density, K removal from soil may be one-third or more higher."

Heavy K demand by fruit is confounded by poor K availability in clay soils. Potassium ions are closely held on clay particles in high cation exchange capacity soils. This is compounded by high levels of magnesium (Mg) which is known to be antagonistic to K uptake.

Also, clay soils are poorly aerated, causing poor root growth and hence more apt to stress vines, which in turn impedes K uptake.

load and long season than to variety, she added.

Symptoms (of potassium deficiency), explained Elkins in the UC newsletter *Lake County Horticultural Notes*, include faded to necrotic leaf margins, spreading inward into interveinal tissue and finally complete necrosis (tissue death).

"Black" or "chocolate" leaf is also associated with K deficient and stressed

vines, especially red varieties. "Clusters are small, unevenly colored and partially raisined. Both clusters and leaves are small and vine growth and yield are depressed."

Affected Lake County vines were mainly on heavy, "cracking" clay soils, fairly young or very heavily cropped relative to vine size and vigor, noted Elkins.

Potassium demand by grapes, she con-

tinued, is high, increasing dramatically between veraison and harvest. "In an experiment at UC Davis' Oakville Field Station, Larry Williams of the Department of Viticulture and Enology found that the per vine K level of cabernet sauvignon clusters increased 6.9 grams each from August 1 to veraison.

"Based on 8 X 12-foot spacing, this equals 12 pounds K per acre removed by the crop. Seventy five percent of this amount was redirected from leaves,



(Ca) for Mg ions on exchange sites.

Sonoma County farm advisor Rhonda Smith has seen good results with drip irrigation. In this case, three pounds per vine applied in the fall is thought to be adequate if followed by at least three in-season fertigation of a high content soluble K such as 0-0-30 KCO₃ (not KC1).

• In the longer term, it may be desirable to improve available K uptake, aeration and rooting conditions. Although there is little experimental data in North Coast vineyards, this is often done by applying heavy quantities of gypsum (calcium sulfate) to substitute calcium

"The theory is," Elkins said, "that since Ca and K have a favorable exchange relationship, unlike Mg and K, more K will be present in the soil solution and hence available for uptake. Also, Ca is utilized to improve soil structure and permeability. Unlike lime, gypsum will not increase soil pH and will actually contribute acidifying sulfur.

"To offset the Mg in our soils, a gypsum program will probably require heavy amounts over multiple years to achieve the desired results. To see timely K deficiency correction in severely affected vineyards, it is recommended that K fertilizer be applied.



“Potassium fertilization will more likely remedy a deficiency without gypsum than gypsum will without applied K. Growers may want to consider mixing gypsum with K fertilizer to maximize the effect of both in a localized area of the root zone.”

- Water management must be optimal in heavy clay soils. “Too dry or too wet soil will hinder feeder root growth, cause vine stress and upset K balance.”

Finally, and very importantly, Elkins cautioned, crop load must be balanced with vine vigor, age and inherent site conditions. “For those with chardonnay, this seems especially critical.”