CALCIUM DEFICIENCY OF ROSE

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Two years ago in Vol. 16, No. 3, of this bulletin we discussed calcium (Ca) deficiency of chrysanthemum (Nelson 1972a). Since then Ca deficiency has occurred a number of times in North Carolina in rose crops. The native soils in this region are acid as is the peatmoss or pine bark which is used to ammend these soils for rose culture. Ca deficiency is often synonymous with low media pH. Limestone incorporated into these media dissolves away before the four to five-year span of this crop is completed necessitating corrective measures.

SYMPTOMS - A slowly developing sequence of symptoms is associated with Ca deficiency (Fig. 1). In the early stages the rate of growth of the plant slows down. Lower leaves turn yellow and drop off. Some young leaves, but not all, fail to develop to full size. The small leaves bear a chlorosis which is most pronounced along the margin diminishing toward the center of the blade. The winged leaf tissue along the base of the petiole of these leaves is usually unaffected, thus it gives the illusion of being disproportionately large. Stem elongation becomes reduced leading to compact foliage at the end of stems. Soon after the foregoing symptoms the terminal and lateral buds stop developing altogether. Root death occurs concurrently with these symptoms. Finally death of the plant occurs.

Fig. 1. These pictures show various symptoms of Ca deficiency in rose, 'Forever Yours'. (1a) Internodal development diminishes toward the terminal end of the stem leading to a compact arrangement of foliage. All buds have stopped developing. (1b) The fourth and fifth leaves down from the terminal end of this shoot are so greatly reduced in size that only the petiole wings are apparent. The terminal bud has stopped development. Terminal leaves are compact while the lower two leaves are turning chlorotic from the margins inward. (1c) All buds have stopped development and the lower leaflets have abscissed.

DIAGNOSIS - The symptoms just described can be used for a visual diagnosis of Ca deficiency. Attention should be paid to overlapping symptoms of boron (B) and copper (Cu) deficiency described by Boodly and White (1969) in the Rose Manual and by Nelson (1972b). Boron deficiency is characterized by short internodes and the abortion of growing points leading to a "witches broom". The "witches broom" does not occur with Ca deficiency. Copper deficiency, like Ca deficiency, results in miniature size leaves with pronounced petiole wings; however, buds do not usually cease development as is the case with Ca deficiency.

Soil analysis is a good tool for assessing Ca status. The Ca level itself is a good indicator. The pH level is also a handy tool since it reflects the Ca level in soils of this region and can be determined quickly by florists themselves. Calcium level and pH are indicative of each other since among all nutrients in soils of this region Ca is the primary nutrient which when increased will increase the soil pH level.

Calcium deficiency can be anticipated in soils with a pH level of 5.5 or lower. It is not impossible to occur at higher pH levels but less probable.

Foliar analysis also provides a good method for diagnosing Ca deficiency. For analysis the uppermost five-leaflet leaf on stems with a flower bud just beginning to show color are used. The normal concentration range for Ca in these leaves is 1.0 to 1.5% on a dry weight basis. Concentrations below 1.0% denote deficiency. (Boodley and White 1969).

CORRECTION - The easiest way to deal with Ca deficiency is to prevent it from occurring. If the pH level of the medium is carefully controlled then this disorder should not develop. Prior to planting incorporate finely ground limestone (calcium carbonate) into the soil to achieve a pH level of 6.0 to 6.5. Routine soil analyses should be made at a four-to eight-week frequency. When the pH level drops by a magnitude of 0.5 units (from 6.0 to 5.5) then limestone should be applied to the soil surface at the rate of 2.5 to 5 lbs per 100 sq. ft. The lower rate is sufficient for sandy soils while the high rate applies to clay soils or soils rich in organic matter.

If Ca deficiency should occur the soil pH should be checked to determine how much limestone can be applied. In general 5 lbs per 100 sq. ft will raise pH 0.5 to 1.0 units. Limestone is only slightly soluble; therefore, a few months is required for all of the material to become active. Correction however, should begin in a few weeks. If the deficiency is severe then a faster recovery is warranted. Hydrated lime (calcium hydroxide) can then be used at the rate of 1.5 lbs per 100 sq. ft. Broadcast as a powder and then syringe all lime from plant foliage and stems. The rate of correction may also be hastened by providing much of the routine nitrogen in the form of calcium nitrate.

LITERATURE CITED

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