

MINERAL DEFICIENCY SYMPTOMATOLOGY

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To profitably grow any crop, it is important that the factors necessary for desirable plant growth be available to the crop. To control all of the plant growth factors under field conditions is not possible. As seen in the last few years, such environmental factors as cloudy conditions, low seasonal temperatures, and excessive rainfall can affect cranberry production. An area where a four degree of control can be exercised is assuring that the nutritional requirements of the crop are met. To assist growers in defining the nutritional status of their crops, there are three diagnostic methods which are available, namely, 1) soil testing, 2) plant analysis, and 3) visual observation. A research base is necessary to assure that these methods can be used effectively. As you are well aware, soil and plant testing standards have been developed for cranberries and can be used to assist in diagnosing the nutritional status of your crop. To specifically define whether nutrition is or is not a problem in your crop is helpful and important.

Visual observation is a very practical procedure for assessing the nutritional status of the cranberry crop. A normal plant appearance and satisfactory crop yields would indicate that the nutrient level in the crop is adequate or sufficient. However, if the concentration of a nutrient is below the critical value in the plant, plant functions will be disrupted, and symptoms will occur. The severity of the symptoms will increase with a decrease in concentration below the critical value. A common symptom for all plant nutrient deficiencies is reduced plant growth. Other than reduced growth, visual symptoms will vary with the particular nutrient. Plant symptoms may appear in any of the organs including leaves, stems, roots, flowers, fruits and seeds. Without definitive symptoms, assigning the problem to a particular nutrient is difficult. Some degree of uniformity is essential for making the right diagnosis.

An attempt to develop and define deficiency symptoms for 11 nutrients elements on cranberry plants was conducted under greenhouse conditions using a hydroponic system. For the micronutrients (nitrogen, phosphorus, potassium, calcium, magnesium and sulfur) rooted cranberry cuttings were grown in a complete nutrient solution for 9 weeks. Excellent growth occurred during this period. After 9 weeks, plants were transferred from the complete nutrient solution to a solution containing all the nutrients minus the element to be tested. In the absence of each of the nutrients, growth was affected in 10 to 15 days and symptoms were present.

A slightly different technique was used for the micronutrients (zinc, copper, manganese, boron and iron) because it was previously observed that there can be enough of the micronutrient in the cranberry cutting to supply growth for an extended period. From a previous study for manganese, it was observed that there was enough manganese in the cutting to sustain the plant for 20 weeks before symptoms appeared. High manganese concentrations is not unusual under Wisconsin conditions because of the acid soils in cranberry bogs. For the micronutrients, the

rooted cranberry cuttings were started in the complete nutrient solution minus the particular micronutrient at the beginning of the experiment.

Besides observing the symptoms for each nutrient, the effected plant part was analyzed for its elemental composition for comparison with the standards for cranberry tissue samples.

Our observations indicate that the deficiency symptoms associated with particular nutrients on cranberry plants are quite difficult to define. Some of these symptoms will be discussed.