Nutrient Deficiencies in Cranberries

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Plant Nutritionists have identified 16 elements that are essential for plants to grow and develop. Of these 16 elements, 2 are supplied by air, carbon (C) and oxygen (0), and 1 from water, hydrogen (H). Carbon dioxide (CO,) in the air is the source of C. Oxygen comes from air as O2. In the photosynthetic process, water (H2O) is split releasing H which along with C and O is metabolized to form carbohydrates, etc. Of the dry matter content of cranberry plant, C, H, and O make up over 90% of that content. Under field conditions, it is assumed that these 3 elements are adequate for normal plant growth.

Thirteen of the 16 elements are referred to as either macro or micronutrients and are supplied by the soil and absorbed into the plant by the roots. The macronutrients are nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and sulfur (S). This group is required in relatively greater quantities by the plant, and the concentrations in the tissue are expressed as a percentage. The 7 micronutrients are zinc (Zn), copper (Cu), manganese (Mn), boron (B), iron (Fe), chloride (Cl), and molybdenum (MO). They are required in very small amounts by the plant and are expressed as parts per million (ppm) in the tissue. Even though the amounts of these nutrients needed by the plants are different, they all are essential for the crop plants, cranberries included.

The soil with supplemental fertilization is the primary supplier of the macro and micronutrients. The survey data for Wisconsin Cranberry Bogs previously discussed by Dr. Roper illustrate that a majority of these bogs are in the sufficiency range. However, if nutritional problems are present, diagnostic tools are available to assist in solving the problem.

There is a close relationship between the available nutrient supply in soil and concentration of that nutrient in the plant. Therefore, a chemical analysis of a plant tissue sample from a bog is a good way to assess the nutritional status of a plant-soil system primarily because a plant analysis provides a relatively complete picture of the essential plant nutrients. To make this evaluation, a comparison between the sample analyses and standards for the cranberry crop is used.

It is important to have a good set of standard values for comparison to nutrient concentrations of field samples. These standards are developed by growing cranberry plants in controlled conditions which allows for careful measurement of growth response to nutrient composition. From a deficiency standpoint, the nutrient concentration that is most important to define is the concentration above which the plant grows normally and below which a growth reduction occurs. We define this concentration as the critical concentration for e&h plant nutrient. In the deficiency zone, plant growth is reduced and this reduction becomes more severe as the nutrient concentration decreases. Besides a growth reduction, an abnormal plant appearance will usually be present. Abnormalities become more severe as concentration of a

particular nutrient decreases. We have observed nutrient deficiency symptoms on cranberry plants; however the symptomatology associated with a number of nutrients is difficult to differentiate for one and another. We find that visual symptoms do not define a specific nutrient deficiency as well in a cranberry crop compared to other horticultural crops. To be sure, tissue analysis is suggested for making a correct determination in nutrient associated problems.

The tissue analysis standards for cranberries are as follows:

MACRONUTRIENTS

	Proposed Levels		
Nutrient	Low	Sufficiency Range	High
	---------- % ----------		
Nitrogen	<0.90	0.90 to 1.00	>1.00
Phosphorus	<0.13	0.13 to 0.18	>0.19
Potassium	<0.50	0.50 to 0.90	>0.91
Calcium	<0.30	0.31 to 0.60	>0.60
Magnesium	<0.15	0.15 to 0.20	>0.20
Sulfur	<0.07	0.08 to 0.20	>0.20

MICRONUTRIENTS

	Proposed Levels		
Nutrient	Low	Sufficiency Range	High
	----------ppm----------		
Iron	<40	40-80	>80
Boron	<10	10-20	>20
Copper	<5	6-10	>10
Zinc	<15	15-30	>30
Manganese	<10	10-200	>200