PLANT NUTRITION OF THE CRANBERRY CROP

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The cranberry plant requires certain chemical elements which we refer to as plant nutrients for normal growth and development. Three of these elements (carbon, hydrogen, oxygen) come from air and water, and another 13 elements (nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, zinc, boron, manganese, iron, copper, chloride, and molybdenum) are supplied by the soil and are absorbed into the plant by the root system. If any one of these 13 elements is not adequately supplied by the soil, it is necessary to supply the element of concern by fertilization. However for a majority of these elements, the soil supplies an adequate amount for normal growth, and as growers you need not be concerned with but a few of the elements. If a reasonable fertilizer program has been followed, fertility will very seldom be a problem.

As growers it is important that a diagnostic procedure be available to evaluate the nutritional status of your crop. One procedure is leaf or tissue analysis. A tissue analysis can provide an almost complete listing of the soil supplied elements which allows for a good evaluation. For a perennial crop like cranberry, tissue analysis is a good diagnostic tool.

For tissue analysis to be effective, it is essential that a set of standards for the nutrient elements be available for comparison to the elemental composition of field tissue samples. This comparison will assist in the determination of the absence or presence of a plant nutritional problem. A set of standards for a number of the nutrient elements was developed by Dr. Dana and is shown in Table 1. We are in the process of evaluating the standards primarily for confirmation and to provide additional information which will permit us to do a more effective evaluation of field samples. Besides composition, definable symptoms can be helpful in determination of possible problems.

For an evaluation of the standards, cranberry plants have been grown in hydroponic systems under greenhouse conditions. This allows for accurate control of nutrient availability and the development of plants with a wide range of elemental composition. Composition is then compared to the type of growth which may be normal or abnormal.

Specific evaluation procedures have been to grow cranberries from rooted cutting for 10 weeks on a complete nutrient solution in a hydroponic system. Excellent growth is obtained during this time period with 1.5 to 2 foot runners as a common response. At 10 weeks, the plants are transferred to a complete nutrient solution minus the element to be evaluated. The common response is a gradual reduction in the concentration of the nutrient element in the tissue to a point where it will become low enough to reduce plant growth and also to develop definable symptoms. The elemental tissue concentration at this point will assist in defining the low level where the cranberry plant will function normally and will set the low level for the plant analysis standards which is a most important standard. The data

developed for the nutrient elements phosphorus (P), potassium (K), and sulfur (S) are shown in Figures 1, 2 and 3, respectively. For phosphorus in Fig. 1, yield continues to increase even after 6 weeks without available phosphorus in the nutrient solution. During this period the phosphorus concentration in the tissue dropped below the proposed low level of P without a growth reduction. The response to potassium is different (Fig. 2). When the potassium concentration in the tissue dropped below the proposed low level, growth stopped indicating that the present proposed level is accurate. No standard has been established for sulfur. The data for sulfur (Fig. 3) indicate that growth continues even at a very low tissue concentration of sulfur. This type of data has been collected for all of the essential nutrient elements except iron, chlorine, and molybdenum and will be analyzed and provided in a form which can be used by you the grower.

Table 1. Nutrient concentration of cranberry tissue where deficiency symptoms were observed and the proposed concentrations of cranberry tissue samples for determining the nutrient status of a crop.

Nutrient	Conc. at observed deficiency	Proposed conc. Low	Sufficiency range	High
		----------%----------		
Nitrogen	0.70	<0.90	0.90 to 1.00	>1.00
Phosphorus	0.09	<0.13	0.14 to 0.18	>0.18
Potassium	0.17	<0.50	0.50 to 0.90	>0.90
Calcium	0.05	<0.30	0.30 to 0.60	>0.60
Magnesium	0.02	<0.15	0.16 to 0.20	>0.20
Sulfur		no estimates		
		----------ppm----------		
Zinc	3.8	<15	15 to 30	>30
Boron	1.0	<10	10 to 20	>20
Manganese	2.0	<10	10 to 200	>200
Iron	2.6	<40	40 to 80	>80
Copper	3.1	<5	6 to 10	>10

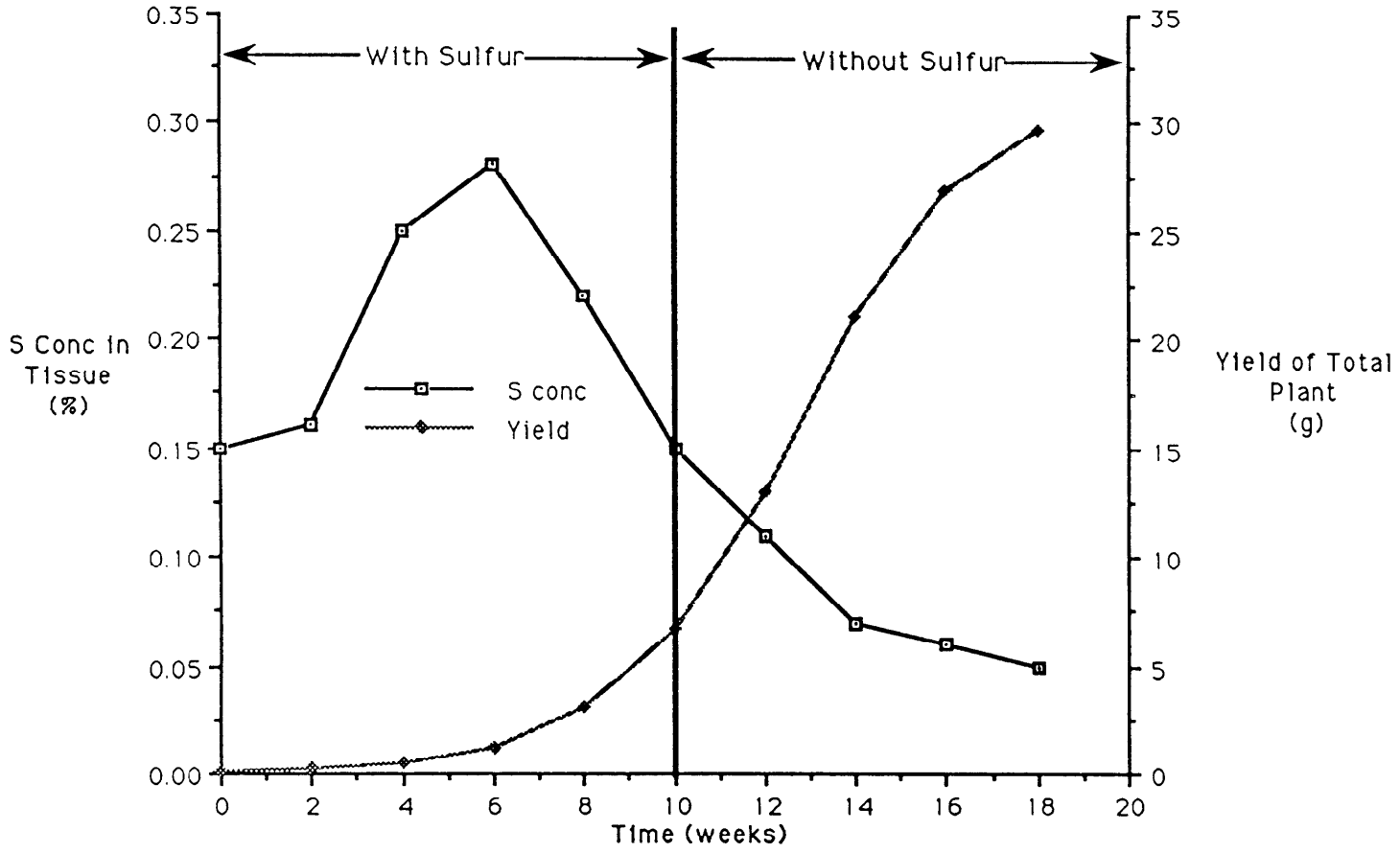


Fig. 3. Relation between S concentration and yield of cranberry plants.

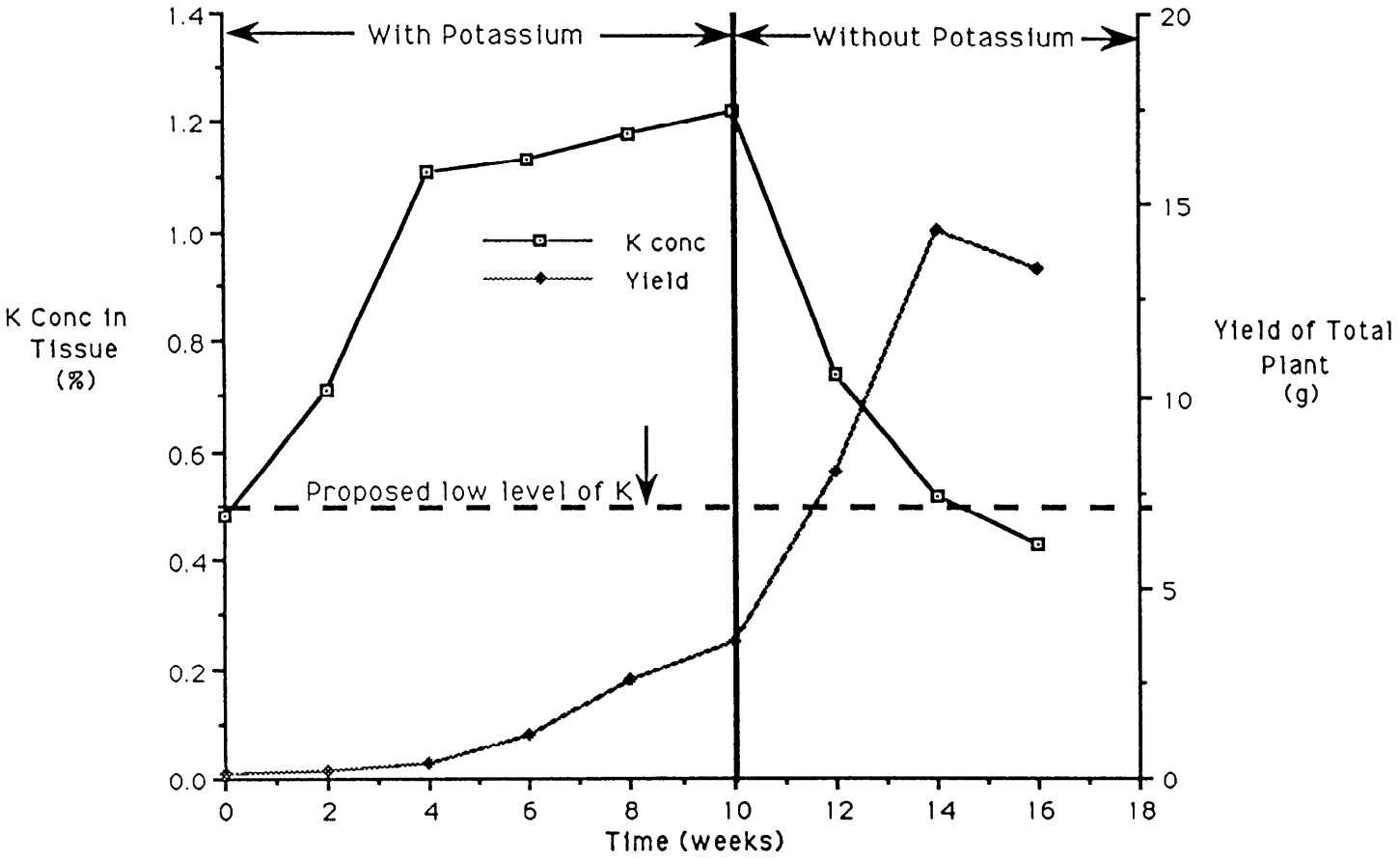
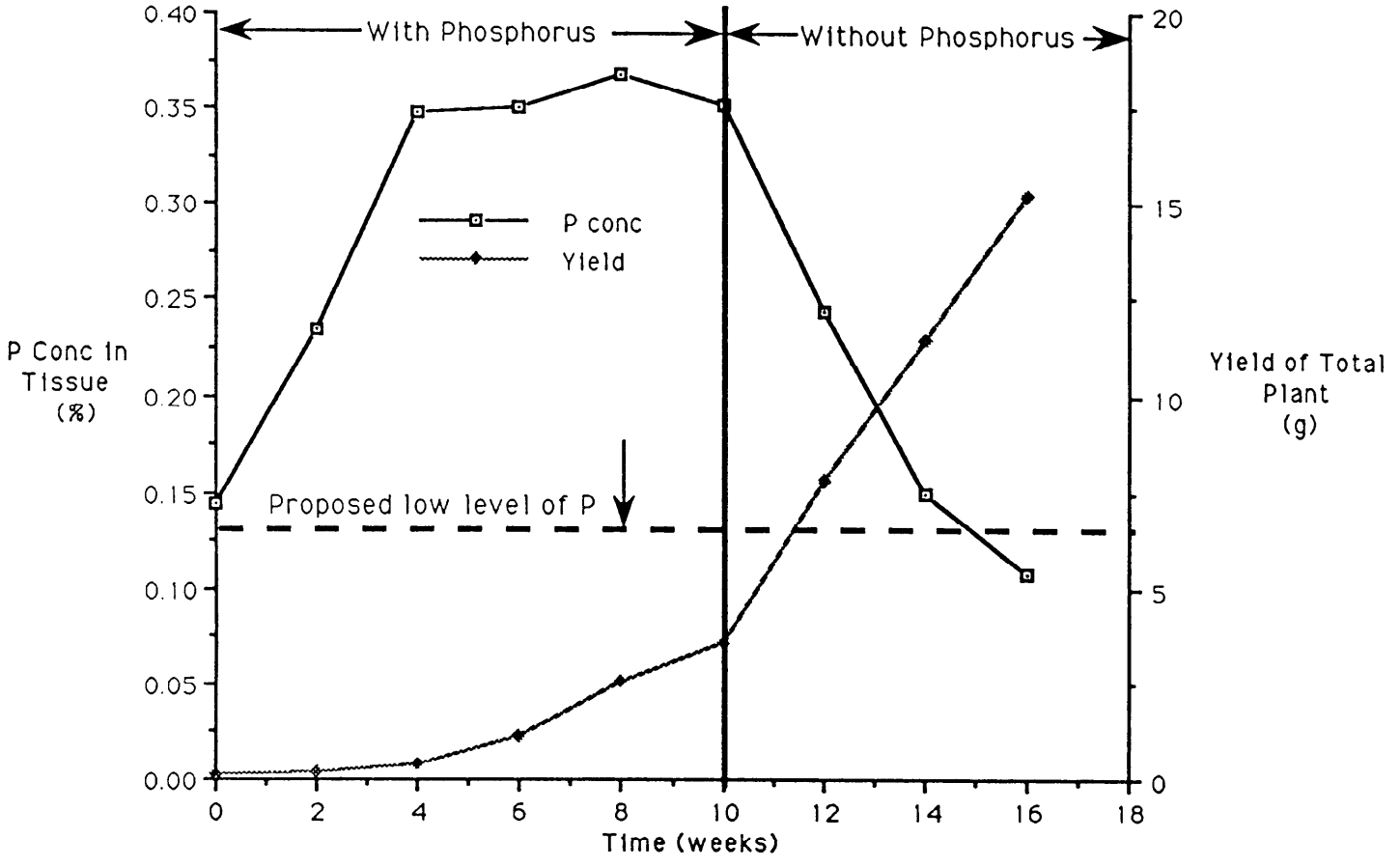


Fig. 2. Relation between K concentration and yield of cranberry plants.



Fig, 1. Relation between P concentration and yield of cranberry plants,