

Tissue Test Summary

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Tissue testing is a powerful tool for ascertaining the need to change a fertilizer program. Tissue testing provides a snapshot of a period in time of all of the environmental, cultural, and genetic factors that affect the nutrient content of plant tissues. Cranberry growers are encouraged to take annual tissue samples in late August through early September. The results will guide your fertilizer program for the coming year.

Each year a number of cranberry tissue samples are sent to the University of Wisconsin-Extension Soil and Plant Analysis Laboratory in Madison. This winter I was able to obtain a download of their data for the past three years. The data were provided in a spreadsheet where each row denoted a separate sample. No marsh or bed identification was provided. The samples comprised 281 samples taken over the past three years. This is a large enough sample size that I believe conclusions can be made about the industry based on these samples.

In order to summarize the data in a meaningful way I arranged the data into histograms. This is a means of showing the distribution of results in a graphical way. In each case the left hand axis shows the percentage of samples with a given range of concentrations. The bottom axis shows the concentration of the element of interest in the tissue. The critical value is indicated with an arrow. Samples falling below the critical value will benefit from an addition of that element. Samples at or above the critical value will not benefit from additional applications of that element. However, enough fertilizer must be applied to maintain tissues at concentrations above the critical value.

Nitrogen. Only a handful of samples tested below the critical value of 0.9% and a few samples showed tissue N in excess of 1.1% (Fig. 1). Vines testing in that area would likely show excessive vegetative growth.

Phosphorus. Only five samples tested below the critical value (0.1%) for phosphorus and very few were above the normal concentration (0.2%). This suggests that most Wisconsin growers are doing an excellent job of providing phosphorus to meet plant needs (Fig. 2).

Potassium. Every sample submitted had sufficient tissue potassium (Fig. 3). However, quite a few samples exceeded 0.75% suggesting some growers are applying more than is necessary for optimum plant growth.

Calcium. All samples exceeded the critical value of 0.3% and many samples were in excess of the normal concentration 0.8% (Fig. 4). Calcium is present in many fertilizer materials and the water applied to many properties. It would be unusual to make specific applications of calcium to a bed.

Magnesium. All samples exceeded the critical value of 0.15% and many samples were in excess of the normal concentration (0.25%). Clearly most vines won't benefit from additional magnesium fertilizer (Fig. 4).

Sulfur. All samples exceeded the critical value of 0.08% (Fig. 6). It is surprising that excess sulfur was not found in these tissue samples since sulfur is present in fertilizers such as ammonium sulfate and potassium sulfate. Sulfur is also used to reduce soil pH thus ample sulfur is applied to beds.

Boron. Boron is a micronutrient and thus is required in very small amounts. All of the samples in this survey were in excess of the critical value (15 ppm) and many samples were in excess of the normal range of 60 ppm (Fig. 7). There is no published scientific evidence that loading vines with Boron will increase fruit yield of cranberries.

Zinc. This is the one element that the survey showed was low in vines (Fig. 8). In every case the tissue tests were below the critical value of 15 ppm. Zinc is easiest applied as zinc sulfate and can be blended into other fertilizers. The critical value for zinc is 15 ppm.

Copper. Most samples tested in the normal range (4-10 ppm) for copper (Fig. 9). This is an element that growers will want to pay attention to and not let become deficient.

Most of the tissue samples also had accompanying soil samples. This allowed us to examine correlation between tissue concentration and soil test levels. These soil test values are based on chemical soil testing where the soil is extracted with a dilute strong acid. The extractant is then analyzed for P and K. Chemical soil testing is designed to estimate the amount of P and K that would be available to plants through the course of one season. Figure 10 shows the relationship between soil test P and tissue P. It is clear that there is no relationship. Soil test values are not useful in predicting what tissue P concentrations will be. The R^2 value shows that less than 1% of the variation in tissue P is accounted for by soil test P. The same situation is true for potassium (Fig. 11). There is no relationship between soil test K and tissue K concentration. The R^2 value indicates that less than ½% of the variation in tissue K is a result of variation in soil test K.

The take-home message from this project is that most cranberry growers are doing an acceptable job of managing vine nutrition and soil fertility. The goal of any fertilizer program should be to ensure that the vines are in the sufficient range for the required mineral elements. Except for maintenance doses, adding fertilizer when tissue levels are in the sufficient range is wasteful and expensive.

Figure 1. Distribution of Nitrogen in 180 cranberry tissue samples. The critical value is 0.9% as indicated by the arrow.

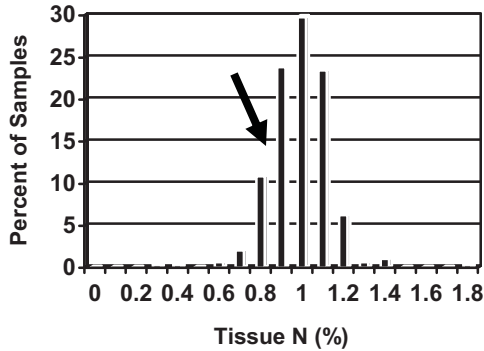


Figure 2. Distribution of phosphorus in 180 cranberry tissue samples. The critical value is 0.1% as indicated by the arrow.

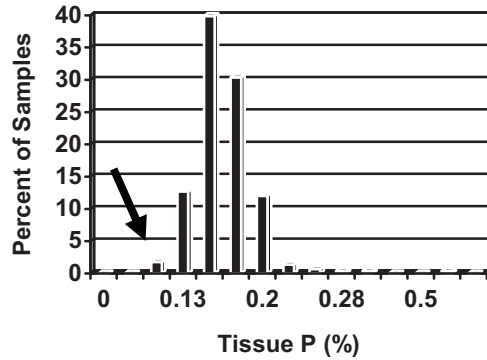


Figure 3. Distribution of Potassium in 180 cranberry tissue samples. The critical value is 0.4% as indicated by the arrow.

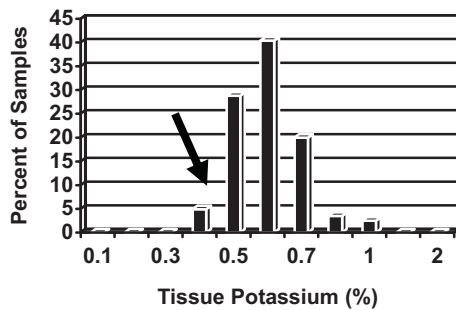


Figure 4. Distribution of Calcium in 180 cranberry tissue samples. The critical value is 0.3% as indicated by the arrow.

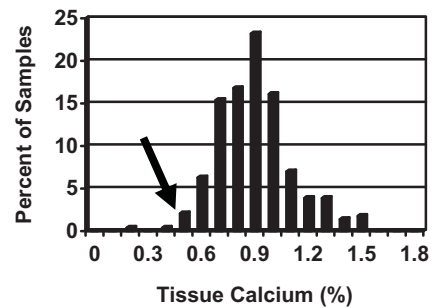


Figure 5. Distribution of Magnesium in 180 cranberry tissue samples. The critical value is 0.15% as indicated by the arrow.

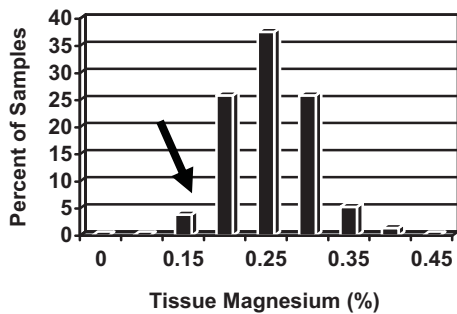


Figure 6. Distribution of Sulfur in 180 cranberry tissue samples. The critical value is 0.08% as indicated by the arrow.

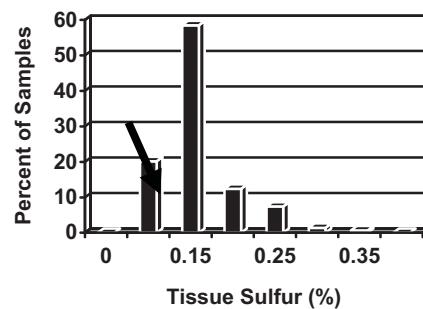


Figure 7. Distribution of Boron in 180 cranberry tissue samples. The critical value is 15 ppm as indicated by the arrow.

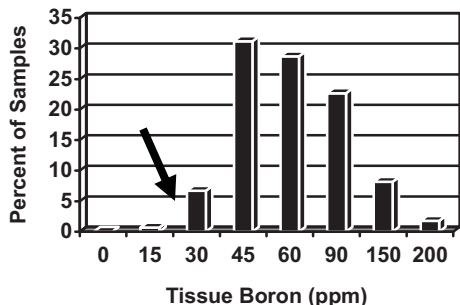


Figure 8. Distribution of Zinc in 180 cranberry tissue samples. The critical value is 15 ppm as indicated by the arrow.

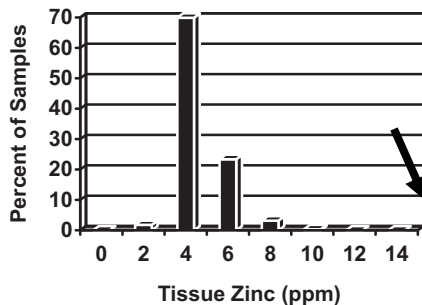


Figure 9. Distribution of Copper in 180 cranberry tissue samples. The critical value is 4 ppm as indicated by the arrow.

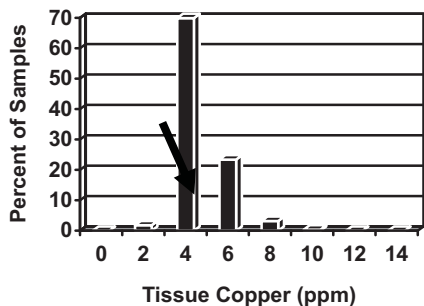


Figure 10. The relationship between Bray soil test data and tissue test data for Phosphorus from 256 Wisconsin cranberry samples. R^2 value = 0.025

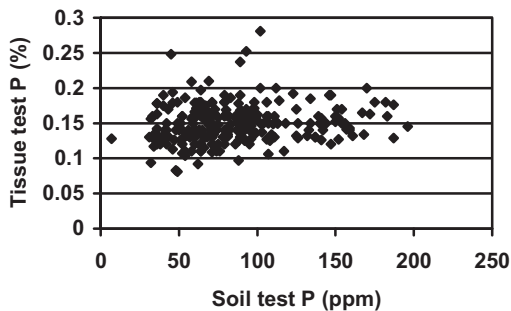


Figure 11. The relationship between Bray soil test data and tissue test data for Potassium from 256 Wisconsin cranberry samples. R^2 value = 0.047

