Integrated
Cranberry Crop
Management
for Wisconsin

Cranberry

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CRANBERRY TISSUE TESTING

The only reliable means of assessing the efficacy of a fertilizer program is tissue testing. The correct time to collect tissue and soil samples for analysis is late August through early September. Cranberries require proper amounts of 13 mineral elements in addition to carbon dioxide, water and sunlight. When any of these items are in short supply growth and yield will be reduced. However, if they are in adequate supply, adding additional amounts will not increase growth or yields. Tissue testing is the single reliable means of determining if adequate amounts of the 13 required mineral elements have been supplied and to gauge if your fertility program has been effective.

Good tissue testing requires consideration of three factors:

- Sample at the correct time
- Sample the correct part
- Normal nutrient ranges

Taking a sample

Collect tissue samples during the last two weeks of August through the first week or two of September. The reason to take samples during this time is that the concentrations of the 13 required minerals are stable during this period so the exact date you take the sample is less critical. Also, the standard values against
which the results are compared are based on sampling in this time frame. Samples taken at other times are not interpretable based on these standards.

Sample the correct plant part

A good cranberry sample consists of current season growth from both fruiting and non-fruiting uprights. Clip the uprights just above the fruit and be sure to get only current season growth. Collect about 20 tips from about 10 different locations within a bed. Don't collect all the samples from one corner or along one edge. Walk a zigzag pattern throughout the bed, or walk from one corner to the opposite corner

collecting samples along the way. Collect from about 10 separate locations within a bed. The total sample will consist of about 200 uprights or about 1 to 1 ½ cups of tissue.

Do not wash or rinse the uprights. Washing will remove soluble nutrients and give you an inaccurate test. Allow the sample to dry overnight before mailing. Use paper bags or envelopes to mail the samples. Please don't use plastic bags. Be sure to label each bag or envelope with a bed number or other identification code. Submit the samples promptly to a reputable laboratory. Your county Extension office can help you locate a suitable lab. If the lab is ASCS certified you can be sure of reliable results and may be eligible for cost sharing.

Soil Testing

Take a soil test at the same time you collect tissue samples. Use a trowel or soil probe to sample to six inches. Collect the soil samples in the same area where you collected tissue samples. The UWEX lab will run a routine soil test accompanying a tissue test at no additional fee ($18.00).

Interpreting the results

Once the results come back from the lab you should compare the results against the nutrients standards for North America and against previous results for the bed or section.

In addition to the lab results you should pay attention to vine growth. Vigorous growth or weak growth may be explained by your test results and will help you alter your fertility program for the following year.

The report will **not** tell you how much fertilizer to apply next season, but will allow you to monitor the efficacy of your current program and point out potential concerns to watch out for later. If you plot the results of tissue testing over time you can begin to see patterns of nutrient changes over time and work to prevent deficiencies.

Table 1. Cranberry tissue standards for producing beds in North America

Nutrient	Normal Concentration[1]
Nitrogen (N)	0.90-1-10%
Phosphorus (P)	0.10-0.20%
Potassium (K)	0.40-0.75%
Calcium (Ca)	0.30-0.80%
Magnesium (Mg)	0.15-0.25%
Sulfur (S)	0.08-0.25%
Boron (B)	15-60 ppm
Iron (Fe)[2]	>20 ppm
Manganese (Mn)[2]	>10 ppm
Zinc (Zn)	15-30 ppm
Copper	4-10 ppm

1. *Normal levels are based on samples taken between August 15 and Sept. 15.*
2. *Cranberry researchers have not found a normal range for Fe and Mn.*

More information about tissue sampling is found in the bulletin A3642 "Cranberry tissue testing for producing beds in North America". Copies are available at your county Extension office or via the web: http://www.hort.wisc.edu/cran/Publications/a3642.pdf

Teryl Roper, UW-Madison Extension Horticulturist

Manners are of more importance than laws. Upon them in a great measure, the laws depend. The law touches us but here and there, and now and then. Manners are what vex or soothe, corrupt or purify, exalt or debase, barbarize or refine us, by a constant, steady, uniform, insencible operation, like that of the air we breathe.

Edmund Burke

Determining the need for phosphorus fertilizer

Marsh managers all have to make a decision about how much phosphorus fertilizer to apply each year. Apply too little and the vines won't be as healthy, resulting in poor growth and reduced yields. Applying too much costs time and money and may result in P leaving beds. What information should a manager use to make the decision about how much P to apply?

Soil testing

Since phosphorus fertilizer is applied to the soil and is taken up by roots from the soil, doesn't it make sense to test the soil to see how much phosphorus is there and available for cranberry roots to absorb? In theory this is a good idea. In practice there are a couple of problems.

Chemical soil testing is done by mixing the soil with an extractant solution, filtering out the soil, and then analyzing the aqueous solution for phosphorus. In different parts of the world different materials are used to extract phosphorus from the soil. In Wisconsin the Bray 1 method is used. This dilute strong-acid extractant (a mixture of dilute hydrochloric acid and ammonium fluoride) solubilizes P minerals including Ca-P, Al-P and Fe-P. In the field these minerals do not solubilize in the soil solution, so cranberry soils can test high for Bray-1 P while the vines are P deficient. Usually these soil tests are calibrated for annual agronomic crops such as corn and soybeans. They are best used on mineral soils.

These chemical extractants don't remove all the P from the soil since not all the P in the soil is plant available. Instead they remove a fraction of the total P that is supposed to roughly equal the P that is plant available. In actuality there can be huge discrepancies between extractable P (an estimate of plant available P) and actual plant available P.

A further complication in cranberry soils is their usually high concentrations of iron and aluminum, particularly iron. Soils that are high in iron release P to the Bray extractants too easily, thus overestimating the amount of P available to plants. Research has shown that chemical soil tests are completely inaccurate if soil iron exceeds 200 ppm. Most Wisconsin cranberry soils exceed 200 ppm iron.

Chemical soil tests are set up for annual cropping systems where all the nutrients required for plant growth must come from the soil each year. Cranberries are perennial. Substantial amounts of mineral nutrients remain in the dormant vines over the winter. These minerals are re-mobilized in the spring to support plant growth so that not all nutrients have to come from the soil anew each year.

It is possible for soils to be low in a given nutrient while the plants growing in that soil are sufficient in the nutrient. Plants have the ability to concentrate elements inside them so a plant can have a higher concentration of an element that the soil. They do this by "hiding" ions inside cellular structures or by mobilizing them to other parts. Plants are able to exclude certain ions such as sodium and aluminum. When a tissue test shows high sodium or aluminum it suggests that the roots are damaged in some way so these unwanted ions are entering the plant. Plants can also be low in a nutrient while the soil is high. An example of this is apples growing in limestone based soils in western Wisconsin. The soils are full of calcium, but getting the calcium out of the soil and into the fruit is difficult. Phosphorus and cranberry vines are similar. Most cranberry soils are high in extractable P, but low in plant available P.

For perennial crops, soil testing is an indirect means of determining the need for fertilizer applications. A more direct means is tissue testing.

Tissue testing

The preceding article in this newsletter deals with tissue testing and how to take and interpret tissue tests. Tissue testing is the primary means used by cranberry growers to determine 1) the need for fertilizer, and 2) the efficiency or efficacy of previous fertilizer applications.

Some have questioned the timing of fertilizer applications in the late summer to early fall, indicating that was too late to make remedial fertilizer applications. While this suggested timing is too late for the current crop year, it is not too late for the coming crop year. When you take a tissue sample in August or September of 2003 the results will guide your spring fertilizer program for the 2004 crop. The cycle for producing cranberries is a 16 month cycle, not a 5 month cycle. The buds for the 2004 crop are already on the vines. That is what we have fertilized this year, not the 2003 crop. We fertilized the 2003 crop during 2002.

The tissue test results don't tell you exactly how much fertilizer to apply. It only tells you if the plants are in the deficient, low, sufficient, high, or excessive range. You must supplement this information with your knowledge of previous fertilizer applications, previous tissue test results, vine vigor, yield, age of the bed, cultivar, etc. When combined, this information can give you a pretty good idea if you need to alter your fertilizer program for the coming year.

SUMMER FIELD DAY

Mark your calendars for Wednesday August 6 and plan to attend the Cranberry Summer Field Day at Elm Lake Cranberry Co. in Cranmoor. Exhibits will open at 8:30 am. WSCGA will hold a business meeting at 1:15 pm. Registration materials are available from WSCGA. The cost for lunch is $8.00. Lunch should be ordered before July 25. Cranberry field day is co-sponsored by WSCGA and the University of Wisconsin-Extension.

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