PHOSPHORUS NUTRITION

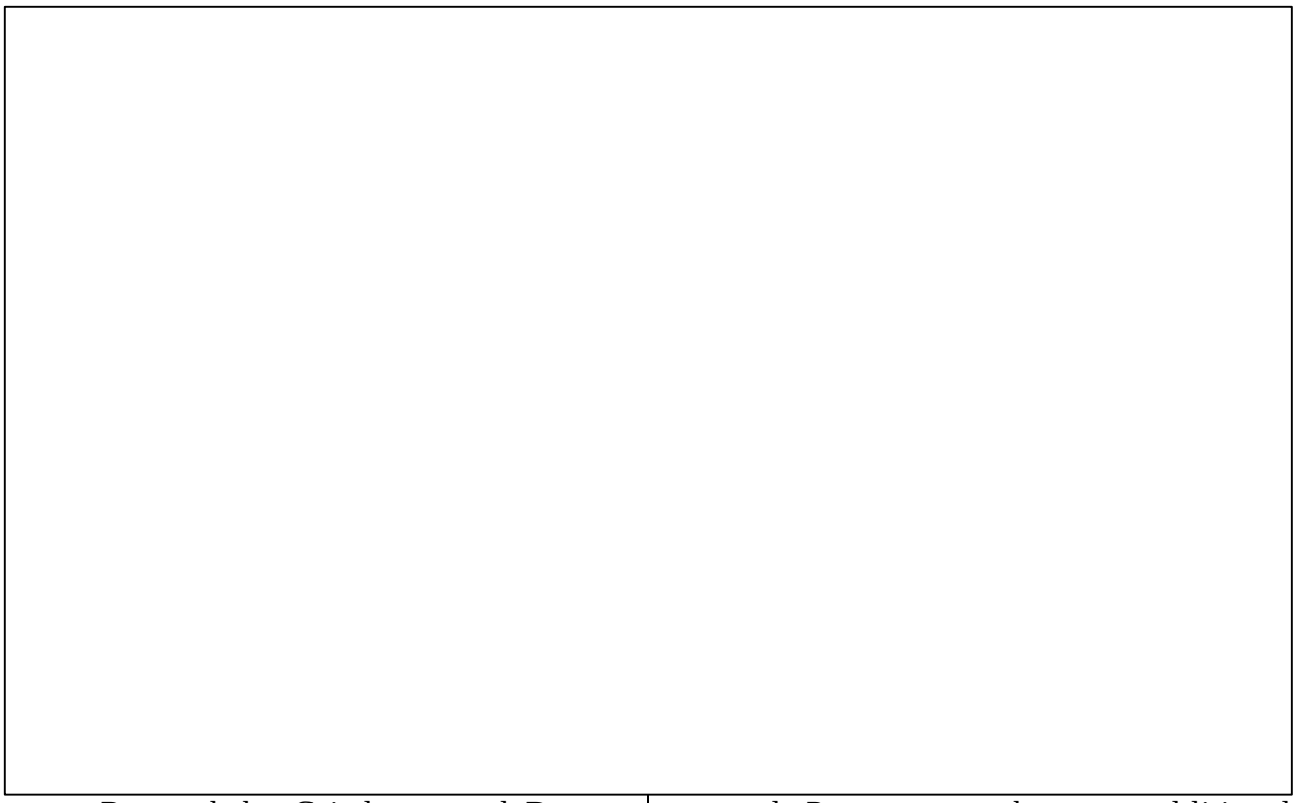
Phosphorus is one of the major mineral elements required by cranberries to grow and produce fruit. Phosphorus can also be an environmental contaminant that can lead to unwanted plant growth in water bodies and subsequent eutrophication. In tissue tests I have seen phosphorus tends to be low while it is often high in soil tests. There are several reasons for this and the conditions under which cranberries grow contributes to the problem. Let's first address the soil and then discuss the tissue tests.

In acidic soils phosphorus exists in the soil solution as the negatively charged phosphate ion $H_2PO_4^-$. Phosphate ions are negatively charged and, therefore, bind tightly to positively charged ions that are available in soils. These compounds tend to be insoluble. Common positively charged ions that bind with phosphate are manganese, calcium, aluminum and iron. Iron and aluminum are more readily available in acidic soils. In normal agricultural soils liming to raise soil pH can increase phosphate availability.

The concentration of phosphorus in agricultural soils "soil solution" is about 0.02 to 0.1 ppm. As this available phosphate is taken up by plants the reservoir is replenished from available sources including that "fixed" by iron, aluminum and calcium compounds (Fig. 1)

Decomposition of organic materials will also release phosphate into soils. This release occurs more rapidly when soils are warm, well drained, and well aerated. This is one reason that crops grown on cold, wet soils respond to applied phosphorus even when soil test phosphorus is high.

One other difficulty in assessing soil phosphorus levels is that testing methods for phosphate are somewhat subjective. Soils generally have between 1000 to 2000 lb/a P in the top 7 inches. However, much of this phosphorus is in insoluble forms and is not plant available. Soils tests for phosphorus use weak acids to remove a fraction of this total P that is thought to be plant available. As a result, soil tests are estimates of plant available P. These estimates are based on yield response to various levels of soil P as determined through soil testing. These tests work reasonably well for annual row crops, but have not been verified for cranberry. Research has shown that as soils dry the soil tests had variable results in predicting actual soil P levels. However, since we don't have data to support the use of other testing methods the normal 'Bray P' soil test is still recommended for cranberry soils in Wisconsin.



Research by Griedanus and Dana showed a yield response in cranberry to increasing tissue P levels. This research was the basis of the tissue test recommendations that are currently in use in North America. The normal concentration of tissue phosphorus is between 0.10 and 0.20%. Cranberry growers apply fertilizer containing P in an attempt to keep tissue P above 0.10%. Since there is a yield response to applied phosphorus growers commonly use fertilizers that contain phosphorus. Remember that this yield response occurs even though soils already contain ½ to 1 ton of phosphorus per acre. The question that remains is: How do I get enough phosphorus into the vines so P is not yield limiting while at the same time not overloading the soil such that phosphorus might move into adjacent water bodies?

Research has shown a yield response to P fertilizer up to 20 pounds of actual P per acre, but no additional response at 40 or 60 pounds of actual P per acre. This suggests that the optimal fertilizer rate for cranberry production is between 20 and 40 pounds actual P per acre. [Multiply the middle number on the bag (P_2O_5) by 0.43 to get actual P. 100 pounds of 6-24-24 supplies 10.3 pounds actual P.]

Phosphate fertilizer is available in several forms. See table 1 for details. Don't let the solubility numbers fool you. Research shows to yield response when solubility exceeds 60%. Various P forms are used in blending complete or balanced fertilizers such as 6-24-24 or 14-14-14.

The first step in managing phosphorus is to be prudent in fertilizer applications. Research suggests that applications of P above about 20 pounds/acre will not increase yields. If you are applying 30+ pounds of P per acre on established beds you are over

Table 1. Fertilizer sources of phosphorus.

Name of fertilizer	Chemical formula	Analysis	Water solubility
Ammonium polyphosphate	$NH_4H_2PO_4 + (NH_4)_3HP_2O_7$		
Liquid		10-34-0	100
Dry		15-62-0	100
Diammonium phosphate	$(NH_4)_2HPO_4$	18-46-0	>95
Monoammonium phosphate	$NH_4H_2PO_4$	11-48-0	92
Ordinary superphosphate	$Ca(H_2PO_4)_2 + CaSO_4$	0-20-0	85
Rock phosphate	$3Ca_3(PO_4)_2 \quad CaF_2$	0-32-0	<1
Triple superphosphate	$Ca(H_2PO_4)_2$	0-46-0	87

applying phosphorus. You should be able to reduce your P application without sacrificing yields. Split phosphorus applications over 3 to 5 applications per season. This allows more efficient uptake over time by the vines.

The availability of phosphorus from organic (peat) cranberry soils changes during the season. When the soils are wet to moist during the early part of the season P is most available. As the soils dry during the summer soils retain P and it becomes less available. Applying P fertilizer to peat soils before roughneck is likely not necessary. The patterns of P retention on sandy soils did not change during the course of a season so P fertilizers may be added to these soils at any time during the growing season.

For all of agriculture Phosphorus is of increasing concern. Traditional wisdom was that phosphorus would be "fixed" in the soil and would not move. Research has now shown that soils can saturate with P just like your water softener will fill up with calcium ions until it is recharged. Applying phosphorus beyond what is needed by the vines for a full crop will saturate the positive charges from ions in the soil and will lead prematurely to phosphate discharges. Additional research that is in the planning stage will examine P fertilization for cranberries more closely.

Teryl Roper, UW-Madison Extension Horticulturist

For more information about this topic see:
A2520 Soil and applied phosphorus
A3588 Management of Wisconsin soils
A3642 Cranberry tissue testing.
These bulletins are available from your county Extension office or by calling (608) 262-3346. Credit cards are accepted.

CRANBERRY INSECTS OF THE NORTHEAST

In the last newsletter I mentioned this book and many of you have called me to find out how to order it. That information is provided below. By the way, "no, the spiney looper is not referred to as the 'Pittsville looper' by Franklin". We just dubbed it that here in Wisconsin until we knew what it was. The nickname has stuck. . . Sorry for the confusion.
UMass Cranberry Experiment Station
P.O. Box 569
East Wareham, MA 02538
Attn: Martha Sylvia

The cost is US$35.00 including shipping. Make checks payable to UMass.
Jayne Sojka, Lady Bug IPM

GROWING SEASON OF 1999

During July and some of August we observed some strange flight on most of our properties. The adult moth is quite large with a gray/brown body with very defined lines on its wings. Sometimes flight can be ignored because

it is so spotty (few and far between) but this particular flight activity was found in all 6 counties that we serve. Some areas were heavy with flight while others were just present. We captures several moths and Buck Joseph delivered them to the Entomology lab in Madison for identification.

It was our hope that these adults were just migrating through like the Aster leafhoppers, but when the days turned into weeks and they were still here we knew that there would be egg laying in and around the beds. Dr. Dan Mahr has notified me that this moth is in the cutworm/armyworm family (Noctuidae) specifically it is *Carnurgia erechtea*, which has a common name of forage looper. In the spring keep a close eye out on your marshes for egg hatch. Dan shares that it feeds primarily on herbaceous plants and is frequently found on grassy areas. So far there is no record of it feeding on cranberry.

Be a part of the solution

I challenge each of you to use your creative talents to find a way to promote our cranberry products right where you are. We have a surplus—plain and simple! Now let's be part of the solution today. If every individual in our industry makes one promotion, just think of the people we'll reach. I know of one family that makes juice of all flavors available to the track team in their local school. What about the golf course, race track, booths at the fair, football games, tractor pulls, volleyball games, horseshoe leagues and the list goes on. Every opportunity I have to serve cranberry products to students, fellow board members, committee representatives and at church fellowships I see to it that the products are there. You know what? I stopped counting how many times people have shared that they have never tasted some of the flavors we have available, but after tasting them they will be sure to purchase some. When I bake with our products and share them I find that I had better bring the recipe with me because undoubtedly someone will want it.

Again, I challenge you to be creative and share!

Jayne Sojka, Lady Bug IPM

Wisconsin Cranberry Crop Management Newsletter
Dept. of Horticulture
1575 Linden Drive
Madison, WI 53706-1590

Nonprofit Org.
U.S. Postage
PAID
Madison, WI
Permit No. 658