

Integrated
Cranberry Crop
Management for
Wisconsin



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ADDRESS CORRECTION

Contact us if you have any address corrections, additions, or deletions.

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CRANBERRY NUTRIENT MANAGEMENT: PHOSPHORUS

Carolyn DeMoranville

Director, UMass Cranberry Station; Extension Associate Professor

Phosphorus (P) is important for plant metabolism; it plays a key role in energy transfers in the plant, in transporting the sugars produced in photosynthesis, and is part of the DNA molecule. If P is deficient, growth and yield can be impacted. That being said, the P requirement for cranberry is the lowest among the major fertilizer elements (much lower than that of N or K). Crop and harvest trash removal account for only about 5 lb/A P in a 250 bbl/A crop. In addition, added P can build up in the upper soil layers and some of that is available to the plants. This stratification often confounds P soil test results, making them difficult to interpret. For this reason, application recommendations in Massachusetts and other regions are usually based on crop use and tissue testing.

P can be an environmental pollutant. Adverse environmental impacts are reduced by using moderate P rates (no more than 20 lb/A per season) and by careful attention to harvest flood management. When bogs are flooded, especially when soil and water are warm (harvest time), P from the soil can move into the flood water. The mechanism for this movement is under investigation. Three possible explanations have been suggested: 1) dissolved P in the soil water moves into the flood, 2) P previously bound to iron in the soil is released as oxygen is depleted during the flood, and 3) loosely bound P forms in the soil are released. It is likely that the explanation will be a combination of all three. When the flood is released, the dissolved P then may leave the bog system.

Research in Massachusetts and Wisconsin has shown that cranberries require additions of P fertilizer for sustained productivity. However, there is no evidence in *any* research plot work or commercial bed observations that more than 20 lb/A actual P (45 lb/A P₂O₅) is required for productive cranberries. In some Wisconsin studies, on high P sand soils, there was no response to P fertilizer on beds with adequate tissue P. Based on this production research in the two regions, 10-15 lb/A P is sufficient to maintain productivity if tissue test P is in the sufficient range (0.1-0.2%). In fact, in plots and demonstration sites in Massachusetts, production and fruit quality were maintained with an average of 10 lb/A and no significant relationship between P rate and yield was observed. Research on new plantings has shown a benefit to a higher P rate in the planting year.

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CRANBERRY NUTRIENT MANAGEMENT: PHOSPHORUS

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At several Massachusetts commercial sites, growers applying an average of 10 or less lb/A/yr P over a period of years have seen either no change or an *improvement* in their crops. As P fertilizer use was reduced, P output from the bog (in flood water) also decreased. When implementing a reduced P rate, it is important to collect August tissue tests and follow these recommendations: If P is <0.10% - increase the P rate and retest next season; if P is 0.10-0.11% - maintain the P rate and retest next season; if P is 0.12-0.15% - maintain the reduced P rate and retest in 2-3 years; if P is 0.16% or more - further P reduction may be considered.

Recommended Phosphorus Rates in Massachusetts

Production system	Recommended P rate lb/A	as P ₂ O ₅ lb/A	Notes
New plantings	up to 30	up to 68	Initial year only
Established beds, tissue test >0.16%	no more than 10	no more than 23	
Established beds, tissue test 0.11-0.15% and stable	no more than 15	no more than 34	Trying a lower rate (e.g. 10 lb/A) is encouraged
Established beds, tissue test <0.12% and trending down	up to 20	up to 45	15 lb/A P with testing should suffice
Established beds, tissue test <0.10%	20	45	

INSECTICIDE PROFILE: DELEGATE

Christelle Guédot
University of Wisconsin, Entomology

Delegate is registered for use in Wisconsin on cranberry. It has been registered for some time now so you probably have some experience with it. It is marketed by Dow AgroSciences™ under the formulation 25WG (25% of active ingredient as Water dispersible Granules). Delegate is in the class of the spinosyns (IRAC group 5) with a mode of action acting on the insect's acetylcholine and GABA receptors on postsynaptic membranes of the insect nervous system, causing abnormal neural transmission. Delegate contains the active ingredient Spinetoram, a mixture of chemically modified spinosyns. Delegate is effective primarily through ingestion of treated plants and secondarily through contact. Delegate also provides translaminar activity by moving into and across leaf tissue. Affected insects will rapidly stop feeding within minutes, become paralyzed and eventually die. It provides control across multiple insect growth stages.

On cranberry, Delegate is registered for control of armyworms, fireworms, gypsy moth, leafrollers, loopers, sparganothis fruitworm, and for suppression of currant fruit fly and thrips.

INSECTICIDE: DELEGATE

- Available as 25WG (25% AI, Water Granule)
- Restricted re-entry interval (**REI**): 4hours
- Pre-harvest interval (**PHI**): 21 days
- No more than 6 applications per year
- No more than 2 consecutive applications
- Do not exceed a total of 19.5 oz. per acre per year
- Rate of use per acre: 3 – 6 oz.
- Minimum interval between applications is 7 days

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INSECTICIDE PROFILE: DELEGATE

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We have had Delegate in our insecticide trials for a while now and it has shown great activity against cranberry fruitworm, sparganothis fruitworm, spanworm, and blackheaded fireworm.

Delegate may be applied by ground equipment, chemigation, and by air (see label for specific application regulations). For ground applications, it is recommended to use a nozzle height of no more than 4 feet above the crop canopy.

Delegate is toxic to bees exposed to it within the first 3 hrs. after application. It is not considered toxic to bees after the spray deposit has been allowed to dry but as a precaution, avoid applying it during bloom when bees are flying.

Delegate is toxic to aquatic invertebrates and must not be applied directly to water.

As always, make sure to read the label before using any pesticide. You can find the label of Delegate at the following link: <http://ws.greenbook.net/Docs/Label/L89337.pdf>

OBSERVATIONS FROM AN INTERN

Justin Wilcox

UW-Stevens Point Student and Intern for Jayne Sojka, Lady Bug IPM

When I accepted a summer internship with Lady Bug IPM I had no clue what I was getting myself into. I had experience with other crops but cranberries were something completely new to me. I had no clue how unique and interesting the cranberry industry was. Working on so many different properties has given me quite the look into the whole industry, in Wisconsin. I get to see all of the hard work that goes into making a successful cranberry crop. Some things that really peak my interest are the wildlife, conservation efforts, integrated pest management (IPM), application of various products and the equipment I see on the marshes.

I knew that when I started this job I would be outside all the time but I didn't realize how much wildlife I would see in the marshes. I see so many times that agriculture is pegged as an industry that causes harm to the environment, but I've seen some examples of the opposite. The marshes create habitats such as, reservoirs and waterways that are very good nesting grounds for all sorts of wildlife. On my first day on the job I was able to see a Blue Heron rookery and from then on I have seen so many different kinds of birds. Sandhill cranes, whooping cranes, trumpeter swans, geese, eagles, and many others. Specifically, marshes provide habitat for the once endangered Trumpeter Swans and Whooping Crane. I've only seen one pair of whooping cranes but I have seen numerous pairs of banded and non-banded Trumpeter Swans making themselves at home in and around the reservoirs. Being able to see these birds in their natural habitat and seeing the success of reintroduction is really great.

Another form of wildlife that I saw all over the marshes were the bees. I hadn't given much thought to bees and their importance to the cranberry industry and I had no clue that bees were used in such quantities. I also had never seen bumblebees brought in to pollinate. I honestly didn't know that bumblebees had their own market. So after a few weeks of working side by side with bumblebees and honeybees I learned a few things. After getting stung 8 times I learned that the honeybees are out there for a reason and that is to collect pollen and in turn pollinate the blossoms. I also learned that if you get in their way they will not hesitate to sting you. On the other hand, the bumblebees were not as aggressive as the honey bees, they seemed to mind their own business and leave me to my crop scouting. After seeing all of the bees and what they do I know have a new appreciation for them and what they do.

As I continued to think about conservation efforts and all of the bees, the timing of pesticide applications came to mind. It's great to see growers plan their pesticide applications around the presence of bees and pollinators on the marshes. Using insecticides that are insect specific instead of other harsh broad spectrum insecticides is a great

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OBSERVATIONS FROM AN INTERN

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example of this. I also had no clue that there were optimal times to spray fungicides and insecticides. I learned that plant stages and calculating percentages in and out of bloom correlate with the application of fungicides and insecticides when targeting specific pathogens and insects. The correct timing and placement of pesticides is vital to having a successful crop. This leads me in to my next point of interest in the marshes, the method of pesticide and fertilizer application and equipment used to maintain the marshes.

I came from a “Traditional Agriculture” background, corn, soybeans and potatoes. In my experience I just saw a big sprayer come in once or twice and apply some herbicide or pesticide and I saw standard tractors. Working in cranberry IPM has given me an entirely different look at pesticide and fertilizer application. The booms and bridges that I saw intrigued me. I quickly learned that no boom is the same, and in some cases a boom just doesn’t work. In turn no marsh is the same; different shaped beds, different methods, and different equipment. So far in my experience the cranberry industry has been the most innovative when it comes to equipment. From alterations to the complete fabrication of the equipment used on the marshes. I’ve seen standard rotary mowers used and completely custom mowers that work perfectly for mowing and maneuvering dikes, to machines meant for cleaning ditches. It truly amazes me to see how every grower fine tunes their equipment to suit their needs because every marsh is so different. So some days I see a boom, and the next day I might see a mister. Every week I see a new piece of equipment that is suited just right for the owner and their needs for their specific marsh.

Overall, my experience has been a fascinating one out on the marshes. I feel like I have learned so much and I’m only halfway through my time here. From the wildlife to the sustainable use of pesticides and the equipment used on the marshes, it all has been an informative and interesting experience that I’ll never forget.

EARLY ROT

Patty McManus

UWEX Fruit Crops Specialist & Plant Pathologist

Early rot is a leaf spot and fruit rot disease caused by the fungus *Phyllosticta vaccinii*. Early rot is so named because the disease starts rotting fruit relatively early (late July and early August) compared to other fungal pathogens (September). If you search the Internet for information on early rot, keep in mind that a related fungus, *Phyllosticta elongata*, causes a minor berry speckle symptom that is not considered a problem.

Leaf spot symptoms are distinct from other cranberry leaf spots (see attached scouting guide). Leaf spots symptoms are most often found in newer plantings where the canopy has not yet closed. Spots are tan to brown and sometimes have a dark red/purple margin. With a hand lens (or with the naked eye if your eyes are good), black pycnidia (fungal fruiting bodies) can be seen in the spots. Leaf spotting can cause significant defoliation in new plantings. If you want a diagnosis, submit leaves with spotting to the Plant Disease Diagnostic Clinic, Dept. Plant Pathology, 1630 Linden Dr., Madison, WI 53706.

By mid to late August, early rot appears on a berry as a soft, watery spot, usually with a distinct margin (see attached scouting guide). The spot is often lighter in color than the healthy tissue surrounding it. Sometimes, but not always, dark concentric rings give the spot a bull’s eye appearance. Sometimes black pycnidia appear on the fruit. However, the bull’s eye pattern and pycnidia are not diagnostic of early rot. We have seen such signs and symptoms when *Phyllosticta vaccinii* is not present.

If you see early rot symptoms in a young planting, and vines are still growing vigorously, you might want to protect the new growth. The most effective fungicides to use, based on our research in Wisconsin, would be Indar or Proline.

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EARLY ROT

Continued from page 4

Keep label restrictions and handler restrictions in mind, no matter what you apply. Indar can be applied a maximum of four times per season, and has a 30-day pre-harvest interval. Proline can be applied a maximum of two times per season, and has a 45-day pre-harvest interval. In terms of fruit rot itself, the best window for spraying is behind us. Work done by Peter Oudemans at Rutgers suggests that the infections that lead to fruit rot occur during or within a few weeks after bloom. However, if infected young plantings will be coming into bearing next year, then you should include either Indar or Proline, or both, in your bloom/early fruit set sprays in 2017.

IDENTIFYING EARLY ROT IN THE FIELD

Patty McManus

UWEX Fruit Crops Specialist & Plant Pathologist

What is early rot of cranberry? Early rot is a cranberry disease that causes leaf spots, premature leaf drop, and fruit rot. Early rot is caused by the fungus, *Phyllosticta vaccinii*.



Figure 1: Early rot symptoms in a new planting in September. Leaf spots are tan to brown and sometimes have dark red margins. By late summer, significant leaf drop can occur.



Figure 2: Leaves from plant at left. Tiny black pycnidia (fungal fruiting bodies) form within spots on the upper surfaces of leaves.



Figure 3



Figure 4

Figures 3 and 4: Early rot on fruit appears as a soft, watery spot, usually with distinct margins. The spot is often lighter in color than the rest of the berry. Dark, concentric rings sometimes form, resembling a bull's eye.

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IDENTIFYING EARLY ROT IN THE FIELD

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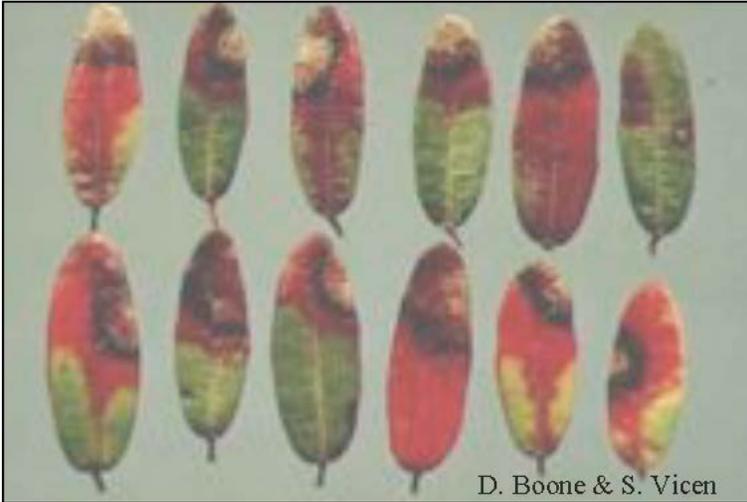


Figure 5



Figure 6

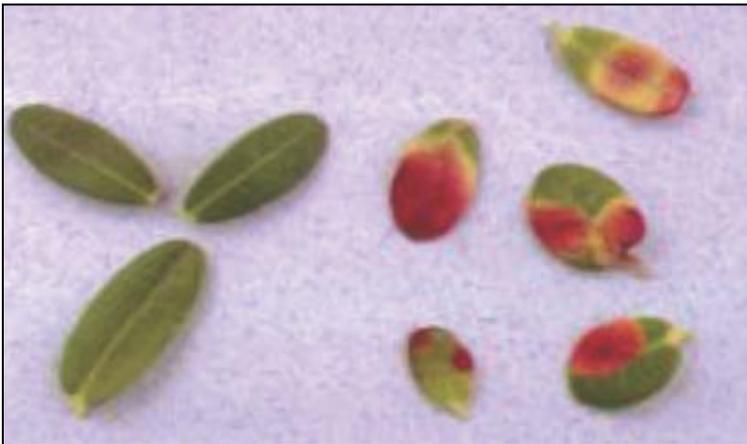


Figure 7

Why scout for early rot? Early rot can be severe in some cranberry growing regions of the U.S., requiring the use of fungicides to control the disease. Since 2005, this disease has been detected in young plantings at several sites in Wisconsin.

What should growers do? Growers should become familiar with early rot and report suspicious symptoms to their crop consultant or submit samples for diagnosis to the Plant Disease Diagnostic Extension Plant Pathologist, University of Wisconsin—Madison, (608) 265-2047, psm@plantpath.wisc.edu.

How can you distinguish early rot from other diseases? The fruit rot phase of early rot is often difficult to distinguish from other cranberry fruit rot diseases. However, early rot appears on berries as early as late July, whereas most other types of rot appear in September in Wisconsin. Some other leaf spot diseases and how to distinguish them from early rot are described below:

Figure 5: End Rot. Symptoms on leaves are rare but very similar to early rot symptoms. Older lesions turn gray. Positive diagnosis requires microscopy.

Figure 6: Brown Leaf. The cause is not known. Leaves turn brown starting in June. Sometimes just one half of a leaf is affected.

Figure 7: Red Leaf Spot. Bright red spots with yellow borders appear in July. Diseased leaves (right) are sometimes shorter and rounder than healthy leaves (left). Spots turn black after in the summer.

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IDENTIFYING EARLY ROT IN THE FIELD

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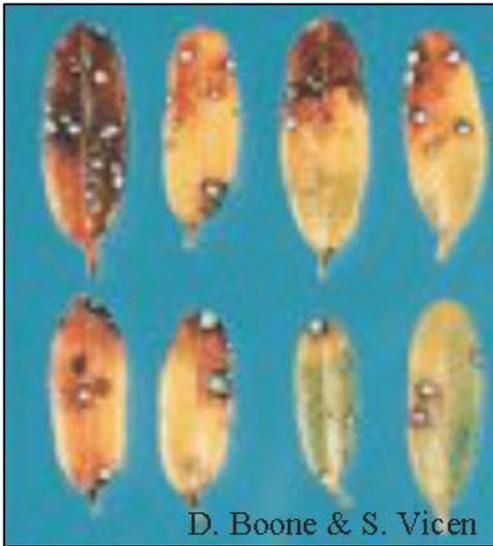


Figure 8: Cladosporium Leaf Spot. Small brown lesion on previous season's leaves. Spots have white or gray centers.

Figure 9: Protoventuria Leaf Spot. Gray to black circular spots with bull's eye pattern appear on previous season's leaves.

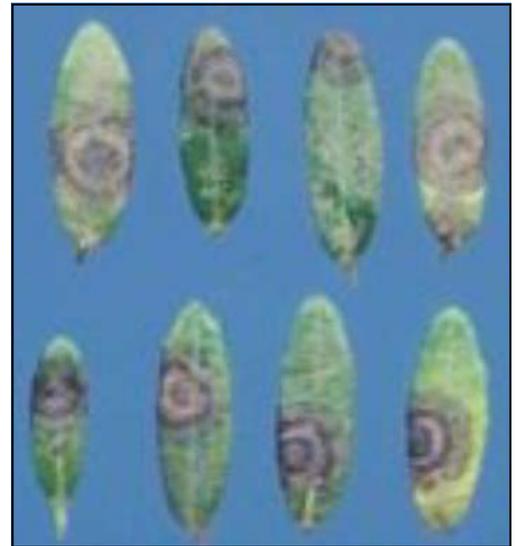


Figure 8

Figure 9

FROM THE EDITOR'S DESK

Matt Lippert

Wood County UW-Extension Agriculture Educator

Earlier this year we included an article about systemic fungicides. There are varying degrees of true systemic action. We asked Patty McManus to clarify this so that we are clear on the terminology. A pesticide that is truly systemic is taken up by the plant and transported throughout growing points of the plant. Cranberry crop consultant Suzanne Arendt offers Ridomil as an example. Locally systemic pesticides move upward in the xylem and intercellular spaces, not throughout the entire plant according to UW-Ext Professor-Pathologist Patty McManus. Examples would be Proline, Abound, and Indar.

A bit on preharvest intervals, Cranberry Pest Management in Wisconsin 2016 Bulletin A3276 (available online at <http://learningstore.uwex.edu/>) lists the preharvest intervals for a wide range of pesticides in Table 3. There are numerous products with PHI equal or greater than 60 days. Cranberry may be a native North American Fruit but the market is now global, certainly a good thing for potential demand. Your handler likely will have more rigorous standards for PHI than what is listed in A3276. Strict observance not only of FDA preharvest intervals but also of international requirements for your handler are an important step in market development. Observe the rules and do your part to develop worldwide respect and appreciation for our cranberry crop!

While we are at the point of observing 60 day PHI for a number of pesticides a more immediate issue this week will be extreme heat. Timing of water and amounts of water may alter the humidity and moisture level in the canopy as well as plant stress. In her article in this issue Patty McManus discusses how younger beds and vines and a more open canopy may increase the incidence of some leaf spot/fruit rot diseases. I invite growers to share their thoughts on the effects of managing timing of irrigation and the moisture level in the plant canopy on plant disease.

GROWER UPDATES

Adams 73 Cranberry

I have been spending a little time away from the marsh the past couple days. The smallmouth are biting on the mid-lake humps in case anybody is heading to northern Wisconsin soon! Night crawlers are doing the trick. Back on the marsh the mid-season rush to apply nitrogen is winding down. Bloom is a distant memory and has been replaced by sizing fruit. The bees have been put on trucks and shipped down the road. We are working more sulfur applications along with 0-0-50 into our schedule right now. Potentially we have another bug spray on the horizon depending on what the scouts find. I'm looking forward to returning to the marsh to see how much progress has been made while I was away.

Jeff Hopkins

Adams 73 Cranberry

Habelman Bros. Tunnel City

We will be applying one of our last fertilizer applications this week. We still have many pinheads coming and some fruit is showing good size with a little blush. Hopefully, Saturday was our last pesticide application for the year. We are at 2217 growing degree days and the soil temperature is still at 67 degrees. We are still applying a liquid foliar to the yellow vines. Our weed control has been good this year, but a few spots will be getting wiped with round-up in the next couple of weeks. We hope everyone stays cool with the forecast this week.

GO BREWERS!!!

Steve Schoonover

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