Integrated Cranberry Crop Management for Wisconsin

Cranberry

Crop Management Newsletter

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Contents:

POTASSIUM RESEARCH RESULTS

With generous funding from the NRCS via the WSCGA, we have been conducting field plot studies trying to discover optimal rates and timing for potassium fertilizer for cranberries. We have established research plots on two properties: an upland sand based bed and in a wetland peat based bed. However, cranberries are planted into a sand lift over the peat in the peat based bed. This article will briefly outline our procedure and what we have learned after two years of study.

We established plots in the two 'Stevens' beds described above. We applied consistent rates of nitrogen and phosphorus to the plots and varied only potassium application. We applied between 0 and 800 pounds of K2O per acre. We also compared the sulfate vs. chloride form at 200 and 400 pounds per acre. Our typical schedule was applications at roughneck, bloom, fruit set and in early August. We also had one treatment with applications at a two-week interval. For the 800 pound rate followed the typical regime, but added large treatments in late August and early September. At harvest we harvested a square foot sample from each plot and counted the fruit before weighing them.

We found that when we increased application rates of K fertilizer that both tissue K and soil K increased, but not always significantly. The results were more pronounced in 2006 than in 2007. We also found that increasing the application rate of potassium did not increase yield or fruit size in either year. Because some of our treatments were potassium sulfate and some were potassium chloride, we were able to see if chloride was detrimental to cranberries. We found no effect of chloride as opposed to sulfate forms of potassium fertilizer within the range we tested.

Some growers believe that large late season applications of potassium will result in better fruit color. To test this hypothesis we collected fruit from our plots and analyzed them for color. We did not sample every treatment, but we had a range from 0 to 800 lbs K2O per acre. We found no effect of potassium fertilizer rate on fruit color in either 2006 or 2007.

We conclude from this study that some potassium fertilizer is required, but so far we are not able to give a recommended rate. We did not find an effect of potassium fertilizer rate on yield, fruit size, or fruit color. Based on these results, I believe that a potassium fertilizer rate of about 200 pounds per acre per year should be more than enough, and growers may be able to get by with less. Also, both the sulfate and chloride forms are acceptable fertilizers for cranberry at the rates tested.

Teryl Roper, UW-Madison Extension Horticulturist

PEST PROFILE: COTTONBALL DISEASE OF CRANBERRY

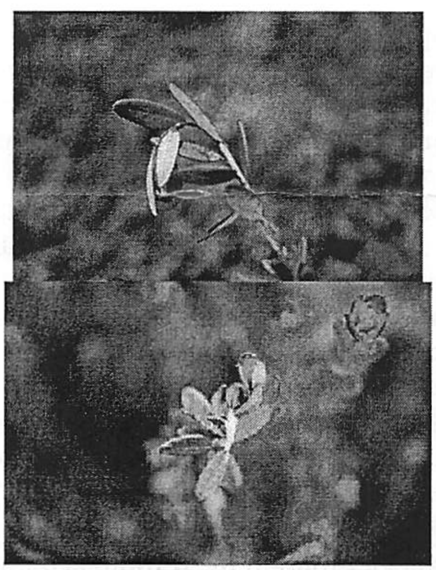
Cottonball (aka Hard Rot of Cranberry), a disease caused by the fungus Monilinia oxycocci, fills the berries with a "cotton-like" fungus making them undesirable for use in various products. Cottonball has been observed primarily in Wisconsin but generally occurs so infrequently that it does not require special control measures. However, on certain marshes Cottonball can be of economic importance. The disease also occurs in the Pacific Northwest and southeastern Canada, but losses due to Cottonball in these areas have generally been only minor. Cottonball has been found to attack most if not all of the popular varieties in Wisconsin but some cultivars may express varying degrees of resistance to the disease. Factors influencing susceptibility to the disease are dependent upon the natural resistance of the variety to fungal infection, the presence/absence of fungal activity during bloom, and environmental conditions favorable to disease development such as moderate temperatures and high moisture levels.

Signs and symptoms of Cottonball: The fungus responsible for causing Cottonball of Cranberry overwinters as sclerotia or "mummies" (dried remains of previous seasons' infected berries). In the spring, soon after the plants break bud and shoots begin to elongate, the sclerotia germinate releasing spores into the air that infect the new, tender shoot growth. This is also known as the primary stage of infection referred to as the "Tipblight" stage of the Cottonball disease. Infected shoots or uprights turn a tan color and wilt back from the tip shortly before and during early bloom. Scouting for the tipblight stage during the hook and early bloom stages will help determine whether or not a fungicide is warranted. As time passes wilted shoots eventually become covered with a white "fungal mantle" of spores (see Tipblight photos next page). These fungal spores then invade the Cranberry flowers (aka secondary stage of infection) in the same manner as pollen as it reaches the stigmata. The fungus does not kill the open flowers but continues to grow inside the developing berry. Infected berries or "Cottonball" do not become noticeable until later in the growing season when they fail to turn red and instead turn yellowish marked with brown stripes (see Cottonball photos next page).

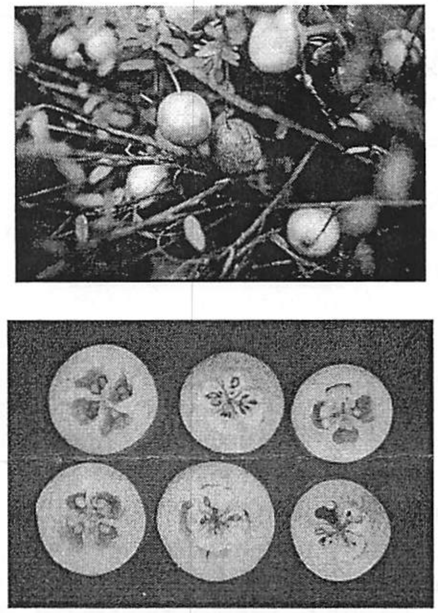
Cottonball Management: Managing the disease that causes Cottonball has generally relied upon the use of fungicides. Fungicides used for Cottonball serve primarily as "plant protectants" although some have "curative properties" as well. In recent years growers have generally used the fungicide Orbit and occasionally Bravo or even Abound for early and late bloom applications to help protect the fungus from entering the blossoms/fruit. In 2007, the fungicide Indar was also registered for the control of Cottonball and fruit rots in general giving the industry yet another tool for the control of rot diseases such as Cottonball. Please refer to the attached articles taken from the UW-Extension's 2007 Cranberry Crop Management Newsletter issues No. 1 "Orbit Fungicide Registered For Cottonball Control" and No. 2, "Indar Fungicide Labeled On Cranberry" for use management guidelines including timing of sprays and rates, restricted entry intervals (REI's), pre-harvest intervals, (phi's), and resistance management strategies. Although we can attempt to reduce the amount of primary infection that occurs from overwintering mummy berries with bud break sprays, research has indicated that the most important and effective sprays for the control of Cottonball has been those applied during bloom. Even though chemical strategies appear to be the most important tools to help keep the disease under control, we also rely and encourage growers to use an integrated management approach to assist in Cottonball suppression. Integrated pest management (IPM) of Cottonball hinges primarily on improved cultural practices such as bed sanitation. Removing Cottonball infected fruit and floating "mummies" (dried remains of infected berries) during and after harvest, particularly spring reflows, is a good method to reduce the amount of innoculum in the field. Improving or having good drainage is another important tool for limiting the spread of this disease.

Note: The fungus responsible for Cottonball of Cranberry is also analogous and very similar to the disease "mummy berry" of Blueberry.

Stages of Tipblight/Cottonball



Early and late stages of Tipblight – note crooked over upright and inverted v-shape at base of leaf near stem (left) and "frosted mantle" and browning of tip (right).



Cottonball berries – in the field, note coloration of fruit (left) and "cotton-like", fungus-filled cross-sections (right).

References:

Caruso, F.L. et al., 1995. Compendium of Blueberry and Cranberry Diseases. The American Phytopathological Society.

Mahr, D.L. et al., 2007 & 2008, Cranberry Pest Management in Wisconsin. University of Wisconsin–Extension Bulletin A3276.

McManus, P.S., 1999, Cottonball Disease of Cranberry. University of Wisconsin-Extension Bulletin A3194.

Roper, T.R. et al., 2007. Cranberry Crop Management Newsletter, Vol. XX, Numbers 1 "Orbit Fungicide Registered for Cottonball Control" (pgs. 2-3) & 2 "Indar Fungicide Labeled on Cranberry" (pgs. 1-2).

***Photo credits:** early stage of Tipblight by T. Dittl and later stage by L. Kummer. Cottonball berries by D. Boone.

FRUIT ROT IN THE FIELD—WHAT TO EXPECT AND WHAT TO DO

Cranberry fruit rot is caused by a complex of at least 12 and perhaps as many as 15 to 20 different species of fungi in Wisconsin. In recent years two fungi have been especially important in Wisconsin: species of Colletotrichum, which cause bitter rot, and Phyllosticta vaccinii, which causes early rot.

Colletotrichum (bitter rot). Various species of this fungus have gained importance in Wisconsin in recent years. For example, in a survey of cranberry marshes in central Wisconsin in 1998 through 2000, we rarely encountered it, but since about 2002 it has affected 15 to 40 percent of fruit in some plantings, including Stevens beds. The reasons behind this are not known but may be related to a series of relatively warm winters that allow the pathogen to overwinter at high levels. Bitter rot tends to show up late in the season (mid September or later), but once the rot is detected, the decline in fruit quality is rapid. Beds can look good one week, and have 15% or more rot just a week or so later. It is impossible to identify bitter rot based on berry appearance alone. Most of the fruit rots look similar, so to determine the cause(s) of rot, we culture fungi from rotting berries.

Disease cycle for bitter rot. Details of the disease cycle are not well understood, but are proposed as follows. The fungus overwinters in the duff layer, and on cranberry vines and other plants. This pathogen is not specific to cranberry, but rather can live on many different crops and weeds. Spores are released starting when cranberry shoot growth resumes in the spring and continue to be released season-long during rainy periods. Wind-driven rain, splashing rain, and irrigation water spread spores. Young leaves and young, green fruit are most susceptible. Studies have not been done on cranberry, but on apple, species of Colletotrichum can infect after five consecutive hours of leaf wetness at 79 oF. Infection would take longer at higher or lower temperatures. Rather than rotting green fruit shortly after infection, the fungus goes dormant or "latent" for several weeks. Then, when fruit begin to ripen, the fungus comes to life again, growing quickly and rotting fruit.

Phyllosticta vaccinii (early rot). Early rot is a cranberry disease that causes leaf spots, blossom blast, premature leaf drop, and fruit rot. Early rot is caused by the fungus Phyllosticta vaccinii. A related fungus, Phyllosticta elongata, causes a minor berry speckle symptom and is common in healthy cranberry plants. Early rot is so named because the disease starts rotting fruit relatively early compared to other fungal pathogens (i.e., in August vs. September). In early to middle August, early rot appears on a berry as a soft, watery spot, usually with a distinct margin. 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. Historically, early rot has been very important in New Jersey, moderately important in Massachusetts, and rare in Wisconsin. However, over the past 3 years, it has become more common in Wisconsin, especially in newer beds. P. vaccinii thrives at temperatures of 84 oF or greater. Plantings with a sparse canopy or with pockets of poor growth are especially susceptible to early rot, because the temperature within the canopy is high.
Disease cycle for early rot. Details are not well understood, but a proposed disease cycle is as follows. Phyllosticta vaccinii probably overwinters on living cranberry plants rather than in the duff layer or soil. Spores are released beginning in spring and continuing season-long during wet periods. Wind-driven rain, splashing rain droplets, and irrigation water spread

spores. Young leaves and berries are more susceptible to infection than older tissues. Unlike Colletotrichum, which undergoes a long latent period, Phyllosticta vaccinii starts rotting fruit while they are green and continues until harvest. In addition to cranberry, Phyllosticta vaccinii infects blueberry and possibly related plants in the genus Vaccinium; however, it is not known to infect weeds common in Wisconsin cranberry beds. Transfer of spores on feet or machinery is possible if vines are wet. However, spread of the disease requires not just movement of spores but also that the plants are susceptible. Therefore, the risk of spreading the disease is probably greatest when there are young, susceptible tissues present. Movement of cranberry vines for propagation can spread the disease among beds on a marsh and over greater distances.

Control of fruit rot

Cultural practices

- Since the pathogens that cause bitter rot, early rot, and most other fruit rot diseases overwinter and persist on vines, do not establish plantings with vines from beds with a history of rot problems.
- Avoid excessive nitrogen fertilization. Nitrogen causes tissues to be succulent and soft, thereby making them more susceptible to infection. Over-fertilization also increases canopy density and causes foliage to stay wet for longer periods.
- On hot days, vines might benefit from sprinkling to reduce heat stress which can predispose them to diseases. It is not known how long vines must remain wet in order for fruit rot pathogens to infect. However, sprinkling for 15- to 20-minute intervals on hot, breezy, sunny days does not provide a long enough period of wetness for fungi to infect.
- Do not irrigate in the evening, as vines will remain wet for several hours. The prolonged wetness will increase fungal infection.
- Clean vines from beaters and other equipment before moving between beds.
- Wear washable boots if walking in a bed known to have rot problems, and disinfect boots with dilute bleach (1:10 dilution) or other disinfectant before entering other beds.

Chemical control

- Most research on fruit rot control with fungicides has dealt with the fruit rot complex as a whole rather than individual pathogens such as Colletotrichum or Phyllosticta vaccinii.
- Timing of fungicide applications dramatically affects results! Fungicides should be applied during bloom and/or early fruit set stages for best results. The fungi that lead to fruit rot infect when fruit are small and green.
- Fungicides to use for fruit rot control were reviewed in this newsletter earlier this year are summarized here:
    - Bravo: Effective but can be phytotoxic in low spray volume and/or if applied on days when the temperature exceed 85oF. Phytotoxicity includes browning of petals and red flecks on fruit. The fruit flecks become almost invisible once the fruit turn red. In some trials Bravo has reduced yields, presumably from burning flowers. Pre-harvest interval of 50 days.
    - Mancozeb (e.g., Dithane): Effective but reduces fruit color if applied during bloom or to fruit. Pre-harvest interval of 30 days.
    - Abound: Reduced-risk fungicide; inconsistent performance in fruit rot trials. Effective against cottonball, however, and does not appear to be phytotoxic even when applied to flowers. Pre-

harvest interval of 3 days.

- Indar: Inconsistent performance in fruit rot trials. Highly effective against cottonball when applied during bloom. No phytotoxicity. Pre-harvest interval of 30 days.
- Copper: Marginally effective at best. Some formulations are accepted by organic certification programs. Exempt from pre-harvest interval.

Patty McManus, UW-Madison Extension Plant Pathologist

2008....THE YEAR OF THE SYRPHID FLY

As we travel from marsh to marsh we are pleased to see the populations of syrphid flies increasing. You see as an adult the syrphid fly feeds on pollen and nectar. We don't even have to bring them in......As a bonus; the adult is here during our bloom time.

This little fly looks like a sweat bee but when you take a closer look at this friend there are some obvious differences. For example; Syrphid flies have two wings, while bees have four wings. Syrphid flies have short antennas and bees have long antennas. Syrphid flies also have compound eyes, while bees have simple eyes. The Syrphid Fly has a black abdomen and a yellow or white band this is placed across their body. Wings are clear, and they are around half of an inch long.

The female syrphid fly lays white, oval shaped eggs on the top of a leaf. She may lay them in groups or single. It takes the egg about two to three days to hatch. Once the egg hatches a larva emerges. Each larva can be green, gray, or light brown and are about a half on an inch long. They feed on pests like thrips, small caterpillars and especially aphids. (We can not help but wonder if they feed on tipworm larvae – maybe wishful thinking on our part)

Pay attention to whom some of your blossoms are being visited by. The Syrphid Fly may be sneaking around in your cranberry beds. If you see it, know that this one is a FRIEND.

Observations from the field,

Jayne Sojka and the Buggettes
Lady Bug IPM, LLC

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