Cranberry Station Newsletter

JULY 22, 2016

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Cranberry Management in Hot Weather

Carolyn DeMoranville

In this issue of the Cranberry Station Newsletter we present information about management during the heat of summer. Some of this information is based on known research, some is based on our knowledge of plant pathology, plant physiology, and related science, and some is a synthesis of experiences of growers and researchers here and in New Jersey.

Early season (pre-fruit sizing).

This spring and early summer was unusual in that we experienced extremely low dew points, with wind and bright skies. Such conditions can cause the bogs and the plants to lose water rapidly. These conditions, along with lack of rain (June was almost 2.5 inches below normal), also caused water tables to drop and water levels in ponds to rapidly decline.

After a very active frost season, with the soil saturated for long periods of time, it is likely that cranberry roots are not as robust as in most years. Combine this with high evaporative demand (low dew point, warm temperature, wind) and we had the perfect storm for stress damage on emerging, tender new growth. We heard many reports of such damage this spring. Even experienced growers saw some damage in inadequate parts of sprinkler patterns or if system pressure was off a bit. It was definitely a spring to reinforce the need to monitor soil moisture and irrigate appropriately.

When growers see tip 'flagging' or wilt symptoms, turning on the sprinklers immediately can help to avoid browning by physically cooling the plant and by returning moisture to the soil. However, if the soil is kept properly moist ahead of these extreme conditions, the flagging should not occur, since the plant will be able to cool itself.

Applications of Pesticides.

Hilary Sandler reminds us that proper plant health aids in herbicide absorption. If plants are stressed due to lack of water or other factors, they do not absorb herbicides as well and efficacy can be lowered. She also notes that "heat" can be a factor with adjuvants added to or included with any pesticide. The general rule of thumb: if the temperature (in degrees F) added to the humidity (in %) exceeds 150, the potential risk of crop injury becomes higher than in other situations.

'Classic' Scald: the New Jersey model. Temperature and sunlight, along with soil and air moisture can play a role in the development of heat scald. Scald is not caused by damage from water droplets left on the fruit following irrigation during daylight hours.

If moisture is available in the soil, transpiration and water circulation within the plant should be adequate to cool the plants and fruit. Thus, proper irrigation is key: too wet and saturated soil will impede root uptake; too dry and there is not enough water to meet demands. Occasionally, conditions occur where water loss is too rapid for the plants to replace transpiration losses even in moist soil. Such conditions, as well as conditions when there is inadequate soil moisture, may lead to scald.

A major scald event in New Jersey in August 1990 was studied by Paul Croft. Weather and bog records for the days of the scald occurrence showed low relative humidity (20%), excessive temperature in the vines (100°F) with shelter temperature of only about 80°F, strong solar radiation (very bright skies), extremely low soil moisture in the upper layer, and a large amount of heat release from the soil to the atmosphere each afternoon. This event followed a strong storm, after which high pressure developed and moved into place as the low pulled away to the north.

If the soil is dry, scald in these conditions will develop more rapidly. Because scald can develop even when irrigation or rainfall has been adequate, a forecast for scalding conditions was important. Based on observations made in 1990, a scald forecast was developed for New Jersey; see the checklist inbox below.

Prevention of classic scald. Scald related to heat, wind, and *low* humidity can be prevented by physically cooling the plants using *short* periods of irrigation (10-20 min.) in the afternoon when these conditions exist. The primary purpose of the brief sprinkler run is a physical cooling of the plants/fruit. In these conditions, the irrigation bursts should be repeated as needed though the afternoon until the air temperature drops below 85°F. It is not necessary to continue irrigation until sunset.

Scald Forecast Checklist for New Jersey
adapted from Croft (1992)

Meteorological Predictors:
- Dew points of 55°F or less during midday hours.
- High ambient air temperatures of 80°F or more (sheltered).
- Clear or scattered sky conditions.
- Recent development of high pressure moving in behind a low, often associated with a strong storm, that is pulling away to the north.

Contributing factors:
- Low moisture in the bog soil.
- Wind speed of more than 11 mph.
- No rainfall or irrigation in the past 48 hours.

Sunscald: The Case for In-Day Cooling

Peter Jeranyama

High summer air temperatures (> 85^{o}F) can potentially cause physiological stresses on cranberry vines. If these high temperatures occur after fruit set, sun scalding can result and further weaken the immunity of the fruit so that they become more susceptible to fruit rot. Other possible physiological stresses include

cessation of cell expansion and cell wall synthesis, poor stomatal conductance and low rates of photosynthesis that in turn affect fruit yield.

Plants in general have a cooling mechanism called transpiration. We ask, could it be possible that the transpiration process is sometimes inadequate to cool cranberry plants? If so, can in-day brief sprinkling using the irrigation system be a solution? What are the temperature ranges that should be used to decide when to initiate and when to stop the sprinkling so that the plant is cooled without wetting the vines to an extent that encourages fruit rot pathogens? We will be conducting an in-day cooling study this summer aimed at answering these questions and determining the temperature threshold for initiating brief in-day cooling (15 min or less). The in-day brief sprinkling approach will be compared to pre-dawn irrigation of a duration that ensures there is adequate moisture in the soil to promote transpirational cooling.

Using transpiration, plants maintain hydration and internal temperature as water is moved from the soil, through the roots and shoots and out through pores (stomata) in the leaves. When this process occurs, moisture is depleted from the soil. Plants can control the rate of transpiration by using the adjacent guard cells to open the leaf stomata to let water out. The water lost from the leaf surface cools the plant through evaporative cooling. The stomata are regulated by two major factors. These factors are (i) boundary layer resistance (weather factors) and (ii) leaf stomatal resistance (plant factors).

The boundary layer of resistance is the layer of undisturbed air next to the leaf surface through which water vapor must diffuse, after it exits the stomata, to reach the turbulent air of the atmosphere. If the vapor exiting the stomata cannot dissipate, evaporative cooling will not occur. The thickness of the boundary layer is determined by wind speed and leaf size. If the boundary layer is not impeding transpiration, the plant can cool itself if water in the soil is adequate. However, the layer of undisturbed air on the surface of the leaf may become so thick that it becomes the primary deterrent to water vapor loss from the leaf. Increasing stomatal opening under conditions with a thickened boundary layer has very little effect of the transpiration rate. Therefore, other mechanisms of cooling, such as in-day sprinkling, are worthy of closer investigation.

The behavior of the guard cells in regulating the stomatal openings is very erratic in cranberry and in general it appears that stomatal control in cranberry adjusts poorly to changing light, temperature, and moisture conditions. As a result, cranberry has poor control over its transpiration process and additional cooling from in-day sprinkling may be especially useful.

Typical conditions for high-temperature scald are sunny and still days with high humidity and air temperatures greater than 85°F. Such days are also associated with a thick boundary layer, decreasing the ability for the plant to cool the fruit. An 85°F air temperature translates to approximately 105°F on the bog measured with an exposed frost monitoring temperature probe. Anecdotal evidence has shown that starting in-day sprinkling before 105°F based on an exposed sensor might be too soon. One grower told me that they had their trigger set at 97°F and they found themselves sprinkling very often and this resulted in greater fruit rot damage than they had previously experienced. From a plant disease standpoint, keep in mind that most fungi prefer hot and humid environmental conditions so beware of setting your temperature threshold too low, especially in bogs that have not been sanded or pruned recently and may have a thick canopy. Otherwise, triggering cooling off periods too frequently may result in the perfect conditions for fruit rot development.

When scald conditions like high heat, high relative humidity, and still air occur, the plant canopy becomes important in providing shade to the growing fruit. Consequently, cultivars that produce large fruits or a heavy fruit load (newer hybrids) and beds with a thin canopy (new plantings) pose more risk to scald in these conditions. We do not have any evidence showing that the small-fruited cultivars such as Early Black and Howes are prone to scald with the exception of 'classic' low humidity conditions (see Carolyn's article). Once scald occurs its effects cannot be reversed, therefore prevention is the best approach.

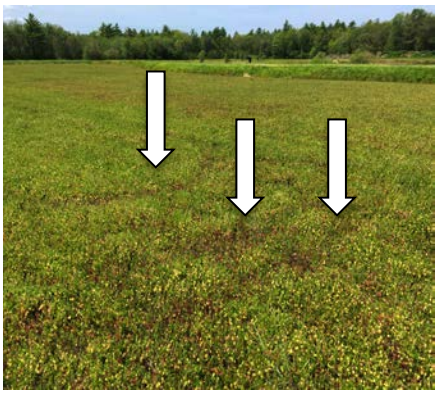
Stem Gall Makes A Comeback

Erika Saalau Rojas

Stem gall is not a new cranberry disease. In fact, it has been in MA since the 1980's although you may have heard of it being called canker or 'beater damage'. I saw a few stem gall cases last summer, but this is the second year in a row where I've seen it in several sites and on samples that came into the lab, all within the last week. The good news is that stem gall is a sporadic disease that doesn't cause major losses and affected plants generally recover very quickly after it resurfaces.

This sporadic reappearance is attributed to weather conditions and physical damage to vines. Although stem gall is considered a minor disease that rarely warrants any treatment, it is important to learn how to recognize the symptoms, since it may suggest that some harvest or winter protection practices should be altered.

Stem gall is associated with different species of bacteria that are commonly found in soil, and the disease can occur in sites where it has not been reported before. Research from Wisconsin suggests that bacteria enter plants after wounding and once inside the plant, bacteria continue to multiply and distort vine and stem tissues. Upon closer look, you may notice **thickening of vines, galls, and/or splitting bark on woody tissues closest to the soil line.** Infection of tissues may occur between fall and spring. Symptoms may not be apparent until summer, once temperatures increase and abnormal growth along the stems and vascular tissues disrupt water transport to uprights. Noticeable symptoms may include wilting, browning of tissues, and upright dieback.



Symptom distribution in the bed may be a good indicator of what could have caused the damage. For example, most stem gall cases observed in 2015 and 2016 seem to have been associated with mechanical or winter injury. It is common to see the **dieback symptoms in a linear pattern** resembling tire tracks, and along centerlines or in bigger patches with heavy or increased machinery traffic (e.g., loading areas, corners, and ends of beds). Smaller patches throughout or at the end of beds can also be explained by uneven ice or snow cover, leading to vine injury and open wounds that allow bacteria to infect tissues.

How can you avoid stem canker? Although you may find chemical products to control bacterial plant diseases, I do NOT recommend making any applications against this disease. Mainly, because this is a minor, sporadic disease that can't be predicted. And by the time you notice symptoms it means that the damage has already occurred. Moreover, there is no evidence to suggest that any of these chemical products are effective against stem gall, and most likely symptoms will disappear by the following season. Lastly, by reducing unnecessary damage caused by harvest machinery, and ensuring even and timely ice coverage during winter and frost protection in the spring you can easily avoid stem gall in the future.

Send in your samples for virus testing NOW!

In summer 2014, we confirmed two new cranberry viruses, Tobacco Streak Virus (TSV) and Blueberry Shock Virus (BlShV), in Massachusetts. For a review of what we know about these diseases, please see the November 2014 Cranberry Newsletter.

Within the past week, I've seen small berries already showing symptoms. This means that if you'd like to get some samples tested, please start looking and collecting plant material now. Virus symptoms are relatively easy to spot. Affected berries may have a red blush, purple, or brown color. Upon closer look you will notice scarring and shriveling of smaller fruit (see pictures below).

To date, we don't know much about the potential impact of these viruses on cranberry yield or distribution, but this season we are collecting plant samples with these symptoms to carry out a survey and learn more about the TSV and BlShV in our state. This is your chance to get your fruit tested for free courtesy of a Specialty Crop Block Grant from MDAR to the CCCGA!

If you find symptoms and would like to get your bogs tested, please collect and send plant material to the Cranberry Station. I will need fresh samples (do not let them sit in a bag for several days), including uprights, affected fruit, and enough plant material to test and store samples. Please send at least 5-10 uprights with symptomatic fruit still attached. If you send in or drop off a sample it is very important that you include the site (location), variety, and your contact information. If you have more questions about symptoms or how to collect samples, please call (ext. 18) or send me an email at esaalau@umass.edu.



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- Cranberry viruses – free testing!!
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Stem gall disease

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