Wisconsin Cranberry Crop Management Newsletter

Volume XVI, Number 2, May 20, 2002

CRANBERRY FROST HARDINESS

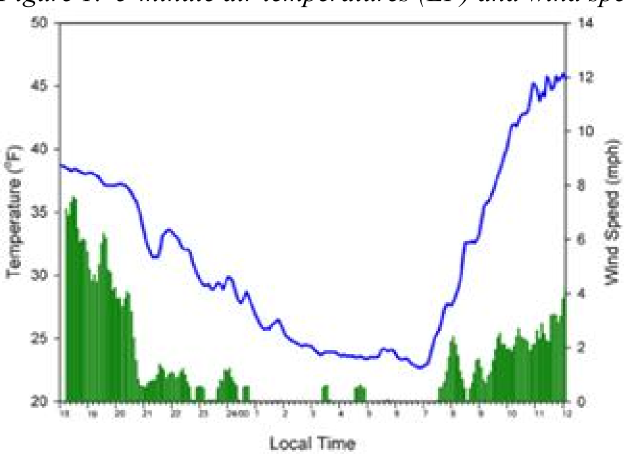
Hopefully by the time you receive this newsletter you will have been able to get a few full nights sleep with the warmer weather that is forecast. This spring has been one of the worst for requiring frost protection. As is typical, frosty nights this spring have been clear and calm. The lack of clouds and wind allows heat to radiate out of the plants and soils into the atmosphere without interference.

Jeff Andresen at Michigan State University wrote this about recent frost events in Michigan that I thought would be instructive for Wisconsin cranberry growers.

“Abnormally cold temperatures on April 21-23 caused major damage to a variety of crops in Michigan. The cold temperatures were associated with a large Arctic-origin air mass moving across eastern North America. Conditions on April 21 and 22 were best characterized as a "black frost," where the sub-freezing temperatures were accompanied by cloudy skies, light to moderate winds, and no visible frost formation on soil or vegetative surfaces. Minimum temperatures in the 28-32° F range were common across northern Michigan the evening of April 21 through the morning of April 22.

“The second event was a more typical, radiation-type of frost. Clear and relatively calmer conditions on the evening of April 22 allowed temperatures to fall to sub-freezing levels over all but southeastern sections of the state (where clouds persisted for much of the night). Air temperatures and wind speed from the Michigan Automated Weather Network station at Fremont, MI (Figure 1) are representative of this radiation-type freeze event across western Lower Michigan. The air temperature fell off quickly during the evening hours of April 22, and quickly approached the dew point temperatures, which were in the mid-20's by early morning on April 23.

Figure 1. 5-minute air temperatures (EF) and wind speeds (mph) between 18:00 EDT 22 April 2002 and 12:00 23 April 2002, Fremont, MI.



"Remember that under relatively clear, calm conditions during the overnight hours, air temperatures typically fall to the dew point temperature. As the air reaches this level, condensation or deposition of frost on the surface releases latent heat and slows the rate of cooling. In the figure, the relationship between temperature and wind is evident, with relatively warmer temperatures associated with the presence of wind and associated atmospheric mixing that it produces. The duration of sub-freezing temperatures varied by location, but was typically six to ten hours. While freezing temperatures in late April are normal at almost all locations in Michigan (the mean last freezing temperatures of the season typically occur at the end of April or in early May), the impacts of this freeze event were made worse due to the unusually warm temperatures and rapid early crop development that occurred just the week before."
MSU Fruit CAT alert. April 30, 2002.

Data from Beth Workmaster and Jiwan Palta demonstrate the relationship between stage of development and hardiness. As buds develop from bud swell to cabbage head they quickly lose hardiness. Figure 2 shows that in 1997 uprights identified at bud swell ranged in hardiness from about -8°F in mid-April to about 25°F in late May to early June. By the time the buds were at cabbage head they were only hardy to 28°F.

This demonstrates that over time as buds are subjected to warmer temperatures they lose their hardiness regardless of stage of development. The date do not show, however, the possibility of reacquiring hardiness as vines are subjected to a period of cool temperatures as has been found in other species.

Determining the appropriate temperature to start irrigating is a difficult one. It cannot be based solely on calendar date or on bud development. Experience helps. My opinion is that many growers "overprotect" by firing up the pumps too soon. Another place to conserve both water and energy is in the morning as the temperatures begin to increase. Once the air temperature rises above freezing and the ice starts to soften you can turn off the sprinklers. At that point heat to melt the ice will come from the atmosphere and not from the vines.

Teryl Roper UW-Madison Extension Horticulturist

Figure 2. Lowest survival temperatures of terminal buds from samples collected in the spring of 1997 at Biron, WI.

	T	BS	CH	BB	BE	RN	EH	HK
4/15	≤ -8	≤ -8						
4/22	~ 0	~ 0						
4/27	≤ -8	≤ -8						
4/29	≤ -8	≤ -8						
5/2	3	3						
5/5	≤ -4	≤ 0						
5/9	~ 10	~ 10						
5/13	10	16						
5/16	10	14						
5/20	10	~ 23						
5/22	14	23						
5/24	21	25						
5/26	25	25						
5/28	25	25	28					
5/30		28	28	32				
6/1		> 25	28	28				
6/3			28	28	29			
6/5				30	30	32		
6/11					30	32		
6/18						30	32	32
6/25								32

The earth does not argue,
It is not pathetic, has no arrangements ,
Does not scream, haste, persuade, threaten, promise,
Makes no discriminations, has no conceivable failures,
Closes nothing, refuses nothing, shuts none out.
Walt Whitman

ON THE LOOKOUT FOR STEM GALL (CANKER)

For a few years now, my graduate student Archana Vasanthakumar has been trying to figure out what causes stem "canker," or as we prefer to call it, stem gall. This malady, which is characterized by bumps and galls on stems that lead to bark cracking and peeling, was especially prominent in 1998. Therefore, I described the problem and gave my view in the 1999 Cranberry School Proceedings (pp. 22-24). At that time, I suspected that the soilborne pathogen *Agrobacterium*, which causes galls on other plants, might be involved. While we have not ruled out *Agrobacterium*, we think it's more complex than that.

Our current thinking on stem gall is that it may not be caused by one pathogen, but perhaps by a collection of bacteria that produce indole acetic acid (IAA) which is an auxin type of plant hormone. Plants make their own IAA. However, bacteria found on plants also produce IAA for various reasons, one of which is to improve fitness and survival. Usually bacterial production of IAA has no bad effects on the plant. However, one exception is a condition called "russet" on apple fruit, in which the IAA from bacteria causes tiny, corky outgrowths that make the apple skin rough (other things can cause russet—bacteria are just one cause). We have found that some bacteria isolated from cranberry stem galls are potent producers of IAA in the lab and cause galls on tissue-culture cranberry plantlets. This raises two basic questions:

1. Are IAA-producing bacteria common in cranberry beds where stem gall has been noted?
2. Could these bacteria be producing so much IAA on plants that they disrupt cranberry tissue growth, thereby causing galls on uprights and runners?

We will be focusing on these questions in the coming months. However, two things have hampered our research on stem gall: 1) Symptoms have been almost non-existent since 1998 (a disease seems to disappear just after you embark on a project to study it!) and 2) We have not yet reproduced symptoms on woody plants, which is important if we really want to prove that bacteria cause the disease. We are working on #2, but we have no control over #1. **PLEASE, IF YOU SEE SYMPTOMS OF STEM GALL, LET ME KNOW** (phone 608-265-2047 or e-mail psm@plantpath.wisc.edu). If you're not sure about the symptoms, give me a call anyway. We would really like to have some fresh galls to test.

Patty McManus, UW-Madison Extension Plant Pathologist

PESTICIDE SAFETY

Preparing the sprayer

Before a spraying operation is started, rinse out the sprayer; remove and clean all nozzles, nozzle screens and strainers. Make sure strainers and nozzle screens are 50 mesh or larger when wettable powders are used. All of the nozzles should be of the same type, size and fan angle for most applications. Check all lines, valves, seals and the tank after filling the sprayer with water and during calibration to be sure there are no leaks in the spray system. For the operator's safety, replace weather-cracked or worn hoses. Adjust the nozzle height and spacing as suggested by the nozzle manufacturer or as specified on the pesticide label. These requirements differ for a given pest or crop.

Operating a pump dry or with a restricted inlet may damage the pump. Do not operate pumps at speeds or pressures higher than the manufacturer recommends. Power take-off pumps should be restrained from rotating by chains or torque bars. Keep all shields in place. Do not use ground speeds that are too high for existing field conditions. Booms bouncing up and down or back and forth can cause application rates to vary by 50 percent. Also, such bouncing can damage the spray booms or the frame of the sprayer.

Handling and mixing

Take precautions to avoid exposure when wettable powders, dust or granules are added to the sprayer tank. When you add materials to the sprayer tank, air is forced out and carries some of the pesticide particles with it. If the solvent in the pesticide is toxic or flammable (or both), be sure the mixing operation is performed in an area where ventilation is adequate. The addition of small amounts of materials such as emulsifiers or thickeners will drastically alter the physical properties of the spray solution. Therefore, the applicator should check the pesticide label to be sure she or he is operating according to label instructions.

Many types of solvents, some of which are chlorinated, are used in the pesticide formulation processes. Vapors of chlorinated solvents are very dangerous to breathe. They can cause a "high," dizziness, or even unconsciousness. They also can cause permanent damage to the kidney, liver, and nervous system in workers exposed to the vapors for a prolonged time.

The skin on various body parts does not absorb pesticides at the same rate. Figure 1 shows dermal absorption rates based on a numerical scale in which the value of 1 for the forearm represents the lowest dermal absorption rate. That value forms the basis for assignment of values to the other body parts.

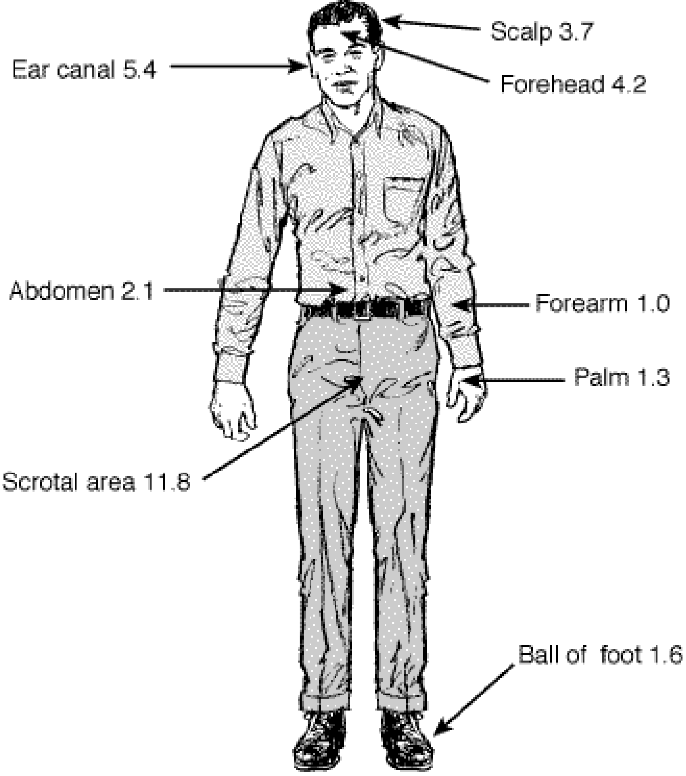


Figure 1. Absorption rates in relation to forearm (1.0)

Field applications

Always be aware of the meteorological conditions existing during pesticide application. Loss of spray from a treated area increases during high winds or low humidity.

If possible, begin spraying in the end of the field that will permit any drift from the sprayer to be blown away from the next area to be treated. Likewise with airblast sprayers; direct the air blast from the sprayer with the prevailing wind and away from the next area to be treated. These two procedures will minimize the amount of pesticide that will be blown onto the operator. Remember, these are only guidelines and are intended to supplement the good judgment of the pesticide operator.

To minimize drift hazards, use the lowest pressure possible, the lowest boom height and the largest spray tips, and add thickeners (if the pesticide label permits) in areas where drift is likely to be particularly hazardous.

Be alert for nozzle clogging and changes in nozzle patterns. If nozzles clog or other troubles occur in the field, shut the sprayer off and move to an unsprayed area before dismounting from the sprayer to work on it. If nozzles must be cleaned in the field, use a toothbrush or a toothpick for cleaning — never a metal object. A metal object can damage the orifice in the spray tip and significantly alter the spray pattern. We recommend carrying extra spray tips on the sprayer so that plugged tips can be replaced with clean ones. Never try to unclog a nozzle by blowing through it.

Check the pesticide label for re-entry and preharvest intervals. The re-entry interval is the elapsed time after a pesticide application before workers can safely re-enter a field. The preharvest interval is the elapsed time between a pesticide application and harvest of the crop.

Equipment cleaning and storage

Trained personnel should thoroughly clean the inside and outside of mixing, loading, and application equipment immediately after use. People who clean contaminated equipment should wear proper protective clothing, including rubber boots, a rubber apron, goggles, and possibly a respirator. A specific area should be designated for cleaning operations. Use a rack or cement apron with a well-designed sump to catch contaminated wash water and pesticides. The cleanup process is important because many chemicals will rapidly corrode some metals and may also react with succeeding chemicals, thus possibly causing a loss of effectiveness.

To clean a sprayer, mix about two pounds of detergent per 40 gallons of water in the tank. Circulate this mixture throughout the bypass or agitator nozzles for 30 minutes and then drain, allowing some solution to pass through the booms or nozzles.

To make an ammonia rinse, fill the tank one-third to one-half full and add two quarts of household ammonia per 25 gallons of water. Circulate the solution and allow a small amount to flow through the nozzles. Allow the remaining solution to stand overnight to neutralize any herbicide remaining in the equipment. Then pump the solution through the nozzles. After rinsing with detergent or ammonia, flush thoroughly with clean water.

When the sprayer is to be stored for a prolonged time, add one to five gallons of lightweight oil (about one gallon of oil per 40 gallons of water) before the final flushing. As the water is pumped from the sprayer, the oil will leave a protective coating on the inside of the tank, pump and plumbing.

To prevent corrosion, remove nozzle tips and screens and store them in a can of light oil, such as diesel fuel or kerosene. Close the nozzle openings with blanks to keep dirt or insects from entering the spray boom. Be sure the pump is drained thoroughly to prevent freezing. Add a small amount of oil and rotate the pump four or five revolutions by hand to completely coat the interior surfaces.

Follow directions in the owner's manual regarding the proper procedures for storing engine-equipped sprayers. Before storing the sprayer, all lines, hoses, valves and the pump should be inspected for damaged parts or leaks. Damaged parts should be replaced before the sprayer is stored.

Extracted from Pesticide Application Safety by David E. Baker, Dept. of Agricultural Engineering, University of Missouri-Columbia.

We are blind until we see
    That in the human plan
Nothing is worth the making, if
    It does not make the man.
Why build these cities glorious
    If man unbuilded goes?
In vain we build the world, unless
    The builder also grows.

Edwin Markham