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MANGANESE DEFICIENCY?

I'm getting some feedback from growers and consultants about Manganese (Mn) deficiency in cranberries in Wisconsin. While Mn deficiency is certainly possible, it is unlikely. This article will outline the importance of Mn, what functions it has in plants and what deficiency symptoms may arise.

Cranberries require very little Mn for normal growth and fruiting. The critical value for tissue Mn is 10 ppm. If plants have more than 10 ppm Mn they have an adequate Mn supply. On the toxicity side, in the greenhouse we had plants with more than 600 ppm Mn in the uprights (so it was inside the plants and not an external contaminant) and did not see a reduction in plant growth. Most plants see Mn toxicity at around 300 ppm. Cranberry tissue tests from the University lab in the late 1980's and early 1990's showed all samples tested with sufficient amounts of Mn (>10 ppm).

Manganese exists in the soil solution as a cation with 2 positive charges Mn^{++}. Mn leaches through soil very slowly. It is usually held in complexes with organic matter and some of the Mn ions are held on cation exchange sites in the soil where it is readily available to the soil solution (and thus to roots). It may form insoluble compounds with soil particles in a manner similar to phosphorus and iron so all Mn in the soil is not readily available for plant uptake.

Manganese activates several enzymes involved in plant metabolism. It is required for growth and fruiting, but in very small quantities. In chloroplasts manganese is involved in the splitting of water in the light reactions of photosynthesis where water is split to create O_2 and $4H^+$.

Inside plants Mn is not mobile (like Ca^{++}). Once it leaves the transpiration stream and is inside a plant cell it is **NOT** remobilized into other tissues. Deficiency symptoms, therefore, are usually found on new young growth and not on older growth. Chlorosis of one-year-old leaves in cranberry that formerly were green is **NOT** Mn deficiency.

What does Mn deficiency look like? If you have the Compendium of Blueberry and Cranberry diseases look at color plate 178 in the center of the book. (If you'd like to order the Compendium call 800-328-7560) The symptoms are chlorosis and necrosis (browning or death) of young leaves and in some cases a twisting or deformation of the youngest leaves. Symptoms are not seen on older leaves.

Some have speculated that application of sulfur is causing Mn deficiency. Actually, just the opposite should be true. Mn availability is greatly affected by soil pH. As soil pH declines Mn becomes more available. For

cranberries Mn deficiency can be overcome by reducing soil pH. The amount of Mn in the soil solution increases 100 fold for each unit drop in soil pH (as from 6.0 to 5.0). One means of increasing Mn availability to plants would be to reduce the soil pH by applying sulfur.

What is causing the one-year-old leaves to turn yellow, sometimes with reddish spots? I'm not sure and I've not had the time to investigate this as I'd like. Heat is likely a contributing factor. We have seen yellowing of old leaves commonly in years with high temperatures. Some growers have applied a micronutrient product containing Mn and have found some relief from the symptoms, but the relief has been short lived.

Is this a significant problem? Will it reduce yields? I don't think so. The reason I say this is that one-year-old leaves contribute almost no sugars to fruit development and maturity. In one set of experiments we fed radioactive CO2 to new leaves above developing fruit, old leaves below developing fruit or to leaves on a non-fruiting upright that was adjacent to a fruiting upright along the same runner. We then examined the fruit for the presence of radioactivity that would indicate that sugars had moved from the leaves into the fruit. We found that the new growth contributed most of the sugars for fruit development. One-year-old leaves contributed very little to fruit development and that sugars did not readily move from an adjacent non-fruiting upright to a fruiting upright. We also measured the rate of photosynthesis in new leaves and one-year-old leaves. The rate of photosynthesis of new leaves was usually double that of one-year-old leaves. These data lead me to believe that once new upright growth has elongated and the leaves are functioning that one-year-old leaves are no longer important. They may be very important in the spring to get help provide for the initial flush of growth, but afterwards their job is finished and they don't create much sugar nor do they translocate that sugar to developing fruit in large amounts.

In another set of experiments we removed leaves above or below or both above and below developing fruit. When we removed the leaves below the fruit there was no effect on fruit set or sizing. Removing the new growth above the fruit did reduce fruit set and size, particularly when we imposed the treatments near the end of bloom.

In conclusion, I'm not sure what is causing the yellowing of older leaves. I'm quite sure it is not Mn deficiency brought on by applications of sulfur for pH management. Further, the old leaves are not vital to development of fruit. I'd like to solve this puzzle, but for now I wouldn't lose any sleep over it.

Teryl Roper, UW-Madison Extension Horticulturist

PRE-HARVEST INTERVALS

While harvest is still some time off, now is the time to think about pre-harvest intervals to assure that any pesticide residues remaining on fruit are within the legal tolerances. A listing of the pre-harvest intervals and re-entry intervals for pesticides labeled for use in Wisconsin is found on page 10 of *Cranberry Pest Management in Wisconsin* (A3276). You'll want to review this information throughout the year as you make decisions about what pesticides to apply and when. Part of the table is reproduced below.

Pesticide	Preharvest interval (days)
Orthene	75
Guthion	21
Sevin	7
Bravo	50
Lorsban	60
Prism	365
Diazinon	7
Fusilade	365
Roundup	30
Dithane & EBDC's	30
Mancocide	30
Marlate	14
Poast	60
Touchdown	365
Funginex	60
Stinger	50
Orbit	45

Please note that most of the pre-emergent herbicides are not listed in this table because if applied during the dormant period either in late fall or early spring the pre-harvest interval is not relevant.

Teryl Roper, UW-Madison Extension Horticulturist

ROUNDUP REMINDERS

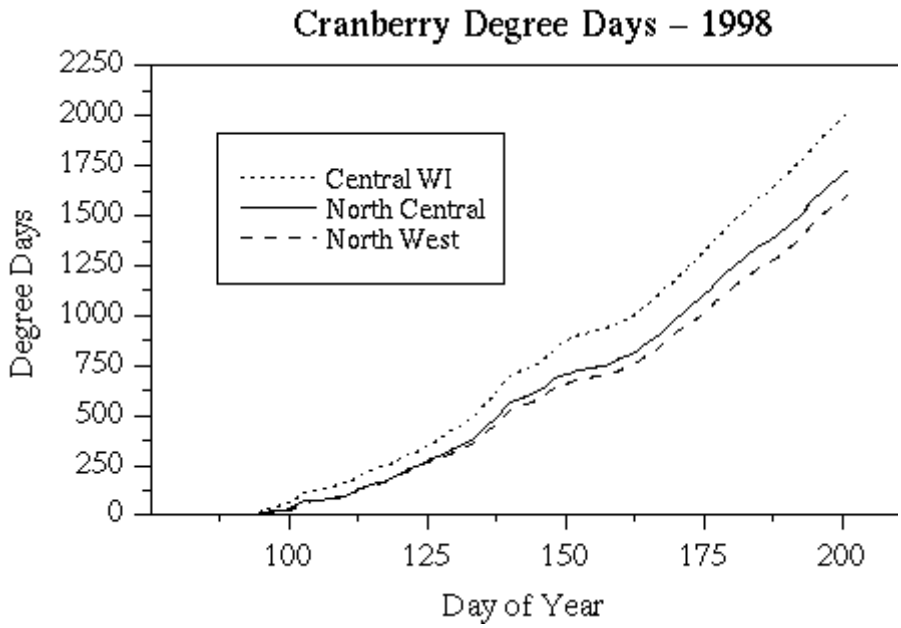
With flowering over and fruit setting growers will once again be thinking about wiping weeds with Roundup. Be sure to read the product label before you begin an application. A few points warrant reminders:

- Coverage is the most important variable. You must have good coverage of the weed's leaf surface in order to get enough material throughout the plant to kill it completely. Dyes added to the wiping solution help you tell where you have wiped.
- Increasing concentration does not make Roundup more effective. Concentrations that are too high may be detrimental as they can kill the contacted tissue before enough is translocated to kill the roots. A 10 to 20% Roundup solution works for most people.
- Cut stump applications are allowed for woody brush. Cut the plant off then treat the stump with a Roundup solution. Making an emulsion with lanolin and then applying to the stump will help keep the Roundup on the surface so it is absorbed for a longer period of time.
- Adding ammonium sulfate per the label specifications can help entry of the active ingredient and will improve performance.
- Roundup requires a 6 hour rainfree period following application to get into the plant. Don't apply if rain is imminent.
- Remember the 30 day PHI.
- Wear appropriate PPE. This includes a long sleeved shirt and long pants and shoes plus socks. Waterproof gloves are not required, but are prudent.
- Keep the wiper surface clean. If dirt, weeds or other debris covers the wiper too little solution will accumulate on weed leaves.

Teryl Roper, UW-Madison Extension Horticulturist

Rock journalism is people who can't write interviewing people who can't talk for people who can't read.

Frank Zappa


Cranberry Degree Days – 1998
Degree Days
2250
2000
1750
1500
1250
1000
750
500
250
0
Central WI
North Central
North West
100
125
150
175
200
Day of Year

Looking Out For The Environment

Proper Cleanup of Pesticide Spills Protects Water Supplies

Spills when handling, transporting or using pesticides are a concern for every producer. But by knowing what to do if a spill occurs, whether it's on your property or on the road, you can help minimize the risk and prevent ground water and surface water contamination.

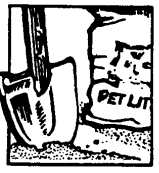
Control the spill as quickly as possible by restoring the container to its upright position, closing a leaking valve or hose or putting a secondary container in place to catch the leaking solution. Of course, appropriate personal safety equipment should be used, such as rubber gloves, rubber boots and eye protection.

Call your retailer for advice on cleanup of their chemical. They will also give you special safety advice and other information.

Contain the spread of the spill when the leak has been stopped by creating soil dams in the path of the spilled liquid. It may be most important to first divert a spill away from a nearby pond or stream and then attempt to stop the leak or spill. This is a judgement call that only you can make.

Begin cleanup as soon as the situation has been stabilized. Quick action on your part to clean up a spill is not only required in many states, but will prevent the chemical from leaching or washing away in a rainstorm.

Use absorbent materials on pavement or concrete to capture the spilled liquids. They can then be shoveled or swept. Non-chlorinated pet litter is an excellent, inexpensive absorbent material to keep on hand for such purposes.



Properly dispose of the drenched soil or absorbent material. This will depend on what and how much was spilled and the rules for disposal in your state. Contact state or local officials or your retailer for legally acceptable disposal options.

Report the spill, if required, before it threatens public health or the environment. If the spill is large or enters a waterway, you'll need to call the local EPA office, the local emergency planning office or the state health department. The reporting criteria vary with the chemical spilled, however, so ask your dealer to check the Material Safety Data Sheet or call the manufacturer for further details.

PROPER SPILL CLEANUP

Who To Call:	
EPA Hazardous Waste Hotline	
800-424-9346	
EPA Safe Drinking Water Hotline	
800-426-4791	
National Pesticides Telecommunications Network	
800-858-7378	
National Agricultural Chemicals Association	202-296-1585
Chemicals Referral Center	
800-262-8200	
Chemtrec Emergency Hotline	
800-424-9300	
EPA Pesticide Management & Disposal	
703-305-7385	

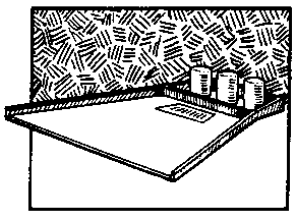
EPA Regional Offices	
Atlanta	404-347-3004
Boston	617-565-3420
Chicago	312-353-2000
Dallas	214-655-6444
Denver	303-293-1603
Kansas City	913-551-7000
New York	212-264-2657
Philadelphia	215-597-9800
San Francisco	415-744-1305
Seattle	206-553-4973

This information is provided by the Alliance for a Clean Rural Environment, a non-profit, non-political organization encouraging environmental stewardship and protection of water quality, supported by the makers of crop protection chemicals.

Looking Out For The Environment

Constructing & Using A Chemical Rinse Pad On Your Farm

Repeated pesticide loading and rinsing in the same area is an environmental risk you needen't take. One solution for protecting these areas is the construction of an inexpensive cement rinse pad. If properly



built, a rinse pad will prevent accidentally spilled ag chemicals from contaminating streams and ponds or leaching into the groundwater. A fenced area on a rinse pad can also serve as a secure ag chemical storage area.

Rinse Pad Design

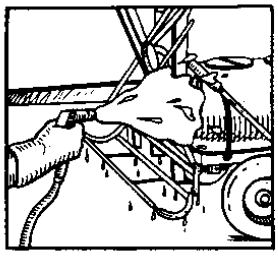
There are many possible ways to design and build a cement rinse pad. One design, developed by an Oklahoma State University ag engineer, provides for the construction of a watertight, reinforced concrete pad large enough to hold the largest application vehicle, plus containment areas dedicated to rinse water storage tanks, mix and load equipment and store ag chemicals.

The pad in this design is sloped to the center and contains floor drains to sumps for easy cleanup. Steel-grated, shallow, concrete collection sumps serve as sediment settling basins and are designed to collect spills and rinse water for transfer to above-ground rinsate tanks. A pump can also be used to move solutions directly from the drain valve on a sprayer into rinsate storage tanks.

Using The Rinse Pad

To use the rinse pad, drive the sprayer or spreader onto the concrete pad. Make sure that the sump drain valve (if installed) is locked in the closed position. Pump any leftover field-strength chemical and rinse water from the sprayer drain valve into a marked rinsate tank.

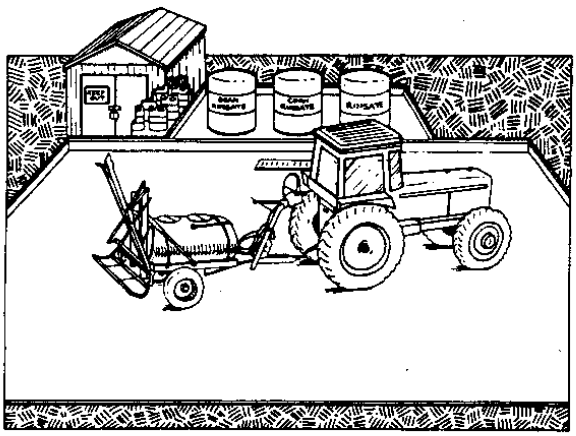
Clean equipment as usual. Rinse water can be stored temporarily in various types of holding tanks, which should be



mounted 3 to 5 inches above the concrete floor so leaks can easily be spotted. Pumps and piping should also be above ground and contained within the rinse pad.

Mount these storage tanks on a level area at the back of the concrete pad. The tanks should be positioned within concrete curbs, high enough to contain 110 percent of the volume of the largest rinse water tank should a leak occur.

Install a sump in the storage containment area to handle rainfall and potential rinse water spills. All sumps should be rinsed and checked regularly.



Storage Option

You may want to add a storage area for ag chemicals and fertilizers when building rinse pads. This will provide extra convenience and added environmental protection. But remember to provide appropriate security and never store ag chemicals and fertilizers in the same containment areas. Separate sumps are needed for each containment area, too.

A Smart Choice

While you may not be required to construct a rinse pad yet, it represents an intelligent choice to help safeguard water qualitity.

For detailed specifications and cost estimates for one design, contact Professor Ronald T. Noyes, Cooperative Extension Service, 224 Ag Hall, Oklahoma State University, Stillwater, OK 74078.

Estimated construction costs for a 20 x 25 foot rinse pad, including labor, is about $900 to $1,300. This estimate does not include equipment such as sump pumps and rinsate tanks.

This information is provided by the Alliance for a Clean Rural Environment, a non-profit, non-political organization encouraging environmental stewardship and protection of water quality, supported by the makers of crop protection chemicals.