THE VEGETABLE AND SMALL FRUIT GAZETTE

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Tip for the Month: "Be slow of tongue and quick of eye"—Miguel de Cervantes

Comments from the Editor

Bill Lamont, Department of Horticulture

I consider the month of March a swing month. It is the doorway between the cold winter months and the warmer spring months. The month can contain rough weather and often lives up to the old saying-- "March comes in like a lion and goes out like a lamb or vice versus". It is the month that contains that famous of all Irish holidays-- "Saint Patrick's Day". I will bet you a pint of green beer that on March 17th there will be the rerun of "The Quiet Man" starring John Wayne and Maureen O'Hara. I will have planted my early red potatoes in the high tunnel by Saint Patrick's Day so I will be in good standing with my Irish relatives in County Tyrone. There are still a few winter meeting left so be sure to check the listing of meetings at the end of the gazette. I want to thank George Perry, County Extension Agent, Schuylkill County for his article "The Effect of the pH of Your Water on Pesticides". Keep those articles coming.
As always, the Vegetable and Small Fruit Gazette Team encourages your feedback so that we can better serve your needs and address your concerns.

Just a Reminder of the Upcoming In-Service Educational Training

Bill Lamont, Department of Horticulture

Just a reminder to check your calendar and make sure the April in-service educational training on high tunnels to be held at the Horticulture Farm, Rock Springs is penciled in. The training session will be on the Operation and Use of High Tunnels which will be offered on April 12, 2000 from 8:30 AM-5 PM at the Horticulture Research Farm at Rock Springs. The training will be conducted at the "High Tunnel Research Facility" and will cover all phases of production in a high tunnel and provide agents with "hands-on" experience in specific phases of the operation of a high tunnel. Topics to be covered include: what crops, determining planting dates, planting

techniques, water management considerations, fertility management, importance of proper ventilation, controlling insects and diseases and opportunities for multiple cropping. There will be a steak cookout for participants at Bill Lamont's house on the evening of April 11th. Mark this important training session on your calendars now.

The Effect of the pH of Your Water on Pesticides
George Perry, Extension Agent, Schuylkill County

Have you ever experienced less than adequate pest control even though you thought you had applied your pesticide according to all of the instructions on the label? Have you ever bothered to check the pH of your water source prior to mixing pesticides in your sprayer?

Several pesticides break down rapidly in alkaline water. In a matter of hours or in extreme instances only minutes, 50 percent or more of the active ingredient may be hydrolyzed to yield a less active compound. If you look closely at some pesticide labels, chances are you will find a statement cautioning you against mixing the pesticide with alkaline materials. The reason for this is that many pesticides lose their effectiveness in the presence of alkaline materials. A chemical reaction, called alkaline hydrolysis, can occur when the pesticide is mixed with alkaline water, water with a pH greater than 7. The more alkaline the water, the more rapid the breakdown of some pesticides.

In many areas of the United States, the water has sufficient natural alkalinity to cause hydrolysis of some pesticides. Both well and pond water in the midwest tends to be alkaline, pH above 7. A pesticide thus may begin to break down as soon as it is added to the spray tank, causing it to be less effective or even totally ineffective for control of pests. If you allow a spray mix to stand for several hours or overnight before using it, 50 percent or more of the active ingredient maybe decomposed under alkaline conditions. The net result is poor pest control. If the pH of the water in your spray tank is greater than 7.5, only 1/2 of a pH unit above neutral, it is alkaline enough to affect the stability of some pesticides. A pH of 7.5 to 8.5 is quite common for many waters in the United States. There have been reports that 5 percent of the natural water supplies in the United States have a pH higher than 9.0. For example, the pH of such large rivers as the Potomac, Ohio, Mississippi, and Missouri often range between 7.5 and 8.5. The pH of the Great Lakes also falls in the alkaline range: Lake Michigan ranges between 7.5 and 8.5, while Lake Ontario is 7.9 to 8.3. Even in Pennsylvania, where acid mine effluent pollutes many streams and ground water sources, alkaline water seems to the rule rather than the exception. It is not uncommon to find waters with pH value between 7 and 8.5.

<u>Pesticides affected by alkaline water</u>

Although there is a great deal of variability between groups of pesticides, as well as between individuals within a group, in general insecticides are affected more severely by alkaline water than are fungicides and herbicides. Among the insecticides, the OP and carbamates are decomposed much more rapidly than the chlorinated hydrocarbons. Since OP and carbamate compounds account for approximately 85 percent of insecticide-acaricide use today, growers need to realize the alkaline conditions in the spray tank may reduce the quality of pest control in the field.

Many manufacturers provide information on the rate at which their products hydrolyze. This rate is usually expressed as "half-life" or the "time it takes for 50 percent hydrolysis or breakdown to occur at a given pH value. For example, with Imidan the time for 50 percent hydrolysis is 15 days at pH 4, 1 day at pH 7, and 4 hours at a pH 8.3.
Other examples in addition to Imidan, which show this trend, include carbaryl, chlorpyrifos, and captan.

imidan

pH	Half-life
4.0	15 days
7.0	1 day
8.3	4 hours
10.0	1 minute

CARBARYL (SEVIN)

pH	Half-life(20°C)
6	100-150 days
7	24-30 days
8	2-3 days
9	1 day

CAPTAN FUNGICIDE

pH	Half-life
4	32.4 hours
7	8.3 hours
10	2 minutes

CHLORPYRIFOS (LORSDAN)

pH	Half-life
7.0	35 days
8.0	1.5 days

Lowering the pH of water

If your water supply is alkaline, especially if the pH is 7.5 or greater, and you are using a pesticide that is sensitive to alkaline hydrolysis, you should consider lowering the pH of the water in the spray tank. A pH can be adjusted to the 4 to 6 pH range by using adjuvants that are marketed specifically as buffering or acidifying agents. Buffercide, Buffer-X, Unifilm B, and LI 700 Acidiphactant are examples of such buffering agents. Granulated food grade citric acid may be the most convenient and inexpensive acidifying material. Two oz. per 100 gals has been shown to reduce the pH of tap water from 8.3 to 5.4. Convenient measures are:

per 100 gal.	1/4 cup, slightly rounded
per 300 gal	3/4 cup, rounded
per 500 gal.	1 1/3 cups

Granulated food grade citric acid is available in 50 lb. bags from suppliers that handle food grade chemicals.
A few pesticide materials should not be acidified under any circumstances. Sprays containing lime or lime sulfur and fixed copper fungicides including Bordeaux mixture, copper oxide, basic copper sulfate, and copper hydroxide should not be acidified. On the other hand, if the product label tells you to avoid alkaline materials, chances are very good that the spray mixture will be benefited by adjusting the pH of your water to 6 or slightly lower. (source: W.K.Hock, Penn State & R. Weinzierl, University of Illinois)

Insect Pest of the Month: Diamondback Moth
Chris Harding, Department of Entomology

The diamondback moth is a pest of cole crops, especially cauliflower. This pest was introduced from Europe before the middle of the nineteenth century and is now found everywhere its host crops are grown. The moth has trouble overwintering in cooler regions although trade winds disperse the moth throughout the United States during the growing season. Recent evidence suggests that the diamondback moth is able to overwinter in Pennsylvania during mild years. When overwintering populations are present, it can significantly increase the populations of diamondback moths.

The adult diamondback moth is small, grayish-brown with fringed hind wings. Probably the best characteristic for identifying the adult is the pattern of white diamonds that is present in a line down the insect's back when at rest. Both coloration and the manner in which the wings are held create this pattern. The eggs of the diamondback moth are round, white and smaller than a pencil point. Eggs are found in groups of one, two or in rare cases 3 and will most often be located on the underside of leaves adjacent to a large vein. The larvae are pale green with a black head capsule and sporadic black hairs. In contrast to some of the other cabbage worms the larvae of the diamondback moth will wiggle furiously when picked up. The larvae are capable of producing silk and may be observed hanging by a silken thread. The pupa is approximately one quarter of an inch long, covered with a loose silken cocoon and will frequently be found stuck to the plant.

Adult diamond back moths will feed in small amounts although the damage is so slight that it will often go unnoticed. It is the larvae of the diamondback moth that can cause significant economic damage.

Larvae have two distinct feeding styles. Shortly after emerging from the egg, larvae are extremely small and will feed by mining (feeding on the leaf tissue between the upper and lower epidermis) into the leaf. The larvae themselves are not visible during this time (because they are inside the leaf). The only evidence is a long tortuous white trail that is the result of underlying dead tissue. As the larvae grow they become too large to feed as a leaf miner. It is at this point that larvae begin to burrow through the leaf tissue resulting in many small holes in the leaf. This type of damage is most commonly called "shotgun damage" due to the appearance of many small "shotgun pellet" holes.

Economic damage is most severe after heading begins. Larvae will burrow into the developing head destroying its marketability. The recommended treatment threshold for diamondback moth depends upon the plant growth stage. From seeding to cupping

the recommended threshold is when 20 percent of the plants are infested. After heading begins, the recommended threshold decreases to 5 percent infestation.

The diamondback moth overwinters as an adult in the debris of the previous year's crop. In the spring when temperatures increase the moth will mate and begin a host search. Oviposition occurs on the under side of leaves, usually immediately adjacent to a vein. Eggs are usually oviposited in groups of singles, doubles or triples although more than one group may be oviposited per leaf. Larvae will feed for approximately ten days before beginning pupation. The pupal case of the diamondback moth is made of silk and is used to adhere the pupa to the plant. An adult moth emerges from the pupal case in 5 to 10 days depending upon the temperature. In Pennsylvania the diamondback moth will have between 4 and 7 generations in a growing season.

The diamondback moth may be able to overwinter in the southern areas of Pennsylvania during mild winters. When populations successfully overwinter, it greatly increases both the number and intensity of moth generations. Following harsh winters it is unlikely that moths have successfully overwintered. During these seasons immigrating diamondback moths are the result of prevailing winds from the south. Due to the variability in Pennsylvania winters, it is impossible to predict which winters may enable overwintering.

The corner stone of good pest management is monitoring. Optimal monitoring for the diamondback moth is the use of pheromone traps to monitor adults. When the adult population rises, begin scouting the plants for larvae and eggs.

When spraying, be sure to use a high-pressure air blast sprayer (>200 psi) with 3 hollow cone nozzles per row. One nozzle should point straight down into the row, while the other two spray from either side. Additionally, use a spreader-sticker to increase coverage. This procedure sprays the plants from 3 sides and reduces the spray shadow that occurs as a result of the change in topography between the leaf and the vein. Keep in mind that it is this region, adjacent to the veins, where the diamond back moth oviposits its eggs. For proper control it is critical to ensure that optimal spray coverage has been achieved.

In some cases, the intensity of summer infestations of the diamondback moth can be reduced by eliminating the overwintering habitat. Because the diamondback moth overwinters in the debris of the previous year's field, all plant material should be either plowed under or raked to a central location and burned. Additionally, fields should be rotated as far as possible between years. This makes it more difficult for adults who have managed to overwinter to find the current year's crop.

For additional treatment options see the current Pennsylvania State University Vegetable Production Guide and as always READ THE LABEL.

That's a Berry Good Question!!!
Kathy Demchak, Small Fruit Specialist, Department of Horticulture

Q. Please report the current status of using specific yeasts and/or enhancing naturally occuring ones with sugar sprays to outcolonize *Botrytis*. Also, how effective is the new soap-based copper spray...has anyone tested it for *Botrytis* on berries? When is the most critical application time to reduced colonization to a manageable level with the least

number of cover sprays? (Thanks to Dan Lefever for asking these questions, which were excerpted from a letter he sent to me.)

A. Wowsers. I'll take this one one part at a time... One of the researchers who originally did the work in the field with yeast to control *Botrytis* (grey mold) had since turned his attention to *Trichoderma*, another promising genus of microbes, some strains of which are effective in grey mold control. According to one of the other researchers who had worked on this project, the use of sugars to enhance naturally occurring populations is taking the long-way around, and is too dependent on too many variables outside of our control to be a reliable method of control.

Most of the recently published work with various strains of yeast focused on their use for postharvest rot control, or in protected environments such as greenhouses, with good results being obtained under these conditions. At least one yeast isolate has recently become labelled for postharvest control of *Botrytis* and *Penicillium* on berries. The active ingredient is *Candida oleophila* (yeast); the trade name is Aspire (Ecogen, Inc.). According to the company, the label may be expanded to include use a few days before harvest, but it will be at least 2-3 years before this happens. It also apparently is more effective against blue mold or green mold (*Penicillium*) than it is against grey mold.

There is no recent published work in scientific journals on the use of soap-based copper sprays. However, in most studies, traditional copper compounds have had little effect against grey mold, plus phytotoxcity sometimes occurred. According to IR-4, the pest control spectrum for copper octanoate (the active ingredient in the product to which Dan was referring) is only for downy mildew, powdery mildew, blue mold, white rust, and anthracnose.

The most critical application time for most fungicides is during bloom (at 5-10% bloom, full bloom, and possibly late bloom if the bloom period is prolonged). Often no additional fungicide application is necessary during harvest if the blossoms were adequately protected.

Thanks to Sonia Schloemann, Univ. of Massachusetts, for information on the work with yeast to which Dan had referred, to Dirk Ave from Ecogen, Inc. for information on the status of Aspire, and IR-4 for copper octanoate control spectrum info.

Got a question? Send it to Kathy Demchak, at 102 Tyson Bldg., University Park, PA 16802. You will be credited with the question, or can remain anonymous, as you wish.

Bramble Cultivars

Kathy Demchak, Department of Horticulture

Last month, we started covering cultivars that had been released in the last few years. We covered strawberry cultivars recently released by Andrew Jamieson from Agriculture and Agri-Food Canada. Also from his program:

'K81-6', available under that designation, a late-season summer-bearing red raspberry. Has produced very large berries on vigorous plants with good flavor. Pick-your-own customers have liked it. However, he reports that some growers have had problems with fire blight and leaf curl virus.

Other new raspberry cultivars, these from Harry Swartz (Univ. of Maryland), Joe Fiola (Rutgers) and Herb Stiles (Va. Tech) cooperatively.

'Lauren'. A '97 release. Early-mid season summer-bearer. Large berries with mild, sweet flavor. Canes are vigorous and productive. Some cane die-back reported with wide winter temperature fluctuations. Performed well at Rock Springs.
'Anne'. A '99 release. Late fall-bearer. Large, yellow berries with wonderful flavor with a hint of banana. However, bore late, and produced sparse canes, so yields at Rock Springs were low. Cane density has been better at other sites, and pinching to encourage branching may improve earliness and yields.
'Caroline'. A '99 release. Early as fall-bearers go. Good-sized, firm berries with great flavor. Vigorous plants, produced very high yields. All-around great plant.

New Publication
Kathy Demchak, Department of Horticulture

For those of you interested in strawberry plasticulture, Virginia has a new publication - "Hill System Plastic Mulched Strawberry Production Guide for Colder Areas" (Charlie O'Dell and Jerry Williams, authors, 31 pp.). It covers everything from planning the operation through harvest and carryover. This is written for VA growers, and some adjustments may need to be made for some areas of PA, but it contains a lot of good information. Copies are $3.50 each. Order forms can be obtained through your County Extension Office.

Do Rotations Matter Within Disease Management Programs?
Alan A. MacNab, Department of Plant Pathology

As agricultural land becomes more scarce, existing farms become more specialized, and land closest to roadside markets increases in value, in part due to the advertisement-value of growing some crops where they can be seen and/or harvested by customers, an increasing number of farmers are considering shorter rotations for some of their plantings. Indeed, it can be very tempting to shorten rotations.

What would happen if one were to ignore rotations, that is, if one were to plant the same crop in the same field year after year? We did this in research fields for both tomatoes and for muskmelons. The results are summarized below in Table 1 (tomato early blight) and Table 2 (muskmelon/cantaloupe Alternaria blight).

Table 1. Defoliation associated with early blight on tomatoes after growing tomatoes in the same field for 1, 2, 3, and 4 successive years.

Successive years	% Defoliation when 5% fruit were ripe
Year 1	3
Year 2	30
Year 3	74
Year 4	70

Table 2. Date when Alternaria blight first appeared on muskmelons (cantaloupes) for successive years after muskmelons were grown repeatedly in the same field (from 1977 through 1981).

Successive years	Years grown	First date when Alternaria blight was first observed	# Days before Aug. 8	# Days after June 1
Year 1	0	August 8	0	69
Year 2	1	August 3	5	64
Year 3	2	July 29	10	59
Year 4	3	July 25	14	55
Year 5	4	July 18	21	48

The results provide a clear indication of the value of rotations relative to diseases caused by pathogens that can survive either in soil or in association with refuse from diseased plants. Many vegetable diseases are in this category.

Traditional wisdom and common-sense, combined with results such as those presented in tables above, tell us that rotations are important. Interpretation of results from various field, greenhouse and lab studies, and observations by many plant pathologists, suggest a minimum number of years that a grower should avoid growing crops affected by specific diseases (See Table 3). All vegetable growers should consider this information seriously as they plan crop rotations within their disease management programs.

Table 3. Minimum years to avoid crops susceptible to specific diseases.

Vegetable	Disease	Period without a susceptible crop
Asparagus	Fusarium wilt & root rot	Indefinite; do not plant without fumigation.
Beans	Root rots	Several years.
	White mold, Sclerotinia	Several years; avoid tomato, potato, lettuce, cabbage, celery, carrot.
	Anthracnose	2 years.
	Bacterial blight	2 years.
Beets	Cercospors leaf spot	3 years.
Cabbage-related plants	Clubroot	7 years; avoid turnip, radish.
	Fusarium yellows	Many years.
	Blackleg	3-4 years; avoid turnip.
	Black rot	2-3 years; avoid turnip.
Carrots	Leaf blights	Few years.
Celery	Leaf blights	Few years.
Corn, sweet	Smut	Few years.
	Yellow leaf blight	3 years.
	Northern leaf blight	Few years.
Cucumber	Scab & leaf spots	2 years.
Eggplant	Verticillium wilt	4 years; avoid tomato, potato, pepper, strawberry, brambles.

	Fruit rots	3 years.
Lettuce	Bottom rot (Rhizoctonia)	3 years.
	Drop, Sclerotinia	3 years; avoid tomato, potato, beans, cabbage, celery, carrot.
Muskmelon	Leaf spots & scab	2+ years; avoid cucurbits.
=cantaloupe	Fusarium wilt	4+ years; watermelon Fus. wilt is different.
Watermelon	Gummy stem blight	2 years; avoid muskmelon, pumpkin, squash.
	Fusarium wilt	4+ years; muskmelon Fus. wilt is different.
Onion	Leaf blights	1 to 2 years.
Parsley	Damping-off	3 years.
Parsnip . . .	Leaf spot & root canker .	1 to 2 years.
Peas	Root rots	3 to 4 years.
	Fusarium wilt	4 to 5 years.
Peppers . . .	Bacterial spot	2 years.
	Phytophthora blight	2 years; avoid tomato, eggplant.
Pumpkin . .	Black rot	2+ years; avoid muskmelon, watermalon.
Squash	Black rot	2+ years; avoid muskmelon, watermalon.
Radish	Clubroot	7 years; avoid turnip, cabbage-related plants.
Turnip	Clubroot	7 years; avoid radish, cabbage-related plants.
Spinach . . .	Downy mildew	2 years.
Sweet potato	Black rot & scurf	3 years.
	Pox	Few years.
Tomato	Bacterial canker	3+ years.
	Bacterial spot	2 years; avoid pepper.
	Bacterial speck	1 year.
	Early blight	2 years; avoid potato.
	Anthracnose	2 years.
	Fusarium wilt	3 years.
	Verticillium wilt.	Several years; longest possible; avoid potato.

Upcoming Meetings
Bill Lamont, Department of Horticulture

Local

March 2, 2000: Lehigh/ Schuylkill County Potato Growers Meeting. Contact: Bob Leiby (610) 391-9840

March 7, 2000: Western Pennsylvania Potato Meeting, Butler, PA. Contact: Tom Zundel (724) 662-2323

March 14, 2000: North Central Vegetable Producers Meeting, Coudersport, PA. Contact: Greg Burns (814) 776-5331

March 15, 2000: Erie County Potato and Vegetable Growers Meeting. Contact Andy Muza (814) 825-0900

Regional

National

March 2-4, 2000: National Potato Council Chip Seminar, Buffalo, NY. Contact: (716) 526-5356.
March 16-17, 2000: Greenhouse Tomato Short Course, Mississippi Agriculture and Forestry Museum, 1150 Lakeland Drive, Jackson, MS. Contact: Dr. Rick Snyder (601) 892-3731. Web site for this event: http://www.msstate.edu/dept/cmrec/GHSC.htm

September 23-26, 2000: 15th International Agricultural Plastics Congress and the 29th National Agricultural Plastics Congress, Hershey, PA. Contact: Pat Heuser, Executive Secretary, American Society for Plasticulture (814) 238-7045.