THE VEGETABLE AND SMALL FRUIT GAZETTE

April, 2000
Volume 4, No. 4

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Tip for the Month: "Do what you can with what you have where you are." –Teddy Roosevelt

Comments from the Editor

Bill Lamont, Department of Horticulture

The winter meetings are completed and I want to thank each of you for organizing what I believe were some excellent educational meetings this past winter. I would like to suggest that we keep the dates and order of the meetings about the same for next year which will certainly help in overall scheduling.

With spring in the air can planting time be far behind? Not in the high tunnels-we already have crops growing and will be planting many more this season. We have two excellent in-service offerings, one on March 11th "New Pest Management Materials for Growing Vegetables" being coordinated by Shelby Fleischer, Department of Entomology. That group will meet in room 504, ASI Building, at 10:30 am. (Some previous notes said 10 am, but time has been moved it to 10:30 AM to give people time to drive in that morning.) Lunch will be provided. Then on the following day, March 12th in-service training on the "Operation and Use of High Tunnels" from 8:30 AM-5 PM at the Horticulture Research Farm at Rock Springs which is being coordinated by Bill Lamont. Lunch will be provided. There will be a steak cookout for participants at Bill Lamont's house on the previous evening of April 11th. I know that many of you have already indicated that you will be in attendance for one or both these but if you haven't, please let myself or Shelby know so we can plan the meals, etc. As always, I thank my colleagues in the other departments for their contributions to this publication and encourage them to keep up the good work. I also want to thank the county extension agents for their excellent articles even though I cannot located the sign up sheet, I know you know what month you are suppose to write an article. The Vegetable and Small Fruit Gazette Team

encourages your feedback so that we can better serve your needs and address your concerns.

The New and Safer Insecticides

Shelby J. Fleischer, Department of Entomology

FQPA often raises concerns about loss of pesticides for growers. However, it has also increased the emphasis for development of new "biorational" pesticides to replace the ones being lost. We will quickly overview what these materials are. But first, why are these termed "biorational"?

The mode-of-action of a pesticide refers to how a material causes a toxic symptom. It's helpful to first think about which organ system is being affected: the nervous system?, the circulatory system?, the endocrine system?, the digestive system? One approach to achieving a biorational status is to target an organ system that exists in insects but is very different in humans, mammals or birds. For example, both humans and insects have an endocrine system that regulates growth and development. But the endocrine system for insects, which regulates molting, is very different than the one for humans. The same can be said for the digestive system. And even where the overall system is similar in many respects, there can be parts of the system, such as receptors that enable the system to function, that are different for insects. Finally, the sensitivity of receptors might be very different for insects than people, mammals or birds. Focusing in on parts of insect physiology that is different than human or mammalian physiology has resulted in the development of the biorational insecticides. And some of these get "fast track" status for EPA approval.

In an word, the biorationals are "selective". They operate, or operate much better or faster, on selective targets. This selectivitiy is used to target insects. And sometimes they selectively target only certain groups of insects - like caterpillar larvae, or beetles, or aphids. In this way the biorationals improve both human and ecological safety. It also means that insects that were controlled in the past are not affected when some selective materials are used. Overall, however, we will improve farm-worker and ecological safety as we learn to incorporate the selective materials into pest management. This atricle will overview some of the newer, selective biorationals that are becoming useful for vegetable pest management in our area. I will base my comments from literature provided by the manufacturers. The intent is not to recommend certain products, but to give you an idea of the range of some of the new, relatively selective options that are beginning to come available for vegetable growers. EPA is claiming that most of these are being given "expedited review".

Many of our older insecticides target the nervous system because that causes relatively quick action. The older ones were developed from human toxins or human drugs. But are the nervous system of humans and insects the same? Well, in some respects yes, and in some no. Some of the receptors in insects are much more responsive to specific chemicals than the receptors in humans, or the receptors are in markedly different concentrations near the outer part of the animal. There are several types of materials that act on the nervous system that take advantage of specificity of the insect

receptors. They achieve safety, in part, by being able to be effective at an incredibly low dose.

Materials aimed at the nervous system

- Neonicotinoids. These include Admire or Provado, from Bayer (active ingredient is imidacloprid). Both Admire and Provado received a label for cucurbits in late 1999. They are labeled for watercress, potato, fruiting vegetables, cole crops, and greens. This is active on aphids, leafhoppers, certain beetles (flea beetles, Colorado potato beetle), but not active against caterpillers.

  Another neonicotinoid being developed by Novartis is expected to be available to vegetable growers soon. Proposed names for different formulations are Platinum or Actara and they are proposed for fruiting vegetables, leafy vegetables, cucurbits, cole crops, and potatoes. (The active ingredient is thiamethoxam.)

- Spinosads. These are metabolites from a soil microorganism (the actinomycete *Saccharopolyspora spinosa*) from Dow. The action site is on the same receptor as the neonicotinyl materials, but at a different location on this receptor. A mixture of metabolites is formulated into different crop protection products. It was granted "Reduced Risk" by EPA. The SpinTor formulation is labeled on fruiting vegetables, leafy vegetables, and cole crops for caterpillars, thrips, and some beetles.

- Avermectins. These are either metabolites from a bacteria (*Streptomyces avermitilis*) grown in fermentation, or derived from such a metabolite. Two examples from Novartis are Avermek, which is a very useful miticide, and Proclaim (active ingredient is emmamectin benzoate). Agrimek is labeled now, and Proclaim is expected soon. Proclaim is particularly well known for activity against caterpillars.

- Indoxycarb. Dupont is proposing registration of indoxycarb for fruit and vegetables, with the proposed name of Avaunt. It is aimed at many caterpillars and some selected bugs and beetles.

Neural inhibition of feeding

- Fulfill (active ingredient is pymetrozine) is proposed by Novartis, and may now have a registration in potatoes. EPA has granted "Reduced Risk" status to the active ingredient. It affects the nerves that control feeding, especially of aphids, whiteflies and other sucking insects, causing them to stop feeding.

Insect growth regulators

- Confirm (active ingredient is tebufenozide) is registered by Rohm & Haas for cole crops, leafy vegetables, and fruiting vegetables. The material mimics the action of a moulting hormone (ecdysone). Insects will stop feeding and undergo improper development. This was the first material to be granted "Reduced Risk" by the EPA for agricultural crops. It is effective against a wide range of caterpillar larvae.

- Neem: Azadirachtin. Neem products are botanical extracts of the seed of the neem tree, *Azadirachta indica* that are being manufactured and distributed by several companies (Amvac, ThermoTrilogy). The materials interfere with one of the hormones (ecdysone) that insects use to control moulting. There can also be significant effects on behavior, perhaps from other compounds in the botanical extract.

Insect digestive system

- Bts. Most growers are familiar with sprayable formulations developed from the soil bacteria *Bacillus thuringiensis*. Different strains of Bt are effective against different caterpillars. Yet other strains are effective against fungus gnats or Colorado potato beetle.

- Transgenics. Genes that code for specific proteins from the soil microorganism *Bacillus thuringiensis* have been moved into the genome of processing varieties of sweet corn, thus conferring host plant resistance. Cultivars with the transformation are very effective against the caterpillars that infest the ears of sweet corn.

This is not a complete list. Some are currently registered, and some are pending registration at EPA. ALWAYS READ THE LABEL and follow the wording on the label. Look for new options for pest control coming from industry even as older options are further regulated or removed by FQPA. If these materials can be used effectively and economically, and if the industry produces them and EPA approves them, then vegetable growers should have options that improve farm-worker and environmental safety. Furthermore, it may become easier to incorporate biological controls.

Resistance Management Guidelines for Strobilurin Use on Vegetables
Alan MacNab, Department of Plant Pathology

Resistance management guidelines were recently developed by FRAC (Fungicide Resistance Action Committee) and were agreed upon by three companies that manufacture and sell these products. The strobilurin products now labelled on some vegetables include Quadris (from Zeneca), and Flint (from Novartis); an additional strobilurin for use on vegetables is being developed by BASF. Guidelines also are available for these additional strobilurin products: Heritage labelled for ornamentals and turf, and Abound labelled for various fruit and nut crops.

These guidelines are important because some fungi can develop resistance to the strobilurins; in fact, this has already occurred, but only outside North America.

Reasons for this update are (1) to remind farmers that there is a potential for resistance to develop where these fungicides are used, and (2) to encourage growers to follow the guidelines as outlined below. By alternating strobilurin materials with other effective materials, and by limiting the number of strobilurin applications per season, the chance for development of resistance to these materials will be reduced.

Information in the guidelines will be included on all new labels. However, some product does not have the new label information yet. Even though there will be a transition time before all labels have the new wording, all growers will benefit from following the new guidelines now. Guidelines pertaining to vegetables and potatoes are summarixed below. Similar guidelines are available for other crops listed on strobilurin labels.

CUCURBITS
(1) No more than one application before alternation to an unrelated fungicide that is effective in controlling the causal fungus.
(2) No more than 4 total applications per season.

POTATOES
(1) No more than one application before alternation to an unrelated fungicide that is effective in controlling the causal fungus.
(2) No more than 6 total applications per season.

TOMATOES
(1) For late blight, no more than one application before alternation to an unrelated fungicide that is effective in controlling the late blight fungus.
(2) For all other diseases, no more than 3 sequential applications before alternation to an unrelated fungicide that is effective in controlling the causal fungus.
(3) No more than 5 total applications per season.

NOTE: The sequential and totals reflect total strobilurin applications (ie. at this time, both Quadris and Flint for vegetables). Therefore, if Flint is used for 2 applications on cucurbits, only 2 additional sprays can be made, regardless of whether they be Quadris or Flint. Likewise, if Quadris is used for two applications on cucurbits, only 2 additional sprays can be made, regardless of whether they are Flint or Quadris.

Honeybees Increase Strawberry Yields

Tim Elkner, Horticultural Agent, Lancaster County

The February Beekeeping Column in the *Country Folks Grower* reported on research which proved that honeybees present in strawberry fields during flowering resulted in more and larger berries. Many growers have believed that this was the case but there had been little research information to document the benefits of bees. However, Dr. Joseph Kovach conducted a study at Cornell University that found honeybee-pollinated fields yielded 20% more strawberries (by weight) than non-pollinated fields.

This finding is significant for several reasons. First – the only cost involved to increase yields was the expense of hive rental. There were no additional fertilizers or pesticides necessary. Second – the resulting berries were larger and sweeter. This would definitely help sales of your fruit. And third – the number of misshapen berries in the field was reduced. This was a result of more efficient pollination by the bees.

Strawberries are wind and gravity pollinated and bees or other pollinators are not necessary to set a crop. However, by having bees present to move pollen between flowers, more achenes (or seeds) are formed. Developing seeds release hormones that cause development of the flesh nearby resulting in larger and better-shaped berries. Developing seeds also stimulate the accumulation of sugars in the fruit so the more seeds there are, the sweeter the berry.

Honeybees find strawberry flowers attractive so large numbers of colonies are not necessary to improve pollination. One strong hive for every two acres of berries should be sufficient to increase your yields. I encourage you to look into having honeybees present during flowering of your strawberry fields this year. This small investment could yield large returns at harvest.

Options for Deer Control In Vegetable and Strawberry Crops

Steve Bogash, Commercial Horticulture Agent, Blair County

There is little doubt that in order to profitably grow high value crops such as strawberries and vegetables that some pre-planning for deer control is a must. The ever-increasing number of deer in the Commonwealth poses a severe threat to the profitability of any produce operation. First a few deer facts:

Deer will eat most anything if they are hungry enough. There was a time when the author believed that garlic was completely out of the question, but hungry deer will even take an occasional bite of garlic.

A little deer math: start with a hypothetical herd of 24 deer (8 are bucks and 16 are does). Now use some method of effective hunting: 6 bucks and 8 does are harvested during hunting season. This leaves 2 bucks and 8 does for this coming breeding season. Each doe has 1.7 fawns on average in good habitat. We now go into next season with 23 deer and this is after killing more than half of the herd.

No amount of deer control is effective long term without intensive herd population management as ever increasing numbers of deer will overwhelm any barriers we create.

Repellants don't work, at least for very long. There are numerous repellants on the market. Most will work for a short period, but seldom for more than 2-3 weeks and most need to be reapplied regularly. Hungry animals have been shown to pay little attention to repellants.

Some Methods of Deer Control Worth Consideration:

Radio Collared Dogs

Cornell evaluated in one research project a greatly beefed-up dog radio collar system called Off-Limits. This system has been shown effective on areas as large as 30-50 acres per enclosure depending on terrain, dog's abilities and desired control levels. Since dogs are highly territorial, they essentially stake out the area as their own and will chase any varmints or deer from inside the antennae area. Selection and training of the dogs as well as the placement of shelter, food and water sources is imperative for this to work well. Dogs that are not used to people may be a problem in "pick your own"

operations. Some dogs tire of the chase without ever catching the deer and quit chasing them. Cost: approximately $4,000 for 30-50 acres.

Full Height Barrier Fences

Nothing beats a full height (8-10') fence for deer control. If you can afford to surround a planting with a barrier that deer cannot get over, under or through you've got good deer control. The big problem with this method is short and long-term cost. Initial installation is expensive as even inexpensive plastic mesh materials can run $1.00 per foot, 10-12' posts are not cheap and annual maintenance can be time consuming.

Slant Fence

Slant fence systems using high-tensile wire and an electric charger are quite effective, as deer do not readily jump over a barrier with depth. This five foot tall fence is up to eight feet deep. Drawbacks to this system are the initial cost of installation and the need to maintain a weed and grass free strip under the fence.

Low Cost Two Wire Electric Fence

Baited, low-cost, polywire fencing can provide highly effective deer control with minimal capital outlay. A typical polywire fence of this type has two wires on fiberglass posts set at 20–30 foot spacing. The top wire is 30-36" off the ground and the low wire is 18-20" off the ground. Pieces of aluminum flashing that resemble pup tents are crimped along the top wire at 10-15' intervals. Peanut butter is then smeared under these tents. The wires are charged and when the deer come to investigate the peanut butter, they receive a "correction" to their moist nose. The highly visible polywire and peanut butter baits on a charged wire provide an effective deterrent to feeding inside the wire. This system is generally good on areas up to 5 acres. The baits must be maintained with fresh peanut butter every 2-4 weeks and care needs to be given in planning the location for the enclosure. Locating this psychological barrier in a long used deer thruway will not have any effect, as they will leap over the wires. This system is very inexpensive as the only costs are for fiberglass posts, polywire, a little miscellaneous hardware, peanut butter, and a charger. Solar-powered, battery chargers can make this system completely portable to those areas on your farm with no power.

The concept with all electric fencing is to train the deer to stay out of an area. So start before your crop needs protection and maintain the fence. Don't turn it off during the time that you want protection because the deer will periodically test the wire and go through if the system is off. During high snow periods, your fence may become ineffective.

For more information on Deer Control Methods:

Penn State:

Deer: PA Wildlife Nuisance and Damage #12

University of Maryland Cooperative Extension:

Controlling Deer Damage in Maryland, Wildlife Management Series

Low-Cost Electric Deer Fence, Wildlife Management Series

Virginia Cooperative Extension:

Low-Cost Slant Fence Excludes Deer from Plantings (web article from Charlie O'Dell)

Time to Check for Strawberry Problems

Kathy Demchak, Department of Horticulture

Spring is the best time of year to check your strawberry plants for a number of problems. If you have patches that are doing poorly, dig up some plants from these areas and slice through the main roots lengthwise. One diagnostic symptom of red stele (Phytophthora root rot) shows up when the soil is cool, and becomes less obvious as the soil warms. If the plants have this disease, there will be a reddish discoloration in the center (the stele) of the root. Also, check for root weevil larvae (small white grubs 1/4 to 1/2" long, depending on the species) in the top 6" of soil. Slice through the crown of the plant, too. You may find tunnels made by grubs or the grubs themselves. The crown should be creamy white throughout. If you notice a brown or reddish discoloration, the plants may have been cold-injured, though some diseases also cause discolorations of the crown. Starting before bloom, check weekly for tarnished plant bugs (they cause button-berry) and clipper. Sample in a V-shape across the field. For tarnished plant bugs, tap at least 30 flower clusters over a white plate. More than 0.25 nymphs per cluster before 10% bloom or more than 0.5 nymphs per cluster during mid to late bloom are the thresholds for a spray application. If no tarnished plant bug nymphs are found until mid-bloom, delay spray application until after bloom to protect pollinators. For clipper, check 5 to 10 2-foot sections of row. An average of 1 clipped bud per foot of row is the threshold for control. If your planting borders woods, check some additional sections in the border rows near the woods. Sprays of these border rows may be sufficient.

Sources of information: Commercial Berry Production and Pest Mgt. Guide, Integrated Pest Mgt. for Strawberries in the Northeastern United States, and NRAES Strawberry Production Guide.

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

Q. Where's the new 'Commercial Berry Production and Pest Management Guide'? (Asked by several county agents.)

A. At the printer. It should be out sometime between the middle and end of April. Unfortunately, your overly optimistic Small Fruit Extension Associate found that there were a few more steps in that whole process than I expected. In the meanwhile, to make the pesticide tables available to growers who need them now (the part of the guide that I'm assuming is needed most at this point), I've emailed advance copies of the pest control tables to most of the county agents. If no one in your county Extension office has these, please ask them to contact me so I can get someone from their office on my list of small fruit contacts. Also, please give them your name and address so you can be mailed a copy of the tables directly. I ask that anyone who gets these pesticide tables not just get them instead of the new version of the guide. There is information in it that I think you'll find useful. See last December's Vegetable Gazette for info on changes to the guide.

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.

Potato Musings

Potato Seed Piece Size and Placement Affects Yield
Bill Lamont, Department of Horticulture

Bill Bohl, Extension Educator from Idaho had a nice article on this subject that I wanted to share it with you. When we plant we hope to have a good potato seedpiece that is space equally in the row and the proper distance between the row. If we miss getting things right-seed size and placement-it will negatively impact yield and quality.
A 100 percent stand of potatoes planted 12 inches apart, in rows spaced 3 feet would have 14,520 plants per acre. We routinely do this figuring with vegetable transplants. If we have a yield goal of 320 cwt. per acre and every plant produced exactly the same amount (let just say that this is true for illustration), then each plant would contribute about 2.2 pounds to the total yield. If 10 percent of the plants were missing, you might then think that the yield would be reduced by 10 percent. However, this doesn't happen because plants on both sides of the missing one compensate by producing more yield because of less competition. Additionally, several successively missing plants may result in more yield reduction than an equal number of sporadically missing ones. Nonetheless, the bottom line is missing plants reduce yield. Thus, if you had a 100 percent stand in the field, applied sufficient fertilizer, maintained the correct amount of moisture, prevented any disease and insect problems from reducing your yield, then you would see what the potential maximum yield would be for a given variety on that acre for that year.

Achieving as close to a 100 percent stand as possible begins before planting. You first need to obtain a uniform seed piece size profile. Evenly sized seed pieces will generally plant more uniformly. You cannot determine seed piece size profile by only knowing the average size. Two seed lots with the same average seed piece size could likely have considerably different seed size profiles. You should not only have an average seed piece size of 1.5 to 2.5 ounces, you should also have at least 72 percent of the seed pieces in the 1.5 to 2.5 ounce size categories.

The seed piece size profile is determined by individually weighing approximately 100 seed pieces and placing them in size categories of less than 1 ounce, 1.0-1.5 ounces, 1.5-2.0 ounces, 2.0-2.5 ounces, 2.5-3.0 ounces, 3.0-3.5 ounces, 3.5-4.0 ounces, and greater than 4.0 ounces. Calculate the percentage in each size range by dividing the number of seed pieces in each size category by the total number of seed pieces and then multiplying by 100.

Just as missing plants can reduce yield, non-uniformly placed seed pieces may also cause a yield reduction. A significant factor contributing to missing or misplaced seed pieces is operating the planter too fast. Recognizing there is not single best planting speed for all planters, you will need to determine the best speed for your planter.
Evaluating seed piece placement accuracy will take some time to do correctly. You should uncover seed pieces in about 25 feet of row behind each planter unit, which allows you to measure the accuracy of the entire planter.
After exposing the seed pieces, measure the distance to the nearest inch from the center to center of each seed piece. Consider a seed piece accurately placed if it is within 3 inches of your desired spacing. For example, if you want a 12-inch spacing, then all seed pieces

placed 9 to 15 inches would be accurately planted. After measuring the distance between each seed piece, record whether the space is too close, accurate, or too wide in comparison to your target spacing. Then calculate the percentage of spaces in each category.

For example, let's say you want an average seed piece spacing of 12 inches. You uncover 22 seed pieces in one row finding 3 spaces less than 9 inches (too close), 16 spaces at 9 to 15 (accurate), and 2 spaces more than 15 inches (too wide). Note that you are accounting for the spaces between the seed pieces rather than the seed pieces themselves so you are measuring 21 spaces-one less than the number of seed pieces uncovered. Your seed piece placement accuracy is 16 divided by 21 x 100 = 76 percent. This would be done for every row.

You should also calculate your average seed piece spacing. You may be surprised to find the average seed piece spacing is not what you intended. Determine average seed piece spacing by measuring the total distance between the first and last seed piece in each row and dividing by the number of spaces. In our example, let's say the distance between the first and last of the 22 seed pieces uncovered was 276 inches. The average seed piece spacing for that one row would be 276 divided 21 = 13.1. In our example, the desired spacing was 12 inches so the spacing is too wide. To get an overall average, add the total distances for all rows and divide by the total number of spaces.

Planting a potato crop correctly will most likely result in high yields, and additionally, a uniformly planted crop will likely improve tuber size and quality at harvest.

Upcoming Meetings

Bill Lamont, Department of Horticulture

Local

August 14, 2000. Vegetable and Small Fruit Field Day, Horticulture Research Farm, Rock Springs, PA. Contact: Mike Orzolek: 814-863-2251

August 15-17, 2000. Ag Progress Days, Ag Progress Day Site, Russell E. Larson, Research Center, Rock Springs, PA. Contact: Bob Oberheim 814-692-5262.

Regional

National

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.