

VEGETABLE AND SMALL FRUIT GAZETTE

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In This Issue: Comments from the Editor
Bug Against Bug
End Of Season Clean Up
Choosing and Establishing the 'Right' Cover Crop
Cucurbit Downy Mildew Control
Late Blight Reminder
Storing Pesticides Over The Winter
That's a Berry Good Question!
Potato Musings
 Producing Potatoes Using Plasticulture
Upcoming Meetings

Tip for the Month: "The splendid achievements of the intellect like the soul, are everlasting" -Sallust

Comments from the Editor
Bill Lamont, Department of Horticulture

Things are really jumping as we make final preparations for the The Plasticulture 2000 Meeting to be held at the Hershey Lodge and Convention Center, September 23-27, 2000. The Plasticulture 2000 Meetings is really the 15th International Congress for Plastics in Agriculture and the 29th National Agricultural Plastics Congress all rolled into one. We have participants coming from around the world and we are looking forward to a very successful meeting and the opportunity to introduce them to our beautiful state. We have 93 presentations on all phases of plasticulture from new products, uses and disposal. We really appreciate the help that many of you have provided in planning and also carrying out the meeting, demonstration and tours. I want to thank everyone who contributed to this issue and I apologize for being somewhat tardy with this issue. Look forward to seeing many of you at the Plasticulture 2000 meeting. The Vegetable and Small Fruit Gazette Team encourages your feedback so that we can better serve your needs and address your concerns.

Bug Against Bug

Methods for Releasing *Encarsia formosa* to control Greenhouse Whitefly
Cathy Thomas, Integrated Pest Management Program
PA Dept of Agriculture

Four methods of releasing *Encarsia formosa* to control Greenhouse whitefly have been developed in Europe and are used by commercial vegetable producers. The four methods are:

Pest in First, Dribble, Banker plants, and Inundative. The effectiveness and success of these programs are based on the level of honeydew and sooty mold development on foliage and fruit. If sooty mold levels are acceptable for a marketable product, control of Greenhouse whitefly is been achieved.

Pest in First

With this method, adult whiteflies are introduced into the crop at a fixed rate when transplants are installed in production houses. *Encarsia formosa* is then introduced at regular intervals when whitefly nymphs develop. This method has not been widely adopted because of the concern of releasing pests into the crop.

Banker Plants

The banker plant system uses established colonies of parasitoids reared on whitefly infested plants that are introduced into the crop. Mesh screens can be used to cage banker plants to contain whiteflies, and allow only the tiny parasitoids to disperse into the production area. Using this method may require other facilities (greenhouses or growth chambers) to establish the pest and biocontrol on the banker plant, however there would be the advantage of having a sustainable, on site supply of parasitoids.

Inundative

With inundative introductions, high numbers of *E. formosa* are introduced on a regular basis. This method might be used when establishment and reproduction of the biocontrols are not expected. Inundative releases are used in ornamental crops or short term crops. Inundative introductions of biocontrols may not be cost effective.

Dribble Method

With the dribble method, weekly parasitoid introductions begin at planting in anticipation of naturally developing whitefly populations, or introductions of *E. formosa* can be made when whiteflies are first observed. Parasitoids are introduced every two weeks until there is a high level of parasitized whitefly pupae in the crop. This is usually more cost effective than introducing *E. formosa* every week of the crop cycle. The dribble method is the most common introduction method used in PA greenhouses.

These introduction methods should be discussed with your supplier and they can also advise you on the number of *E. formosa* needed for your crop. These numbers will be based on whitefly populations, hence the need for careful crop observation and scouting. These introductions methods can also be used for other parasitoids and predators.

End Of Season Clean Up

Shelby Fleischer, Department of Entomology

The season was cool, which tends to slow insect populations, but there was plenty of insect management activity in 2000. For example, the web site mapping sweet corn pests was accessed close to 2000 times, and we will continue to operate it until Sept. 15. However, as the end of the field season approaches, it's worth considering what practices during the fall and winter will help manage insects for next season.

Crop rotation is always a valuable cultural management technique for both insects and diseases. Sweet corn is a straight forward example. Corn rootworm adults lay eggs at the base of corn, and these eggs overwinter. Next spring, the hatching larvae need to find corn roots, and they can only move about 3 to 5 feet to search for corn roots. Even a short distance rotation, to an adjacent field, effectively prevents the build up of corn rootworms. In fact, rotation is more effective at controlling rootworms than any soil insecticide applied at planting. Disking or plowing corn crop residues and maintaining good weed control to eliminate overwintering sites can also reduce flea beetle and sap beetle populations.

Crop rotation can also help in crucifers. Diamondback moth has started to overwinter in a few spots in Pennsylvania over the last two winters, and crop destruction reduces overwintering. It also helps slow the build up of flea beetles in crucifer crops.

Rotation also helps to control Colorado potato beetle in tomatoes, potatoes and eggplant. These beetles overwinter as adults in both field edges, and in the fields themselves. Rotation distance has a strong effect on the degree of control. Research has shown that a 0.2 to 0.6-mile distance was required to reduce beetle densities by 50% compared to non-rotated fields. But even a short distance will help - the degree of help will increase with distance out to about a half mile. Rotation for potatoes is also important for white grub control: potatoes should not follow grass fields, especially in years of heavy beetle flight.

Cleaning the pumpkins out of your field may also help with cucumber beetles on your farm. The literature claims the striped cucumber beetle overwinter at the edges of fields, under leaves and debris. While this may be true, we also discovered the beetles burying into pumpkins and the soil immediately under pumpkins that were left rotting in the field. I believe that some (I don't know what percent) of the beetles moved from other cucurbits that matured earlier (cucumbers and melons) to the late-season pumpkins, and then overwintered under these rotting pumpkins. Destruction of cucurbit crop residues also reduces overwintering sites of squash bugs. And for squash vine borer, North Carolina reports help from fall disking to expose cocoons, followed by deep spring plowing.

Winter cover crops are important for soil management. If you are planting into those crops in the spring, get the residue incorporated about a month prior to planting to reduce problems from seedcorn maggots in beans, cucurbits, and sweet corn. These maggots are the larvae of a small fly that lays eggs in the spring near the base of new transplants or germinating seeds. The fly has a preference for areas with higher organic matter. So rotting vegetation for a freshly tilled field will be more attractive to the fly. The same logic holds if you are applying manure to that field – stop applying and get the existing

manure incorporated at least a month before planting. Other horticultural practices in the spring that encourage rapid plant emergence and growth of the seedling can significantly help. These include avoiding planting in cold soils, and shallow planting in a well-prepared seedbed.

In summary, crop clean-up and rotation is a good cultural practice for most vegetable crops. Winter cover crops help create the clean environment because the vegetable crop residues are removed, and also help with soil management, but remember to get those winter cover crops incorporated well before you plant into them to avoid maggot problems.

Choosing and Establishing the 'Right' Cover Crop

Tom S. Becker, Extension Agent /Horticulture, York County

"Cover crops are major ingredients in many biologically integrated farming systems. They're often the first biological technique farmers use, and once they see their benefit, other related practices make more sense to adopt."

Robert Bugg, SAREP UC Davis-based UC Sustainable Agriculture Research and Education Program's analyst

Most organic and conventional PA vegetables growers can agree on one thing:

A cover crop should follow most vegetable crops to add organic matter to the soil.

Those growers not using cover crops are often adding organic matter in other ways including the use of green manure crops, crop residue, animal manures, mulches and compost.

Vegetable growers in York County establish cover crops: (1) as a full-season, rotational crop in vegetable production, (2) as a living or no-till planting mulch layer, (3) as a 'catch' crop for nutrient recycling especially nitrogen or (4) as a seasonal winter crop grown for soil protection.

Land availability and the cost to establish and incorporate cover crops limit many of our grower's uses of the technique. On many small farms, cover crops are sown following grain or vegetable harvest in the Summer or Fall.

The most common and reliable species, winter rye, provides a very dense grass mat all winter. Rye continues to grow if temperatures stay above 38 F. Winter rye is plowed under before it is 18" high followed by a late-planted spring vegetable crop.

In Vernon Grubinger's new book, Sustainable Vegetable Production From Start-Up to Market, Vernon provides one of the 'best' reasons to use winter rye, oats or other small grains as a winter cover. He calls it 'mopping up available nitrogen'. As a result, nitrogen becomes available to a vegetable crop later in the Spring in the upper 4 to 6 inches of soil. Additional nitrogen results from fertilization, manure applications or the mineralization of soil organic matter.

Unfortunately, after late-harvest (Fall) vegetables, cover crops are sometimes not practical. To avoid going a season without any cover crop, some growers plan their cover crops as part of a sequenced crop rotation. For example, a 3 year rotation of vegetable

(potato, etc.)/wheat/clover and grass allows the cover crop to be inter-seeded with the winter wheat.

Often, the use of a winter cover crop is unplanned. Winter cover crops may follow a crisis event like a major disease or insect infestation, hailstorm, early Fall freeze or other catastrophic events. For more information on the selection and establishment of a cover crop, contact your cooperative Extension office.

Here's a list of selection and establishment tips for August.

1. What cover crop species works 'best' overall on your farm and in your crop rotation? To answer this question, establish two or more test strips (10 X 50 feet) long or longer with different types of cover crop species or mixtures for one season. Note the cover crops emergence and establishment capabilities. Seed company suppliers often supply a grower with a 1 to 5lb trial bag of seed. For example, for a single test plot, sow winter rye in early September at a rate of about three quarters of a quart of seed per each 1000 square feet of area.
2. Think 'spatial niches'. In vegetable plantings, strip-cropping provides a simple method for rotating a cover crop with a vegetable planting. Field strips or beds of a Fall or Spring planted cover crop are alternated with strips of early-planted vegetables like potato, onion, cabbage, lettuce or peas. Adjust the width of your fields to accommodate easier cover crop seeding using your seeding equipment as a standard. Strip cropping is a low cost, low input way of getting the benefits of a cover crop
3. Even in plastic mulch systems, one method being evaluated is seeding a cover crop in the Spring between raised beds and/or plastic mulch rows for crops like tomato, pepper and eggplant. Planting or mulch layer strips that are 5 feet wide are worked several weeks later for the cash crop.
4. Less common is interplanting or interseeding a cover crop as a companion crop between the rows of tomato or cole crops. Careful sequencing and an irrigation source ensures the growth of both are not hindered. For interseeding to work, sow the cover crop with only vigorous vegetable crops (sweet corn, cabbage, winter squash, not onions or carrots) and only after that crop is well established, around the time a cultivator could get in for the last time.
5. Winter annuals cover crops like rye and wheat work best with warm-season crops like peppers, tomatoes, sweet corn, melons, squash, pumpkins and sweet potato. A wet Spring often limits incorporating the cover crop for early crops like kale potato, lettuce, onion, cabbage, broccoli, radish, beets and carrots.
6. A full-season cover crop can add significant fertilizer and organic matter to the soil. Plan for it annually in your crop rotation plans for each field.
7. Try a new cover crop species like hairy vetch alone or in combination with rye or oats. One application is increasingly popular on raised beds. Prior to planting a cover crop in early September, plow, disc and establish permanent (2 to 3 year), 4-8" high raised beds. Plant 25 to 40 pound per acre of a legume like hairy vetch. Allow 60 days before a hard winter freeze to get the legume established. In late Spring, the cover crop is killed by mowing or a herbicide application and becomes

- a mulch layer for no-till seeding or transplanting of tomatoes, melons, peppers and pumpkins. Seed a new cover crop on the existing beds after your vegetable harvest. Hairy vetch can contribute up to 100 lbs or more of available nitrogen per acre to a vegetable crop the following Spring.
8. The cover crops of 'choice' for quick establishment in the Fall for soil erosion control include winter rye, forage-type ryegrass or crimson and sweet clover.
 9. Deal in reality. Cover crop systems do require time, money and management. If not properly managed, cover crops can actually interfere with the vegetable crop. Find the least expensive cover that meets your goals. Low cost cover crops like rye range from \$21 per acre up to high cost covers using vetch at \$60. To save time and money, use minimal soil preparation prior to seeding. Conventional seedbeds that are plowed, disked and harrowed require time and labor. Keep lots of residue on the surface.
 10. Know the optimal seeding time and rate for each cover crop. Desirable seeding dates include Sept. 1 to Nov. 10 for rye, Sept. 1-Oct. 1 for a rye/vetch mixture and July 15-Aug. 20 for ryegrass/sweet clover mixture. For late cover crop plantings (Oct/Nov), look at the 7 day or longer weather forecasts for your area. Does the seed have enough time to germinate and establish itself before Winter. If they are predicting rain, plant prior to it.
 11. Know the characteristics and organic matter content of your soil type. On some soil types, cover crops allow earlier field entry and planting in the Spring. Cover crops like alfalfa, barley or white clover require good soil drainage or high nitrogen. For wet sites, use alsikes clover or winter rye. For low fertility sites with low pH, use pearl millet, barley, alsikes clover or birdsfoot trefoil.
 12. How will you get your cover crop established? Think 'big' picture. Small-scale farm equipment, drills and precision seeders for small areas are hard to find. Lawn equipment rentals often offer useful equipment (if its working properly) for small farms.
 13. Get recommendations from your Cooperative Extension office on seeding rates and its need for incorporating residues. For cover crops established for grain production or for use as a forage crop, use higher seeding rates.
 14. Before choosing a seeder, consider the cost to operate. Growers may find an old 'barrow' seeder useful for small areas while electric hand-held or tractor mounted spinner- seeders in larger areas.
 15. Many cover crop species are small-seeded. As a result, shallow incorporation is required. Smaller cover crop seed (legumes, ryegrass, etc.) tends to adapt best using broadcast application equipment rather than a grain drill. Whenever broadcasting seed rather than using a drill, increase the recommended seeding rate slightly. Grain drills tend to establish a better stand and use 20 to 50 percent less seed than a stand established using broadcasting equipment. Grain drills and push-seeders lack what custom-seeders have, a cultipacker to firm the soil. An ideal seed placement recommendation for winter annual grains is 1 1/2 inches deep.
 16. Is your main goal Spring and Summer weed control? Fall planted cover crops compete with weeds better in the Spring than a Spring-planted cover crop.

- Consider using a summer and winter cover crop to transition from a fallow or uncultivated areas of pasture to cropland intended for vegetables.
17. Take a soil test before planting. Cover crops require adequate soil pH and fertility. If needed, incorporate the recommended fertilizer or lime prior to planting using a disk.
 18. Brassicas like rape, kale, turnip and radish establish quickly in cool weather. Any crop with a taproot like alfalfa or clover work well to break up compacted or hardpan soils.
 19. Spring oats seeded alone or with vetch in late Summer or Fall provide an adequate protective winter cover. Oats winter-kill and do not regrow in the Spring. As a result, incorporating the cover crop is easier than other cereal grains.

Cucurbit Downy Mildew Control

A. A. MacNab, Department of Plant Pathology

Wet conditions have favored downy mildew development and recent appearance in southern New Jersey indicates that downy mildew could be appearing soon in the warmest areas of Pennsylvania. Leaf spot symptoms appear first, but when conditions favor disease, all foliage can be affected; sometimes it appears that leaves have dried up "over night", and an affected planting can look like it has been affected by frost. The best fungicides for downy mildew control are Bravo (a broad spectrum material for many diseases), and the Ridomil Gold combination products. The Ridomil Gold combination products are specific for downy mildew, and can be best for downy mildew control. The Ridomil Gold combination products include:
Ridomil Gold/Bravo 81WP, 1.5-2 lb/A
Ridomil Gold/Copper 70WP, 1.5-2 lb/A, and
Ridomil Gold MZ, 58WP, 1.2-2 lb/A.

Late Blight Reminder

A. A. MacNab, Department of Plant Pathology

The following are general comments regarding the potential for late blight in tomatoes (and potatoes) in Pennsylvania for the remainder of the season. In my opinion, the late blight threat exists in the western half, and in the northern half of the state. Based on reports of late blight available from many states including Wisconsin, Minnesota, Michigan, Virginia, Pennsylvania, New York and Maine, I believe the same threat exists in most of these states, and probably, in many additional areas of the US and Canada. Regular protection of these crops should be considered for the remainder of the season.

Details provided from our disease forecasters have given us extremely important advanced warnings that conditions have been unusually favorable for the development of late blight throughout the growing season. Personal observations have demonstrated to me that fungicides listed in eastern-US production guides are doing a remarkable job of

controlling this dangerous disease. The key is to provide good coverage with effective fungicides applied at appropriate intervals.

Growers have asked what to do if late blight appears: Here are a few considerations.

1. Scout fields regularly (at least once a week) to insure early detection.
2. Stay on a regular fungicide program.
3. Do not delay harvest any longer than necessary. Chance of late blight appearance will increase as the season progresses, and once present, will become more difficult to control.
4. During washing and grading, watch tomato fruit closely and remove any affected fruit.
5. For tomatoes, use of clorox in the wash water will kill any late blight fungus spores on fruit surfaces. Fortunately, even if some late blight were present at harvest, it is easy to detect and discard affected fruit. Even if present in a shipment, late blight would not spread within a box, so after harvest, is a "better" disease to have than bacterial soft rot and Botrytis fruit rot.
6. If any late blight is present, try to rinse equipment before moving from one field to the next.
7. Destroy affected plantings as soon as possible. Method to kill plants will depend on the situation. If surrounding plantings are not affected, consider either killing the plants quickly with paraquat/gramoxone, or spraying the planting with an effective fungicide to kill spores shortly before disking the field.

Storing Pesticides Over The Winter

Emelie Swackhamer, Horticulture agent, Lehigh/Northampton Counties

Proper winter storage of unused pesticides may save you more money than you think. Obviously, you can eliminate the cost of having to replace a pesticide ruined by improper storage. Not so obvious are the financial rewards realized by having a properly-stored pesticide perform at 100% of its potential next year, instead of at a reduced efficacy. The last thing any grower needs is herbicide failure or less protection from pests or disease than they were counting on. Additionally, some improperly stored pesticides may crystallize and could clog up application equipment when you go to use them next year. Avoiding this will save time and money too.

Every pesticide label has a section on "Storage and Disposal". It is usually printed at the end of the label's text and this is where you can find out about any specific storage requirements. Some pesticides will break down in high heat, others will break down if they freeze. Read the labels on the products you have left over this year and make sure you are following the manufacturer's recommendations for storage.

It is always best to plan your pesticide purchases so you have only enough to get you through the season. If you don't have extra left over, you won't have to store it. In practice however, even the best planners sometimes have pesticides left over. The 2000 Penn State Commercial Vegetable Production Recommendation guide offers these tips to get your pesticides through the winter safely:

- Keep them at temperatures above freezing, under dry conditions, and out of direct sunlight.
- Keep pesticides in their original containers, with complete labels, and follow specific storage recommendations on the label.
- Store herbicides separately from other pesticides to avoid contamination.
- Write the purchase or delivery date of the product on the label with a permanent marker. Products may lose their effectiveness over several years, and you need to keep track of how old it is.
- Ventilation is important for storage of most pesticides.

Improperly stored pesticides will deteriorate. Some of the general signs of deterioration are excessive lumping or caking, not suspending in water (wetttable powders and soluble powders), separation of components (emulsifiable concentrates) or failure to appear milky when mixed with water (emulsifiable concentrates and oils). If you suspect a pesticide has deteriorated in storage and you are having doubts about using it, check with the manufacturer.

The 2000 Penn State guide also has list of 45 commonly used pesticides and their storage requirements on page 6. Refer to this list now, before the onset of winter, to make sure your pesticide are safely stored. If you don't have the guide, call your local extension office for a copy of this list and they will send it to you.

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

That's a Berry Good Question!!!

Q - Part 1. My neighbor used 2,4-D at renovation and his strawberry field looks pretty good. I didn't. Can I still use it on mine?

A. No, you can't. Even if it labelled for use in the fall (which it's not), using it now would be a bad idea. 2,4-D is a growth regulator, and its application during the time of flower bud formation (anytime from late August on), can cause some really strange-looking berries.

Q - Part 2. If not, could I use it next spring to get the dandelions, which are my main problem? (Anonymous.)

A. Using 2,4-D in early spring is on the label. The catch is the part of the label that says 'in early spring when plants are dormant'. On the one hand, if the strawberry plants are dormant and you live in a colder part of the state, the plants (and dandelions) are probably covered with straw. Neither would translocate much herbicide even if uncovered. However, if it's warm enough to do much for the dandelions, chances are the strawberry plants are starting to grow, and there's a risk of damage. Really, at this point, if there aren't too many dandelions out there yet, hand-pulling when the soil is wet so you can get the roots out, before they multiply, is probably the best option.

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

Producing Potatoes Using Plasticulture
Bill Lamont, Department of Horticulture

Three varieties of potatoes Eva, Kueka Gold and Dark Red Norland were grown at the Horticulture Research Farm using three colors of plastic mulch, red, silver and black with bare ground as a check with drip irrigation. Each variety was approximately 1/3 of an acre. The land was prepared and fertilizer was broadcast at the rate of 160 lbs. of Nitrogen. The plastic mulch and drip irrigation tape was apply using a mulch layer that made a 30 inch wide bed that was 4 inches high. The drip irrigation tape was from T-Systems International and was 8 mil thick and had the openings spaced 12 inches apart and was buried in the center of the bed 3-4 inches deep. On May 18 seed pieces were planted using a waterwheel planter 12 inches apart in the row with 17-18 inches between the two rows on the mulched bed. The rows were 200 ft long. No additional fertilizer was added. Admire was applied via the drip irrigation system. July 31st the Dark Red Norlands were vine killed and dug approximately 15 days later and Kueka Gold and Eva were vine killed in the later part of August. After the plastic mulch and drip irrigation tape was retrieved the Kueka Gold was dug on Sept. 6 and the Eva was dug on Sept. 7. They were dug with a single row digger with a bagger attachment. The yields out of the field were Dark Red Norland 304 cwt, Kueka Gold 479 cwt., and Eva 392 cwt. Bare ground was 130 cwt less than the yield of the plastic mulch treatments for each of the varieties. The potatoes could have been harvested earlier than when they were harvested. At a sale price of \$10.00 a cwt that is not bad money on an acre of potatoes. We will be washing and grading out the potatoes and taking the weights of each size class for each plastic mulch treatment and bare ground. Will provide you with a more detailed report in a future issue.

Upcoming Meetings
Bill Lamont, Department of Horticulture

Local

Regional

October 6-7, 2000: Sustainable Passive Greenhouse Design and Year-round Food Production, Spring Grove, PA. Contact: Steve Moore 717-225-2489

October 13-15, 2000: Grow Biointensive Sustainable Mini-Farming Workshop, Chambersburg, PA. Contact: John Jeavons Phone: 707-459-5958

October 20-21, 2000: Organic Transplant Production in a Mechanically Controlled Greenhouse, Bivalve, MD Contact Jay Martin, 410-873-2942

January 30-Feb. 1, 2001: Mid-Atlantic Fruit and Vegetable Growers Convention, Hershey, PA. Contact: Bill Troxell (717) 694-3596.

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.