UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

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Crop conditions

The cold spring continues. So does plowing, fertilizing, planting, transplanting, and early harvests of asparagus and greens. A remarkable amount of sweet corn under plastic has not yet been cut out – a sign of the lack of spring heat waves in our weather pattern so far this spring. That could change any time. Direct-seeded corn is up and growing slowly. Cool season crops are coming along. Growers are still gambling with their early plantings of tomatoes, summer squash and zucchini and using covers for warmth or irrigation for frost protection. Cool gray weekends have not brought out the flocks of homeowners to farmstands and farmers markets that growers were prepared to serve. Lets hope for a sunny, beautiful Memorial Day weekend!

Cucurbit diseases

The 'good old days' when you could plant a pumpkin crop, do a little weed control, and come back in the fall to harvest a nice crop seem to be long gone. Diseases abound, and it seems that new and more challenging diseases keep popping up. This summer, *Vegetable Notes* will publish a series of articles on key cucurbit diseases: Phytophthora capsici, downy mildew, powdery mildew, Plectosporium, and others as needed. We hope not to be bearers of continual bad news, or alarm growers into spraying excessively, but rather to help you to be well informed so that you can moniter effectively, choose materials wisely, and end up with a healthy crop.

Brassica pests

Cool springs are said to favor cabbage root maggot flies. Cool, moist soils are attractive for laying eggs, and cool soils favor survival of the eggs and small larvae. A good hot sunny day will bring soil surface temperatures up above 110 F, which kills eggs. We've not seen much of that yet. What we have seen, in several fields we've scouted, are cabbage maggot eggs laid near the stems of plants. They are not hard to find if they are there: look at the base of the stem, at the soil surface or in soil near the stem.

Flea beetles continue to be active. New plantings should be covered carefully with row cover, or be prepared to use insecticides. Rotate far from last fall's Brassica crops if possible.

Cabbage root maggot eggs around the roots of a brassica

See the May 12 issue for thresholds and recommended management practices for both of these pests.

--R. Hazzard

Update on managing downy mildew in cucurbits

Downy mildew is a potentially devastating disease that fortunately occurs sporadically in the northeastern US, and usually appears late enough in the growing season that yield is not impacted. In 2004, however, this disease appeared in NY and elsewhere in the Northeast much earlier than usual causing extensive defoliation. By late June, growers in NC were 'going through the worst epidemic of downy mildew on cucumber that anybody can remember seeing' and the disease had already appeared in NJ. Downy mildew was first noticed on Long Island about 4 days after a rainstorm on 31 July that was the remnant of the first hurricane of the season. Some pumpkin fields were severely affected, especially where fungicides had not been applied beforehand. Subsequently downy mildew developed throughout upstate NY and MA, becoming more widespread than in the previous 25 years. Impact varied with time of disease onset and fungicides used.

Only leaves are affected. Spots are angular being delineated by leaf veins. Often several spots occur together in a coalesced group. Initially spots are pale green, then yellow

before the tissue dies. Affected tissue in pumpkin can be more orange than yellow. On the leaf underside spots appear water-soaked at first. Extensive defoliation can occur when conditions are favorable. Leaf petioles often remain green and upright after the leaf blade has died and drooped. In contrast with powdery mildew, spores of the downy mildew fungus are darker (purplish gray) and develop only on the underside of leaves. Spores are not always present and symptoms can vary greatly, thus diagnosis can be challenging. Photographs are posted at

http://vegetablemdonline.ppath.cornell.edu.

The downy mildew fungus exists as pathotypes varying in ability to infect the various cucurbit types. Some can infect all types while others are able to infect cucumber and cantaloupe but not watermelon, squash or pumpkin.

Manage downy mildew by planting resistant varieties, monitoring disease occurrence and weather forecasts, and applying broad-spectrum protective fungicides before detection and systemic narrow-spectrum fungicides when downy mildew occurs early in crop production. Some cucumber varieties and a few melons have resistance to downy mildew. Resistant cantaloupes include Allstar, an Eastern type that is also resistant to Fusarium wilt and powdery mildew. Choose planting sites with good air movement and without shading. Avoid overhead irrigation in early morning when leaves are wet from dew or late in the day when leaves will not have an opportunity to dry before dew forms. Maintain ample but not excessive nitrogen fertility.

This fungal pathogen does not survive winter in the Northeast, thus it only occurs there when conditions favor spore production, release, and movement by wind from where the disease is occurring plus favorable conditions for disease development where the spores land. These factors have been used to forecast where downy mildew will occur in the eastern USA. Forecasts are posted at a North Carolina State University web site (*www.ces.ncsu.edu/depts/pp/cucurbit/*) when the program is funded. Even when the forecasting program is not supported, as occurred in 2004, a map of the current active sources and a table describing each is maintained at this web site. Click on 'Current Forecast' on the left side of the home page, then '200X disease map' for the current year in the center of the next page. This web site also has photographs and descriptions of symptoms. Although downy mildew rarely starts developing early enough in the growing season in the Northeast to be a major disease, its destructive potential, as witnessed in 2004, warrants regularly checking this website, monitoring weather forecasts to know when storms are expected from affected areas and scouting for symptoms. Another source for information is *http://vegetablemdonline.ppath.cornell.edu/factsheets/Cucurbits_Foliar.htm.*

Broad-spectrum contact protectant fungicides (Bravo, Maneb, Dithane, copper) provide some downy mildew control. Researchers in NC regularly conducting fungicide efficacy trials for downy mildew rated chlorothalonil (4 rating) better than mancozeb and maneb (3) and also copper (1).

Systemic fungicides are recommended beginning when downy mildew is forecast to occur in the area or symptoms have just started to develop. Apply every 5-7 days depending on disease severity. Fungicide resistance is a concern with this pathogen; therefore, alternate among systemic fungicides in different chemical classes and tank-mix with protectant fungicides when the systemic is not formulated with a protectant. Fortunately several systemic fungicides are now available. **Note: More information on resistance will be available in the next issue.**

Curzate is labeled for use at 3.2 oz/A on a 10-14 day schedule for a maximum of 9 applications. It has a 12 hr REI and 3 day PHI. Since this product reportedly has good curative activity (about 3 day kickback), it is a good product to use first after downy mildew is detected. However, it has poor residual activity (only 1-2 days), thus it is critical to tank-mix it with a protectant fungicide and to follow-up with another systemic fungicide when disease pressure is high. Curzate should be used as soon as possible after rain if not applied before (2 hr rainfastness). Cost of product per application is $8.50/A.

Previcur Flex is labeled for use at 1.2 pts/A on a 10-14 day schedule for a maximum of 6 pts. PHI is 2 days. REI is 12 hours. Tank-mix with protectant fungicide. Cost of product per application is $13/A.

Gavel and phosphorus acid fungicides are effective for downy mildew as well as Phytophthora blight. Gavel contains mancozeb and zoxamide, a new active ingredient that specifically targets fungi causing these diseases. Gavel can be used on cucumber, melon, summer squash, and watermelon but not on pumpkin and winter squash because it contains mancozeb. Gavel is labeled for use at 1.5–2.0 lb/A, which will cost about $8.10–$10.80/A, every 7 to 10 days or when conditions are favorable for disease for a maximum of 8 applications. New phosphorus acid fungicides (Phostrol, ProPhyt, and Fosphite) are more effective than Aliette. They have a 12 hr REI and can be applied to all cucurbits at 2.5-5 pt/A, which will cost about $8.28-$16.56/A, on a 7-14 day interval up to 6-7 times/crop. Phosphite ion, the active ingredient for these fungicides, effects fungal pathogens directly and promotes the plant's defense system.

Fungicides with mefenoxam (Ridomil Gold Bravo, Ridomil Gold Copper) are highly effective but most at-risk for resistance. Ridomil Gold Bravo applied at 2 lb/A will cost $34/A. PHI is 5 days. REI is 48 hours.

The QoI (aka strobilurin) fungicide Cabrio, now regis-

tered in NY, is more effective than the QoI Amistar. Cost of product per application ranges from $19.13 to $25.50 for Cabrio at 12–16 oz/A and $11.64 to $29.11 for Amistar at 2-5 oz/A.

Generally, although symptoms were severe in early August when downy mildew was first observed on Long Island in 2004, growers were able to avoid excessive loss of leaves by applying these fungicides that have systemic activity for this pathogen. This was clearly demonstrated in a field where there were edge areas that the spray boom did not reach. Powdery mildew was more severe than downy mildew in early September. Although the canopy looked adequate in September, apparently in some fields there had been enough loss of foliage to downy mildew that the older portions of vines had died resulting in rotten handles on fruit.

Please Note: The specific directions on fungicide labels must be adhered to -- they supersede these recommendations, if there is a conflict. Any reference to commercial products, trade or brand names is for information only; no endorsement is intended.

--Margaret Tuttle McGrath
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DOWNY MILDEW FORCASTING INFORMATION

Growers are, understandably, quite concerned about the potential for downy mildew to move northward early in the season as it did in 2004, with potentially expensive and devastating consequences. The North American Disease Forecast Center at North Carolina State University runs a Downy Mildew forecasting site. This website is familiar to tobacco growers because it also tracks the progress of blue mold of tobacco. It will give updates twice weekly on the progress of downy mildew. Here are excerpts from reports to date (through May 19) :

From : *http://www.ces.ncsu.edu/depts/pp/cucurbit/*

"Cucurbit downy mildew has been found and reported to the NAPDFC in southwestern (Manatee and Collier Counties) and southeastern (St. Lucie and Palm Beach Counties) FL. However, the disease is assumed to be in most of southern FL counties. The disease has been found to be very aggressive in all counties…. March 15: growers and scouts report that downy mildew is prevalent on cucumber, cantaloupe, and squash around southwest FL. Last seasons resistant cucumbers have been attacked in FL and along the East Coast. It has become very aggressive and difficult to control. Palm Beach County reports harsh epidemics on cucumber with some fields leading to 100% infection, thus leading to some crops being abandoned. The disease has also been reported on melons in few locations around Manatee County…April 7th, cucumbers and melons, except watermelons are the worst hit by downy mildew. Growers continue to struggle in controlling the disease.

Current forecast: Forecast Summary: Thursday, May 19. Trajectories today through Monday do not threaten any other areas outside of central and southern FL.

This newsletter will be tracking the forecasting website and other soruces of information to keep New England growers informed of the progress and management options for this disease.

--Ruth Hazzard

PLATINUM LABEL FOR CUCURBITS: SECTION 2EE ALLOWS USE ON STRIPED CUCUMBER BEETLE

Platinum™ (active ingredient thiamethoxam; EPA Registration No. 100-939; manufactured by Syngenta Crop Protection) has a federal label for use in cucurbit vegetables. The pests listed on the federal label are aphids, flea beetles and whiteflies. Effective March 9, 2005, Syngenta announced a 2(ee) request to add a pest, cucumber beetles, using the same application methods, rates and timing currently allowed on the Section 3 Platinum Insecticide label. This is considered a recommendation on an existing federal label, rather than a new label. The use is for early season control of cucumber beetles on cucurbit vegetables.

DIRECTIONS FOR USE:

Apply Platinum insecticide at the rate of 5-8 fluid oz /Acre to control cucumber beetles on cucurbit vegetables. Apply at planting using one of the approved soil application methods listed on the federal label. Make only one application per season.

The user must refer to the federally approved Platinum label and read and follow all applicable directions for use, restrictions, and precautions. It is violation of federal law to use this product in a manner inconsistent with its labeling.

This recommendation should be in the possession of the user at the time of pesticide application. It may be available from suppliers. Also, a copy of the recommendation can be found on the Syngenta website *www.syngenta-us.com*. (Select 'labels and msds/crop protection, select 'special labels' and search for your state, Section 2ee, Platinum).

This recommendation is made as permitted by Section 2(ee) of FIFRA, as amended, and has not been submitted to or approved by the EPA. The states in which this applies are CT, DE, MA, MD, NJ, PA, VA and WV.

--Adapted from John Abbott, Syngenta Crop Protection, Greensboro, NC, 1 800 334-2884

PESTICIDE RESISTANT SWEET POTATO WHITEFLY (*Bemisia tabaci*) SEEN FOR THE FIRST TIME IN THE UNITED STATES

In March 2005 the pesticide resistant *Bemisia tabaci* biotype Q was detected for the first time in the United States on poinsettia plants from a nursery in California. This strain is known to have resistance to pyriproxyfen, buprofezin, and reduced susceptibility to the neonicotinoid insecticides imidacloprid, acetamiprid and thiamethoxam. *B.tabaci* and its biotypes can attack over 500 species of plant in 74 plant families including vegetables such as tomatoes, peppers, cucumbers, beans, eggplant, cabbage, and squash and ornamentals such as poinsettia and hibiscus. Biotypes of *B. tabaci* can act as vectors for Gemini viruses. For more information about this insect you can visit the Florida Department of Agricultural and Consumer Services pest alert website:
http://www.doacs.state.fl.us/pi/enpp/ento/b.tabaci.html

If you notice a whitefly species displaying pesticide resistance, please contact the Massachusetts Plant Pest and Noxious Weed Hotline at 617-626-1779.

-Julie Callahan, Massachusetts Department of Agricultural Resources

SWEET CORN: TRAPPING NETWORK FOR THE REGION- AND ON YOUR FARM

The University of Massachusetts Vegetable Program – and other Extension systems across the Northeast – are busy setting up sweet corn trapping networks for the season. We will again be reporting trap captures from across the state. We encourage growers to use this data network – but you can also contribute to the network, and benefit from setting up traps on your own farm.

It is time to set up traps for the first generation of European corn borer. Why trap for them on your farm? Trap data tells you when the flight begins, how heavy it is at your farm, and maybe even more important, when it ends. To determine if and when to spray the tassel, you have to get out and scout the field -- traps won't tell you that. But they will tell you if your early corn will need sprays for corn borer during silking. Especially with corn started under plastic or row cover, silking may begin while ECB flight is still high. At that stage, egg masses are deposited on leaves near the ears, and new larvae tend to move directly into the ear. You might not see this with scouting. If flight remains high during silking, controls may be needed.

So -- now is the time to get ECB traps set up! Use two **Heliothis Scentry™** traps, one baited with the lure for the Z (Iowa, I) strain and one for the E (New York, II) strain. The moths and larvae of these two strains of ECB look identical, but the male moths respond to a slightly different chemical blend wafting on the night air.

Place in weedy borders near early corn, with the base of the trap close to the top of the weed canopy. As ECB moths prefer the humid, protected areas of weedy borders, more are captured there. Place traps at least 50 feet apart to prevent cross-contamination of the pheromone plume that attracts the male moths. Hang lures in the center of the lower opening. Traps cost $48 - $65 each and lures about $2.00 each. The field life of each lure is 3-4 weeks according to the supplier; however, we usually change lures every 2 weeks. Lures should stored in the freezer until they are used. Lures from previous years that have been kept frozen will be perfectly good this year.

The following businesses provide traps and other IPM supplies:

--**Gempler's** (general supplier) P.O. Box 270, Mt. Horeb, WI 53572 (800) 382-8473

--**Great Lakes IPM** (general supplier) 10220 Church Street, NE, Vestaburg, MI 48891 (517) 268-5693

--**Trece, Inc.** (manufacturer of pheromone lures and traps) P.O. Box 6278, Salinas, CA 93912 (408) 758-0204

Every year several growers, and vegetable specialists generously offer to report their weekly capture data to the UMass Extension newsletter. If you'd like to be one of them, we would be happy to help you set up your traps and learn how to check them! This year, thanks to a grant from the EPA, we can cover some of yor costs. Call the UMass Extension Vegetable Program at 413-545-3696, or email R. Hazzard at *rhazzard@umext.umass.edu*

--Ruth Hazzard

USING SYSTEMICS FOR STRIPED CUCUMBER BEETLE CONTROL

Updates for Massachusetts Growers in 2005

All over the Northeast, striped cucumber beetle is our most serious early-season pest in vine crops. These beetles spend the winter in plant debris in field edges and with the onset of warm days and emergence of cucurbit crops move rapidly into the field. Densities can be very high especially in non-rotated fields or close to last year's cucurbit crops. Adult feeding on cotyledons and young leaves can cause stand reduction and delayed plant growth. More importantly, the striped cucumber beetle vectors *Erwinia tracheiphila*, the causal agent of bacterial wilt. This disease overwinters within the beetle and is transmitted by contact of beetle feces with the open wounds in leaf tissue caused by beetle feeding. Bacteria multiply and block the vascular system of the plant, causing vines to wilt. This disease can be effectively managed only by preventing feeding by the beetle. Vine crops vary greatly in their susceptibility to wilt.

Early season infection. Cucurbit plants at the cotyledon

and first 1-2 leaf stage are more susceptible to infection with bacterial wilt than older plants, and disease transmission is low after about the 5-leaf stage. Wilt development is strongly influenced by the dose of the pathogen that the plants receive. It may be a relatively small proportion (1-10%) of overwintering beetles that carry the Erwinia pathogen and are able to infect plants. The higher beetle density during early plant growth, the more severe the incidence of wilt. Male beetles that discover a host plant will release an aggregation pheromone that calls others to their spot. Groups of beetles feeding, wounding and defecating on a single plant are more likely to transmit disease, and to acquire the pathogen and transmit it to other plants.

Thresholds and foliar controls. Beetle numbers should be kept low, especially before the 5-leaf stage. Crop rotation -- to a field at a distance from last year's cucurbits -- reduces beetle numbers significantly and may eliminate the need for controls. Beetle numbers tend to build up when vine crops are planted in the same or nearby fields year after year. Conventional IPM systems have relied on scouting frequently (at least twice per week) and treating after beetles colonize the field. To prevent bacterial wilt, we recommend that beetles should not be allowed to exceed one beetle for every 2 plants in susceptible crops. This is a lower threshold than is needed to prevent significant foliar damage. Less wilt-susceptible crops will tolerate 1 or two beetles per plant without yield losses. Proper timing can be difficult: growers have to be ready to respond quickly in a very busy time of the season, and weather or field conditions can delay sprays.

Systemic controls. A relatively new class of insecticides, the neo-nicotinoids (also called chloronicotinyls, or nicotine mimics) provide a useful alternative to the traditional foliar insecticides such as synthetic pyrethroids or carbamates. Imidacloprid (Admire™) has been registered for use on striped cucumber beetle for several years, and thiamethoxam (Platinum™) has just received a Section 2ee recommendation for use on striped cucumber beetle (see accompanying article). This class of insecticides has several advantages. Because of the systemic activity when applied to soil or seed, these products are taken up through the roots and transported into new leaf tissue where they persist through the critical early plant stages. They can be applied in the furrow or as a surface band at planting, which simplifies control efforts especially in fields where a sizable invasion of cucumber beetles is likely. They can be applied through drip irrigation, which allows application to be timed shortly in advance of the expected arrival of the pest, and is suited to crops grown on plastic. They can be applied as a transplant drench prior to setting out in the field. Also, they are very well suited to a perimeter trap crop system – which dramatically reduces the cost per acre for pest control.

The risks include development of resistance from overuse against the same population of beetles. As with any pesticide, insects can become resistant when a product is used year after year in the same field, thus, we recommend rotating Admire or Platinum with other classes of insecticides. Another potential risk is injury to pollinators if rates are excessively high. In several years of working with growers using Admire, we have not observed injury to pollinators at the rates growers have used (1 to 1.1 oz per 1,000 feet). The foliar formulation of imidacloprid (Provado)is not labeled for cucurbits, and the foliar formulation of thiamethoxam (Actara) has a labeled for cucurbits but may not be sprayed during bloom.

Using systemics in direct seeded crops. It is important to get the insecticide into the soil to avoid photochemical breakdown; placing it in the furrow or irrigating it in can accomplish this. One of the most efficient systems for an in-furrow treatment is to attach an injector to the planter for placement at the seed level after the furrow is opened and before the seed drops. This has the advantage of one trip through the field and very precise targeting of material. Where it is applied to the soil surface, it should be watered in with irrigation (or rainfall) to move it to root depth for seedlings. For growers who plant by hand on a two-way grid for cross-cultivation, apply in a twelve-inch band at the time that fertilizer is incorporated.

Rates. Platinum rates are recommended at 5 to 8 oz per acre. See the label for a chart of recommended rates per 1000 feet of row at various row spacings. For example, at 3 foot spacing, the recommended range is 0.34 to 0.55 oz/1000 liner feet, while at 7 foot spacing, the rates range from 0.8 to 1.29 oz/1000 feet. It may be possible to use a similar approach as for Admire (see table below) in calculating rates per row feet. We have not seen research on the efficacy of high vs low rates but will be conducting such a trial at the UMass research farm this summer.

The Admire label gives a range of 16 - 24 oz per acre or 0.9 to 1.3 oz per 1000 feet of row. Studies have found a rate of 1.0 or 1.1 oz per 1,000 feet to be sufficient for controlling cucumber beetle in the critical early weeks. Given the wide range in row spacing with these crops and the fact that it is a banded application, we have suggested that growers calculate rates based on the number of row feet to be treated per acre. Below is a table of rates for various row spacings. The same rates can be used for trickle applications.

Row spacing (feet)	Row feet per acre	Row feet /1000	Rate/acre at 1.1oz/1000 ft
2	21,780	21.8	24.0
3	14,520	14.5	16.0
4	10,890	10.9	12.0
5	8,712	8.7	9.6
6	7,260	7.3	8.0
7	6,223	6.2	6.8
9	4,840	4.8	5.3

Note that, for any of these materials, use of lower than label rates could result in inadequate control.

Using imidacloprid on transplants: This method of application is, obviously, less expensive than a furrow drench. The best time to treat is about 1 day prior to planting in the field. We have seen effective results with a rate of 0.02 ml/Admire plant, although this is lower than the rates for some plant populations listed on the label. Be careful of phytoxicity at higher rates. In Pennsylvania, burning of leaf tissue in cucurbits was observed at 0.04 ml/plant.

Admire™ can also be used for Colorado potato beetle or flea beetle control on tomato, pepper and eggplant transplants. Again, be cautious not to use too high a rate, as phytoxicity can result. The suggested rate for tomato transplants is 15 ml - or 0.5 ounce - per 1000 transplants.

Accurate measuring of small amounts is very important! A plastic syringe, available from the local drug store medicine section, can help ensure that these small measurements are accurate. Apply in diluted form with enough water to achieve even application and soak the root zone. Methods of application include a Hozon, Dosatron, or a backpack sprayer followed by watering, or a watering can applied in two directions to provide even coverage.

Example. Multiply 0.02 ml per plant times the number of plants in your flat. For example, use 20 ml to treat 1000 transplants. Dilute this amount of Admire in a volume of water sufficient to soak to soil mix evenly. For example, If you use a Dosatron set at 1:200, then calculations would be as follows:

Total Water: **200** X **0.02** ml = **4** ml per plant
x **1000** plants
4000 ml (**4** liters, **1.05** gal)

--In this example, you would mix 20 ml Admire in 1.05 gal water for 1000 transplants.

To help make other conversions: You can convert ml to oz by dividing by 29.6 (there are 29.6 ml in one fluid oz).

Another way to apply Admire to transplants is through a water wheel planter. Use the same rate of Admire per plant (0.02 ml) and the rate of water per plant that fits your planter (e.g. 8 oz). Multiply by the number of plants and mix the total Admire needed with the total water needed in tank. Make sure your workers wear protective gloves and allow time for uptake (1+ days) into leaves. Note that the highest rate of uptake will be into new growth.

Drip application: A drip system can be used for Admire or Platinum applications to either direct seeded or transplanted crops. Know your system well enough to know how long it will take to inject a given amount of concentrated solution (eg one bucketful) and to soak the area between emitters. Apply early enough to allow the plant roots and leaves to take up the material before beetles arrive. The system should be primed with water first, and imidacloprid injected slowly for even distribution. Make sure to use enough water to soak the area between emitters. More emitters provide more even distribution of product.

Calculate the rate needed per 100 or 1000 ft of row. Place the total amount in bucket with enough water for 20-30 minutes injection. Charge system with water first to get the soil wet. Turn on the Venturi or other injector, to inject slowly for even distribution (20 or 30 minutes). Then flush lines with clear water and to move product out and down.

Perimeter treatments. Previous publications (see April issue) have discussed Perimeter trap cropping for cucumber beetle in detail. A number of growers are using a neo-niconitonoid insecticides in the planter in a banded application surrounding the field, with one or two rows of blue hubbard in the outer hopper of the planter. In 2004 this system provided excellent control of cucumber beetles in cucumber and butternut squash.

In potatoes with or without a preferred trap crop, perimeter treatments with a systemic can have a similar effect. Insects feeding on treated plants die rapidly without moving further into the field. In potato, a 3-row barrier treated with insecticide controlled 70% of the colonizing population of Colorado potato beetle (Ferro 1995). In a non-rotated potato field, a 30-foot wide perimeter treatment around a 10 acre field (17% of the field area treated with Admire) controlled Colorado potato beetle for the entire season (Ferro 1997). This approach has the advantage of reducing the cost significantly.

Non-target effects: Bees are very susceptible to imidacloprid and thiamethoxam and could be affected by its presence in pollen if it is still at high levels in the plants at the time of flowering. Bees intoxicated by Admire or Platinum, like beetles, show unusual behaviors such as tremors, staggering, and falling over before dying. This could happen with bees at excessively high rates of these insecticides. We have not observed it at the rates suggested in this article (eg 1.1 oz/1000 ft of Admire; we do not have field experience with Platinum).

Cautions on overuse. The down side of these materials might be that they are 'too easy'. That's not necessarily a

bad thing for growers who are always too busy! However if these are overused on a routine basis, these products may well be lost to resistance in a fairly short time. Furthermore, they are not cheap. For a truly IPM approach, combine or alternate these materials with crop rotation, perimeter trap cropping, and field scouting followed by foliar sprays with other classes of insecticides to reduce the likelihood of resistance and keep use rates low.

NEXT ISSUE: focus on organic options for striped cucumber beetle control

--Ruth Hazzard, University of Massachusetts

PERIMETER TRAP CROPPING Q&A

Q: What if I only have small plantings of mixed winter squash? Can I still use PTC?

A: Absolutely. All you really need to do is separate out the maxima species in your mixed planting and place them around the edges. If the outer one or two rows are squash from the *Cucurbita maxima* group, such as buttercup or blue hubbard, as well as the first and last couple of plants in each row, you will in effect have created a PTC border. This is an effective way to use a PTC system in a small mixed planting. For a list of winter squash and pumpkins in the Maxima group, please see the list below.

Q: Do I have to use blue hubbard squash for a trap crop?

A: While Blue Hubbard works very well as a trap crop, it is by no means the only thing that will work. We have found that most winter squash and pumpkins in the *C. maxima* group, such as buttercup squash, giant pumpkins, and Cinderella pumpkins, make excellent trap crops. You could even plant a mix of these species around your crop, so as not to have too much of any one thing. The one thing that you want to make sure of is that you don't plant a trap crop that is particularly susceptible to wilt, like Turk's Turban.

Q: What if I don't have a market for Blue Hubbard squash, or any of the other *C. maximas* you are recommending?

A: If you can't or don't want to sell your trap crop, you can simply till in the trap crop once the main crop is far enough along to be able to withstand any further beetle pressure. Generally, once the main crop is getting ready to vine, the worst of the danger is over. At that point you can just till in the trap crop and let the main crop spread into the perimeter.

Q: Can I use PTC for anything other than Butternut squash?

A: At UMass and UConn we have found that PTC systems have worked well in winter squash, pumpkins, summer squash and cucumbers. The system may also have potential in summer cantaloupe, though we haven't evaluated those crops as of yet. Zucchini is quite attractive, and should be watched closely as a main crop.

--Andy Cavanagh, UMass Extensions

Main Crop	Trap Crop	Pest
Butternut Squash	Blue Hubbard Squash, other *Curcubita maxima*	Striped Cucumber Beetle
Summer Squash	Blue Hubbard Squash, other *Curcubita maxima*	Striped Cucumber Beetle
Cucumbers	Blue Hubbard Squash, other *Curcubita maxima*	Striped Cucumber Beetle
Melons	Blue Hubbard Squash, other *Curcubita maxima*	Striped Cucumber Beetle
Pumpkins	Blue Hubbard Squash, other *Curcubita maxima*	Striped Cucumber Beetle
Peppers	Cherry Bomb Hot Peppers	Pepper Maggot
Tomato	Italian Eggplant	Colorado Potato Beetle, Flea Beetle
Eggplant	Italian Eggplant	Colorado Potato Beetle, Flea Beetle
Cabbage	Collards	Diamondback Moth
Cabbage	Komatsuna, other Brassica rapa	Flea Beetle

CUTWORMS ON SEEDLINGS

Its time to watch out for cutworm damage in direct-seeded and transplanted lettuce, corn, brassicas. peppers, tomatoes, and eggplants.

Monitoring. Scout weed borders before plantings go in. Check newly transplanted crops to look for damage: clipped stems or leaf feeding (some cutworms climb up into foliage). If you find clipped transplants, you can usually find the larva in the soil near the plant. Estimate % stand loss to determine need for a spray.

In sweet corn, Rutgers University suggests inspecting 20 plants at 5 sites (total 100 plants). Threshold is 3% (3 or more plants damaged). Damage may be more concentrated around field edges.

Life cycle and identification. There are many species of cutworms that attack vegetables including black cutworm, variegated cutworm, dingy, spotted, dark-sided, or glassy cutworm. Spotted and variegated cutworms climb and feed above-ground, and black cutworms climb when they are young (less than half an inch long). Cutworms can be difficult to identify. Variegated cutworm has some pale yellow markings on its back, while black cutworm is nearly uniform gray to black with a greasy, rough appearance.

Adults of all cutworms are moths with dark gray forewings, often with various lighter or darker markings, and lighter hindwings. They are in the same group of moths (noctuids) as the corn earworm, fall armyworm, and cabbage looper, but with very different life cycles and habits. They are capable of migrating long distances but it is very likely our own resident populations which are causing problems. Black, spotted and variegated cutworm have at least two generations per year in this region.

Black and variegated cutworms spend the winter in the

larval or the pupal stage as deep as 5 inches (12 cm) down in the soil. Spotted and dingy cutworms overwinter only as larvae. It is these larvae that are present in the soil at planting time, ready to feed on early spring transplants and seedlings. They may be of varying sizes. Young black cutworm larvae are more likely to feed on plant foliage. Older larvae feed on stems near the soil line during the night and descend into the soil during the day. They clip stems of young seedlings and are reported to feed on the wilted plant material. Larval development takes about a month (28-34 days).

Adults emerge from overwintered pupae in May or June and from pupae of spring-feeding larvae later in the season. Females lay eggs on grass leaves, weeds, or the soil surface. Attractive habitats include weedy or grassy areas, and alfalfa; corn and soybeans are among the least attractive hosts. Black cutworm moths are reported to select low spots in the field that has been waterlogged or flooded for egg laying. Eggs are also concentrated on low-lying weeds such as chickweed, curly dock, shepherd's purse, peppergrass, mustards such as yellow rocket, or plant residue from the previous year's crop. Note that the above list includes lots of winter annual weeds that grow in the fall – weeds that we often overlook.

Cultural Management. Weedy land harbors the most cutworms, as the adult moths seem to prefer dense plant cover for egg laying. Crop residues may also attract higher populations. Therefore, crops that follow weedy crops, alfalfa, or no-till crops are more likely to be damaged by cutworms. Plant early transplants into fields that had low weed pressure the previous year, especially in the fall, or where crop residue was tilled under in the fall. There seems to be little information about specific relationships between what cover crops are planting in the fall, and cutworm infestations in the following year.

Plow fields in spring and keep weed free for at least two weeks before planting to starve young larvae and reduce egg-laying. Avoid planting susceptible crops close to sod, alfalfa or fallow areas. Summer plowing disturbs eggs and larvae and raises them to the soil surface where they are more vulnerable to predation and desiccation. Fall plowing will do the same. Plan rotations to avoid planting vulnerable crops after a grassy sod, and plow sod fields in later summer or early fall. Cultivate frequently to injure and expose hiding cutworms to predators. Daily search and destroy missions -- by hand -- are a time-honored "biological" management for small plantings!

Chemical Management. Post planting treatments for corn include Asana, Baythroid, Lorsban, Ambush/Pounce or Warrior. For cole crops, Ammo, Asana, Lannate, Lorsban and Warrior are labeled on certain crops. A new material, Confirm, is labeled for cutworms on Brassicas. Check labels for restrictions. For best results apply in the evening just prior to active feeding. Consult the New England Vegetable Management Guide for more details - online at

www.nevegetable.org

Biological management. Probably the most promising biocontrol organisms are beneficial nematodes, which are available commercially and can attack soil insects such as cutworms. It is important to use the correct species. Two species of nematodes, *Steinernema carpocapsae* (Sc), or *Heterorhabditis bacteriophora* (Hb) are often used in combination because they live and attack insects in different levels of the soil. This works well for cutworms that move up and down. The nematodes are shipped to you on a sponge. You mix them with water and apply to the soil. Follow the instructions that come with them. They can reduce cutworms and last for anywhere from 8 days to several weeks, according to various research trials. The nematodes reproduce in the soil and, if the conditions are good for them, large populations of the nematodes will build up and these will hold the population of cutworms down. Good soil moisture favors survival. Repeat applications may be needed.

Other organic options. Insecticidal baits made of a concentrated solution of Bt, mixed with bran and a bit of molasses have been reported to work. The bait can be sprinkled on the ground near the crops or made into patties that are placed along the rows. Bt sprays (ie, *Bt aizawi or kurstaki* directed at plant stems and foliage) work sometimes, but not consistently, possibly because large cutworms do not ingest a big enough dose of BT to stop feeding and die before they have caused damage. Collars around each seedling work on a garden scale but are impractical for field scale crop systems.

Suppliers of parasitic nematodes:

--**ARBICO**- 800 827 2847
--**Green Spot**- 603 942 8925
--**Hydro-Gardens**-800 634 6362
--**IPM Labs**- 315 497 2063
--**Johnny's Selected Seeds**- 207 861 3900
--**North Country Organics**- 802 222 4277

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