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NEW HAMPSHIRE VEGETABLE, BERRY & TREE FRUIT NEWSLETTER

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Volume 2.3 **May, 2006**

PERIMETER TRAP CROPPING FOR VEGETABLES - THE BASICS & SOME UPDATES

What is it & how does it work? Perimeter trap cropping (PTC) is a strategy to control insects by planting a border of a more attractive 'trap' crop around the main crop that you want to protect. Insects attracted to the trap crop border are killed before they enter the main crop, usually by spraying with insecticides. Advantages of using PTC to control insects include:

- Reducing or eliminating insecticide use on the main crop
- Less spraying = lower costs, lower chance of chemical residues, fewer environmental and safety concerns
- Preserving beneficial insects
- Effective in combination with other pest control methods

PTC is most likely to work for insects that prefer some varieties or types of certain crops over others and that enter the field from the perimeter. PTC is not effective for all, but has been shown to work for the following crop/insect combinations:

Blue Hubbard squash - *striped cucumber beetle* and *squash vine borer*
Commercial growers in Connecticut successfully used sprayed Blue Hubbard trap crops to protect **summer squash** from cucumber beetle and squash vine borer. Researchers have shown the same results for main crops of **cucumber**, and Massachusetts trials on commercial farms in 2004 showed that the system also worked for main crops of **butternut squash**. In the butternut trials, growers treated trap crops either with foliar sprays of Sevin (carbaryl) or soil drenches at planting time with the systemic insecticide Admire (imidacloprid), and main crops were not treated. All growers involved in both studies felt that the PTC system saved time, reduced their pesticide use, and saved money or cost the same as their normal insect control.

Does it need to be Blue Hubbard? UMass researchers have been testing whether other varieties of squashes would work as a cucurbit trap crop. In 2004, they found that other *Cucurbita maxima* squashes (the same species as Blue Hubbard) were also preferred by cucumber beetles, and would therefore be a reasonable choice for a trap crop. This list includes giant pumpkins (Big Max, Prizewinner), white and specialty pumpkins (Valenciano, Cinderella), other hubbards (Red Kuri) and buttercup squashes (Ambercup). Avoid Turks' Turban, which is very attractive to beetles but is also very susceptible to bacterial wilt.

Cherry peppers - *pepper maggot*
Pepper maggot flies occur primarily in southern New England. They prefer to lay their eggs in cherry vs. bell peppers. Connecticut researchers showed that spraying cherry pepper borders when maggot flies were detected protected unsprayed bell pepper plots (2% infested fruit with PTC vs. 15% without).

Collards - *diamondback moth* and *imported cabbageworm*
Researchers have found that diamondback moth and imported cabbageworm prefer collards to cabbage. Borders of collards did keep diamondback moth populations below economically significant thresholds in commercial cabbage fields in Florida.

Komatsuna (*Brassica rapa*) - *flea beetle*

Flea beetles prefer non-waxy Brassica crops (like Tatsoi, Mizuna, Komatsuna, mustards and radishes) to waxy Brassica oleracea crops (like broccoli, cabbage, cauliflower, collards, kale). UMass researchers have found that flea beetles accumulate in Komatsuna border crops surrounding larger plantings of Brassica oleracea main crops. UMass Specialist Ruth Hazzard suggests planting a double-row border of Komatsuna to completely surround the main crop, with repeated sprays to control insects in the trap crop.

TIPS for using Perimeter Trap Crops:

- Use in conjunction with crop rotation to minimize pests coming from *inside* the field
- Plant the border crop so that it completely surrounds the main crop – no gaps!
- Use multiple border rows (2-3) if you suspect insect pressure may be high (near where insects overwinter).
- Make sure trap crop comes up at the same time or before the main crop.
- Monitor trap crops (2-3 times a week) for insects. If a systemic insecticide was used, scout to make sure it worked!
- Spray the perimeter as soon as insects appear.

For more information, see several fact sheets published by Massachusetts and Connecticut researchers at:

http://www.hort.uconn.edu/Ipm/veg/htms/sumsqshptc.htm
http://www.hort.uconn.edu/ipm/veg/htms/trpcrops.htm
http://www.umassvegetable.org/newsletters/archive/2005/2005-04-01.pdf

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CRITICAL SPRING TEMPERATURES FOR TREE FRUIT CROPS, by George Hamilton

For fruit growers it's a trying time when crops are in bloom and we are flirting with temperatures near or below 30 F. Those growers with wind machines or overhead irrigation, they may need to use them in the coming weeks.

As temperatures warm in the spring, bud scales in fruit trees begin to open and new leaves and flowers emerge. During this process the ability to withstand cold temperatures decreases. The cold "tenderness" of different fruit crops is related to the stage of flower development. As individual flowers are exposed to the environment and colder temperatures, their ability to withstand frost diminishes. When the fruit flowers are open, temperatures below 28°F will begin to cause injury.

Below are tables for apples, pears, peaches, and sweet cherries adapted from data collected in Washington on critical spring temperatures (degrees Fahrenheit) that will result in injury to fruit buds. Note also that peach buds are slightly hardier than apple or cherry buds. All temperatures are in degrees Fahrenheit. The tables show the temperatures at which 10% and 90% of fruit buds would be killed when exposed to the temperature for 30 minutes.

Apples (based on 'Delicious') – Critical Temps *(°F)*		
Stage of development	***10% kill***	***90% kill***
Silver tip	*15*	*1*
Green tip	*18*	*10*
Half-inch green	*23*	*15*
Tight cluster	*27*	*21*
First pink	*28*	*24*
Full pink	*28*	*25*
First bloom	*28*	*25*
Full bloom	*28*	*25*
Post Bloom	*28*	*25*

Peaches (based on 'Elberta') – Critical Temp *(°F)*		
Stage of development	***10% kill***	***90% kill***
Bud swell	*18*	*1*
Green calyx	*21*	*5*
Red calyx	*23*	*9*
First pink	*24*	*15*
First bloom	*26*	*21*
Full bloom	*27*	*24*
Post bloom	*28*	*25*

Pears (based on 'Bartlett') – Critical Temp *(°F)*		
Stage of development	***10% kill***	***90% kill***
Bud swell	*15*	*0*
Bud burst	*20*	*6*
Tight cluster	*24*	*15*
First white	*25*	*19*
Full white	*26*	*22*
First bloom	*27*	*23*
Full bloom	*28*	*24*
Post Bloom	*28*	*24*

Sweet Cherries (based on 'Bing') – Critical Temp*(°F)*		
Stage of development	***10% kill***	***90% kill***
Bud swell	*17*	*5*
Side green	*22*	*9*
Green tip	*25*	*14*
Tight cluster	*26*	*17*
Open cluster	*27*	*21*
First white	*28*	*24*
First bloom	*28*	*25*
Full bloom	*28*	*25*
Post Bloom	*28*	*25*

USING BEES FOR POLLINATION OF SMALL FRUIT CROPS

Rufus Isaacs & Zachary Huang, Michigan State University (MSU Fruit Crop Team Alert Vol. 21, No. 2, April 11, 2006)

Value of pollination. According to calculations by Calderone and Morse (2000), the value of honey bee pollination to agriculture in the United States is as high as $US 14.6 billion per year. Bee pollination of small fruit crops provides the essential cross-fertilization of plants that promotes larger, earlier berries and increased percentage of fruit set.

Use the "late" strategy for small fruit crops. In general, flowers of small fruit crops are less attractive to honeybees than other flowers due to the shape and the relatively low "reward," so a different strategy is required than you might use for apples, which need bees early. You want to have your crop starting to bloom before bringing bees in so that bees tend to forage more on your crop. If brought in too early, bees will learn to forage elsewhere and when your crops bloom, they are not attractive enough to get the bees "back" to where you want them. Blueberry flowers have about three days to be pollinated after the flowers open, but you want the bees to stay in the field, so move bees into blueberry fields after 5% bloom but before 25% percent of full bloom. The "late" strategy is especially important for cranberries, which is not very attractive to bees. Luckily, cranberry flowers will stay open for a while if not pollinated, and the petals will turn to a rosy color if not pollinated in time. In cranberries, it is better to wait until 10% bloom in order to maximize the yield. If you see too many flowers turning rosy, this means you did not have enough pollinators, so make sure to increase the number of hives next year.

Prices for pollination. Most growers will already have their pollination contracts set, but expect to pay anywhere from $40 to $70 per colony for spring fruit pollination. There is a range here because if you only need 10 hives, you might be expected to pay a higher price than the other grower who is renting 500 hives. Colonies might be also of different strengths. Try to deal with the same beekeeper year after year in your area so you know what to expect and can build a good working relationship. If the beekeeper is new in the pollination business, make sure he or she knows your requirements and make sure you sign an agreement for pollination purposes.

Hive densities. The invasion of Varroa mite has decimated the numbers of feral (unmanaged, wild) honeybee colonies that used to contribute to pollination in addition to rented colonies. The proportion of pollination caused by feral bees relative to managed colonies is unclear, but it is safe to say that we need higher densities today than when feral bees were present. **Recommended densities of managed bees are three hives per acre for cranberries**, **and one hive per acre for strawberries and raspberries**. **The average for blueberries is around two hives per acre,** but research has shown variation in their needs for bee pollination**.** This is mainly because cultivars with short open flowers and good nectar production are easier to pollinate. Because of this, varieties like Rubel require one strong hive on two acres, whereas Jersey may benefit from increasing hive densities to five per acre. In general, a good rule of thumb is that you'll need four to eight bees per plant in the warmest part of the day during bloom to achieve good pollination. Do not cut corners in respect to putting enough bees in your crops. Investing some money to have enough colonies there at the right time will provide returns in the form of improved yields.

Hive placement. If possible, place the colonies in a sheltered location with the entrances facing east. This will encourage earlier activity as the hive warms in the morning sun. Hives should be spread out around the field to maximize floral visitation, with a maximum of 300 yards between colonies.

Native pollinators. Many other helpful insects are active in your fruit crop, and with 20,000 recorded species of bees worldwide, some local native bees are probably active in Michigan's small fruit crops providing free pollination. Bumblebees and other native species can be seen looking for flowers already in and around fruit crops, and their activity generally remains high when weather conditions turn too cold or wet for honeybees. These native bees may be insufficient to provide adequate pollination for good yields, however, and cannot be relied on to stand alone as your sole pollination source. By providing the right nesting habitats and food for the bees after your crop has flowered, you can enhance the local populations of native bees around your crop. This is a long-term process and you'll need several years of experimenting before these bees can become a reliable part of your pollination planning. Ongoing research at MSU is investigating strategies for conservation of native pollinators in Michigan blueberries, and we expect this work to be relevant to many other fruit crops.

Pest management during pollination. Do not apply broad-spectrum insecticides when flower buds are open or you may kill a significant number of pollinators. Bee hives should be removed immediately after pollination if post-bloom pesticide applications are planned. By monitoring for pest problems carefully during bloom, growers can help minimize the need for pest control. If an insecticide application is necessary during bloom, the compounds that are least toxic to bees should be used, with careful observation of the pollinator-restrictions on the label. Two insecticides that can both be applied during bloom for control of moth larvae in blueberry and cranberry are the *Bacillus thuringensis* (Bt) products, and the insect growth regulator tebufenozide (Confirm ®). Good coverage is required for both, and a spreader/sticker should be used to improve effectiveness. Inform the beekeeper two to three days before application so that precautions can be taken to minimize bee exposure. Evening application is better than morning application and in general liquid form is less harmful to bees compared to the powder form. More information and a list of chemicals with their toxicity to bees is available at http://www.beelab.osu.edu/factsheets/sheets/2161.html

Pollination information available online. Although it is a little outdated (first printed in 1976), the book "Insect Pollination of Cultivated Crop Plants" covers nearly all crops (fruits and vegetables) and is the best reference available for pollination to-date. It has been out of the print for many years, but the book is available free online at: http://gears.tucson.ars.ag.gov/book/.

AND ON A RELATED NOTE…

Dr. Gary Pavlis recently published the following list of blueberry varieties according to honeybee preference in the Rutgers Blueberry Bulletin (2006 Vol. XXII, No. 3, Apr 19, 2006).

HONEY BEE HIVES Needed for Adequate Pollination of Blueberries

Very Attractive to Bees: 1 hive per 2 Acres		Moderately Attractive: 1 hive per Acre		Poorly Attractive: 2 hives per Acre	
Rancocas	June	Bluetta	Blueray	Stanley	Concord
Rubel	GN-87	Weymouth	Pemberton	Berkeley	Coville
		Darrow	Bluecrop*	1316-A	Elliott
				Jersey*	Earliblue*
*Efficiency of pollination poor, add 1/2 hive more per acre.					

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DO YOU KNOW ABOUT THE NH INTEGRATED PEST MANAGEMENT NEWSLETTER?

Dr. Alan Eaton publishes the NH IPM Newsletter, which has lots of interesting info relevant for fruit growers in NH. Each issue is available at: http://extension.unh.edu/Agric/AGPMP/IPMNews.htm. It comes out biweekly until mid-June, then switches to monthly.

To hear Alan's voice delivering the very latest fruit pest news, you can call the **FRUIT PEST HOTLINE, at (603) 862-3763.** A new message is recorded every Tuesday until September. Call anytime, the machine works 24 hours/day.

UPCOMING MEETINGS AND EVENTS

Sat May 13. **The Organic Apple,** Bible Hill Farm, Warner, NH. 10AM-4PM, taught by Michael Phillips. Topics will include pruning, pest dynamics, soil health, and variety choice for organic apple growing. $30 for NOFA members, $40 non-members. Contact: NOFA-NH (603) 224-5022. **TF, O.**

Tue Jun 6. **Small Fruit Twilight Meeting,** Sunnycrest Farm, Londonderry, NH. Topics will include blueberry, raspberry, strawberry management and pest monitoring in berries and tree fruits. Contact: Nada Haddad (603) 679-5616. **SF, TF, PAT credits.**

Tue Jun 13. **Fruit & Vegetable Twilight Meeting,** Ledgewood Farms, Moultonboro, NH. Topics will include season extension with rowcovers and tunnels, low-spray production and marketing of strawberries and mixed vegetables. Contact: Tina Savage (603) 539-3331. **SF, V, PAT credits.**

Wed Jun 14. **Tree Fruit Twilight Meeting,** Surowiec Farm, Sanbornton, NH. The NH Fruit Growers' Association is sponsoring this commercial tree fruit growers' meeting. UNHCE Specialists will discuss pest and orchard management. Contact: Amy Ouellette (603) 527-5475. **TF, PAT credits.**

Tue Jun 20. **Vegetable Twilight Meeting,** Maple Ridge Farm, Loudon, NH. Contact: Sadie Puglisi (603)225-5505. **V.**

Fri Jun 30. **High Tunnel Workshop,** UNH Woodman Horticultural Research Farm, Durham, NH. Contact: Becky Grube (603) 862-3203. **SF, V.**

Wed July 12. **Tree Fruit Twilight Meeting**, Windy Ridge Orchard, North Haverhill, NH. The NH Fruit Growers' Association is sponsoring this commercial tree fruit growers' meeting with University of Vermont. UVM and UNH Specialists will discuss pest and orchard management. Contact: Tom Buob (603) 787-6944. **TF, PAT credits.**

Thu July 20. **Fruit & Vegetable Twilight Meeting,** Perkins Farm, Plymouth, NH. Contact: Tom Buob (603) 787-6944. **V, PAT credits.**

Wed Aug 9. **Tree Fruit Twilight Meeting,** UNH Woodman Horticultural Research Farm, Durham, NH. Topics will include assessing damage for crop insurance claims and cultural practices to reduce risks of crop loss. Contact: George Hamilton (603)641-6060. **TF.**

Meeting topics: F = flower, O = certified organic, SF = small fruit, TF = tree fruit, V = vegetable, AC = all crops, H = homeowner. PAT credits = pesticide applicator recertification credits available.

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