New York Berry News

CORNELL UNIVERSITY

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CURRANT EVENTS

March 12, 2008. 6:30 – 9pm. *Introduction to Berry Growing*, Herkimer County CCE, Herkimer, NY. **For more information** contact Bernie Armata, 315-866-7920.

March 13, 2008. *Capital District Vegetable and Strawberry Meeting*, Airport Holiday Inn, Latham. **For more information**, contact Chuck Bornt, 518-272-4210.

March 25, 2008. *Berry Pest Management Workshop – Taking the Pain Out of Berry Pest Management* 8:30 am -4:15 pm, Jordan Hall Auditorium, NYS Agricultural Experiment Station, Geneva, NY. **For more information**: .Nancy Long, 315-787-2288 or npl1@cornell.edu.

March 27-28. *Northern New York High Tunnel Training*. Saranac Lake, NY. **For more information** contact Amy Ivy, 518-561-7450.

March 26, 2008. 7 – 9 PM (check on this). *Growing and Marketing a U-Pick Berry Operation*. Broome County CCE, Binghamton, NY. **For more information**, see news brief below.

April 9, 2008. 9am – 12pm, *Berry Brush-Up* Course – Sponsored by Broome, Chenango, Cortland, Tompkins and Tioga Counties, Broome County CCE, Binghamton, NY. See news brief below for details. DEC re-certification credits applied for.

April 22, 2008. *Small-Scale Small Fruit Growing: an Overview*. 6:00-8:00 pm, Cornell Cooperative Extension of Chenango County Office- 99 N. Broad St. in Norwich. Cost: $10 Call 607-334-5841 for more information.

April 24, 2008. *New Berry Grower Class* , 6:30 -9:00 pm, Warren County CCE office, 377 Schroon River Road, Warrensburg, NY. Contact Laurel Gailor for registration information - 623-3291

May 3, 2008. *Introduction to Berry Growing*, Putnam County CCE, class at Cascade Farms, Patterson, NY. **For more information** contact Diane Olsen, 845-278-6738.

While the weather outside has been frightful, spring is still on its inevitable way. Now is the time to be getting ready - berry season is just around the corner. Finish pruning blueberries and brambles, remove and destroy brush, perform sprayer repair, maintenance, and calibration, order fertilizer and needed harvest supplies, prepare for strawberry mulch removal, and finally, review last year's scouting records for weed, disease and insect pests, develop management strategies for this season, and get out that hand lens.

Ready, Set, GROW!

PEST MANAGEMENT WORK SHOP REMINDER

Growers, extension personnel, and consultants alike will benefit from the information presented in this day-long berry pest management workshop to be held in Jordan Hall at the New York State Agricultural Experiment Station, 630 West North Street, Geneva, NY.

The workshop will provide an in-depth look at berry pest management from A to Z, from reviews of best management practices for various pest groups to updates on cutting edge berry pest management research and extension work at Cornell University College of Agriculture and Life Sciences.

DEC re-certification credits will be available for categories 1A, 10, and 22 (5.75 credits). Can't make it to Geneva? Take in the conference at one of our polycom locations listed below.

Plan to join us for this informative event. There is still time to register! Contact: Nancy Long, NYS Agricultural Experiment Station, 630 West North Street, Geneva, NY 14456, npl1@cornell.edu, 315-787-2288.

BERRY PEST MANAGEMENT WORKSHOP

Taking the Pain Out of Berry Pest Management

March 25, 2008
8:30 AM to 4:15 PM

Sponsored by:

NYFVI NEW YORK FARM VIABILITY INSTITUTE, INC.

N.Y. State Berry Growers Association

Cornell University Department of Horticulture

Jordan Hall Auditorium
New York State Agricultural Experiment Station
630 West North Street
Geneva, NY 14456

MORNING SESSION

8:30 AM Registration and Announcements
9:00 AM IPM Elements for Berry Crops
9:30 AM Berry Insect Management Overview
10:00 AM TRAC Berry Software Overview
10:20 AM Break
10:30 AM Research Update, Berry Insects
11:00 AM Diagnosis, Visual Assessment and Management of Plant-Parasitic Nematodes of Small Fruit
12:00 PM Lunch

AFTERNOON SESSION

1:00 PM Berry Pesticide Application Technology
1:45 PM Sprayer Calibration Demonstration
2:00 PM Berry Disease Management Overview
2:30 PM Break
2:40 PM Research Update, Berry Diseases
3:10 PM Berry Weed Update
3:50 PM Upcoming Events for 2008 Season
4:15 PM Dismiss

POLYCOM LOCATIONS

ONEIDA COUNTY CCE
121 Second Street, Oriskany, NY 13424
More information: Jeff Miller, 315-736-3394-ext 120, jjm14@cornell.edu
Registration: Cindy Craven, 315-736-3394 ext 124, clc66@cornell.edu

CHAUTAUQUA COUNTY CCE
3542 Turner Rd Suite 1, Jamestown, NY 14701
More information: David Munsee, 716-664-9502 ext 202, dm276@cornell.edu
Registration: Emily Runge, 716-664-9502 ext 209, ear6@cornell.edu

CLINTON COUNTY CCE
6064 Route 22, Suite 5, Plattsburgh, NY 12901
More information/registration: Amy Ivy, 518-561-7450 ext 104, adi2@cornell.edu

GROWING & MARKETING a U-PICK BERRY OPERATION

Wednesday, March 26, 2008
7-9 PM

Cornell Cooperative Extension-Broome County
840 Upper Front St.
Binghamton, NY 13905

Have you tried to grow berries and can't seem to get the hang of it? Would you like to start a U-pick berry operation during the summer months but don't know much about it?

Come to a workshop on March 26th at 7pm at Cornell Cooperative Extension - Broome County.

A representative of the NYS Berry Project will be on-hand to discuss production & growing techniques for all types of berries. There will also be a discussion on marketing a u-pick berry operation.

The cost will be $10/farm for this workshop. Contact Susan at (607) 584-9966 to register or for more information.

NEW PROSPECTS FOR AN ALL-AROUND SPICE

Ann Perry, ARS News Service, Agricultural Research Service, USDA (301) 504-1628, ann.perry@ars.usda.gov

February 20, 2008. People use anise to add a hint of licorice to everything from holiday springerle cookies to robust bottles of ouzo and raki. Now Agricultural Research Service (ARS) postdoctoral scientist Nurhayat Tabanca and plant pathologist David Wedge have found that anise (*Pimpinella sp.*) is more than just another jar in the spice rack. (*Pimpinella saxifraga*. Image courtesy Nurhayat Tabanca, ARS.)

Teaming up with colleagues in Mississippi and Turkey, they isolated 22 compounds in *Pimpinella's* essential oils and found high levels of organic mixtures called phenylpropanoids. Phenylpropanoids are found in a wide variety of plants, and some are thought to have health-boosting benefits.

However, the chemical structure and biological activity of the *Pimpinella* phenylpropanoids are unique. Some phenylpropanoid compounds the team found have only been found in *Pimpinella*, and four of the compounds they isolated had never before been identified in any plant.

The compounds were evaluated for their activities against the plant fungus *Colletotrichum*, which causes anthracnose diseases worldwide. One unique compound was especially effective against strawberry anthracnose and strawberry soft rot and leaf blight. In addition, *Pimpinella isaurica* essential oils were more effective in controlling aphids than isolated *Pimpinella* phenylpropanoids.

These compounds were also tested for their activity against various major and minor microbes. A few showed some effectiveness against *Plasmodium falciparum*, the parasite that causes malaria in humans, and *Mycobacterium intracellulare*, a bacterium which can cause illness in immunocompromised patients.

Some phenylpropanoids exhibited anti-inflammatory activities. *Pimpinella* essential oils also showed estrogenic effects in a yeast model and were considered to have phytoestrogen properties.

These results suggest that *Pimpinella* essential oils may be a source of potent compounds that could be used in developing powerful new pharmaceuticals and agrochemical agents.

Tabanca and Wedge work at the ARS Natural Products Utilization Research Laboratory in Oxford, Miss. Other researchers who contributed to this research include K. Husnu Can Baser and Nese Kirimer with Anadolu University in Eskisehir, Turkey; Erdal Bedir with Ege University in Izmir, Turkey; Ikhlas Khan and Shabana Khan from the University of Mississippi; and Blair Sampson, who works at the ARS Thad Cochran Southern Horticultural Laboratory in Poplarville, Miss.

IRRIGATING RASPBERRIES: WHAT'S BEST?

Does it make a difference whether a raspberry plant receives water from the top down or from the bottom up? Irrigation methods used in producing this fragile fruit vary regionally in the Northwest, where 80 percent of the popular berries originate.

So researchers have evaluated two often used methods in terms of plants' yield and susceptibility to root rot. They watered Meeker and Coho plants from overhead sprinklers or subsurface drip. They also over- and under watered specific plants to observe those effects as well.

The scientists discovered that the amount of water received mattered more than the way it was delivered, with neither method significantly affecting yield. But the sprinkler system stimulated more fruit-bearing canes per plant and more (but smaller) berries per cane—especially on water-short plants. Drip irrigation produced larger fruit, with less water, and led to no root rot in either cultivar.

David R. Bryla, USDAARS, Horticultural Crops Research Unit, Corvallis, Oregon; phone (541) 738-4094, e-mail brylad@onid.orst.edu.

(Reprinted from: Science Update, Agricultural Research Magazine, Vol. 56 (2), February 2008)

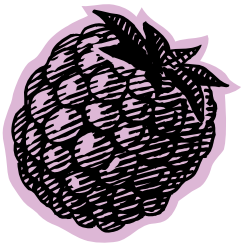
VALUE-ADDED PRODUCER GRANT PROGRAM

USDA's Rural Business-Cooperative Service is seeking applications for the Value-Added Producer's Grant (VAPG) program. Approximately $18.4 million is available through the program this year for grants to assist independent producers, agriculture producer groups, farmer and rancher-owned cooperatives, and majority controlled producer-based business ventures with the production, processing and marketing of value-added agricultural products.

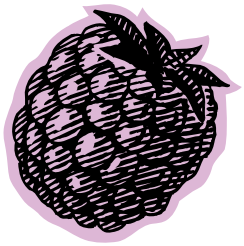
Value added products include those created through a change in physical state, through differentiated production or marketing, or physical segregation. Both working capital grants of up to $300,000 and planning grants not exceeding $100,000 are available through the program, with documentation of either cash or in-kind matching funds required.

All potential applicants are strongly urged to contact their Rural Development State Office to discuss their projects and make inquiries concerning the application process. For more information:
http://www.rurdev.usda.gov/rbs/coops/vadg.htm.

Proposals are due March 31, 2008.



Berry Brush-Up Course



Sponsored by Broome, Chenango, Cortland, Chemung, Schuyler, Tompkins, and Tioga Counties

Wednesday April 9th, 2008

9 AM to 12 PM

Location: Broome County Cooperative Extension
840 Upper Front Street
Binghamton, NY 13905

Do you grow blueberries, strawberries or raspberries but are looking for a little refresher on nutrition and weed management issues? Then come to the Berry Brush-Up Course at Cornell Cooperative Extension-Broome County on Wednesday April 9th from 9am to noon.

The presenters will be Dr. Marvin Pritts, Laura McDermott, and Cathy Heidenreich of the Cornell University Berry Team and Molly Shaw from the South Central NY Ag Program.

Topics to be covered include nutrition and weed management for all types of berries and brambles.

There will also be an opportunity to share your questions and concerns with other growers in the area.

The cost is $10 per farm and pre-registration is requested. For further information or to register, contact Susan at (607) 584-9966.

Agenda:
9:00 Small Fruit Nutrition
Marvin Pritts, Cornell

9:45 Strawberry Weed Management
Cathy Heidenreich, Cornell

10:30 Bramble and Blueberry Weed Management
Laura McDermott, Cornell

11:00 Blueberry Nutrition Survey Results
Molly Shaw, Southern Tier Ag Program, and Marvin Pritts, Cornell

"PESTICIDE ISSUES IN THE WORKS" EXPLORES EMERGING ISSUES

March 5, 2008. EPA has a new web page, Pesticide Issues in the Works. The fact sheets on this page are designed to provide information about issues that are under consideration within the pesticide program but that may be early in the development process or for which information is currently limited.

We want to let the public know we are involved in these issues and to provide what information we can. The first two issues are colony collapse disorder and pesticide volatilization. Subsequent topics will be added as they become available. The web page is available at http://www.epa.gov/pesticides/about/intheworks/.

FIRE BLIGHT OF RASPBERRIES AND BLACKBERRIES

Fire blight can affect brambles just like it affects apples and pears. The disease has been a problem in the recent past in Illinois, Wisconsin, Massachusetts, Michigan and Eastern Canada. Its recent occurrence in New York has not been well documented, and perhaps since no one has been especially attuned to the disease, its importance in NY seems minor.

We wish to determine the prevalence and importance in New York Brambles and we request the assistance of growers, Extension and IPM personnel to bring possible disease outbreaks to our attention. We would then investigate and determine if the suspected problem is fire blight.

(Fireblight of raspberry; photo courtesy A. Schilder, Michigan State University)

What to look for:
The bacterium that causes fire blight, Erwinia amylovora, affects blossoms and succulent shoot growth, just like in apple and pear. Infected tissues turns brown or black, blossoms are often killed and lesions extend down from blighted flowers and shoot tips. Occasionally drops of yellow, orange or brown ooze can be seen on infected tissues.

Please bring suspicious instances to our attention. We will contact you and either visit the site or ask you to send samples to us in Ithaca for analysis, or both. Thanks for your attention and cooperation.

Contact:
Dr. Steven V. Beer, Department of Plant Pathology, 306 Plant Science Bldg., Cornell University, Ithaca, NY 14853.
Telephone: 607-255-7870; E-mail: svb1@cornell.edu; Fax: 607-255-4471.

FARMERS' MARKET PROMOTION PROGRAM

The USDA Farmers' Market Promotion Program (FMPP) grants are targeted to help improve and expand domestic farmers' markets, roadside stands, community-supported agriculture programs and other direct producer-to-consumer market opportunities. Approximately $1 million is allocated for Fiscal Year 2008 for the FMPP, with the requirement that the maximum amount awarded for any one proposal cannot exceed $75,000. Entities eligible to apply include agricultural cooperatives, local governments, nonprofit corporations, public health corporations, economic development corporations, regional farmers' market authorities and Tribal government.

For more information: http://www.ams.usda.gov/fmpp/.

Proposals are due March 24, 2008.

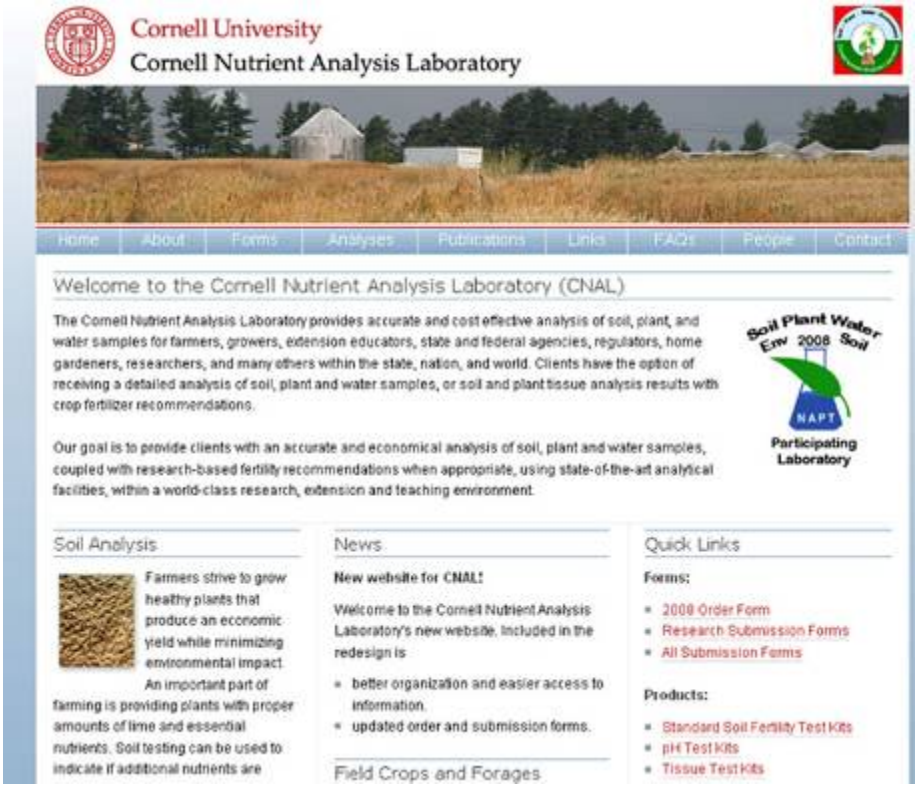
PLANT A SEED FOR YOUR FUTURE WITH THE 2007 CENSUS OF AGRICULTURE

With planting season just around the corner, U.S. farmers and ranchers still have a chance to sow a seed for their future by standing up and being counted in the 2007 Census of Agriculture.

"We've already received more than 1.7 million completed Census forms, and we sincerely appreciate the dedication and effort of the many farmers and ranchers who have responded," said Steve Ropel, director of the U.S. Department of Agriculture's National Agricultural Statistics Service (NASS) New York Field Office. "But for those whom we have not yet heard from, there is good news- there is still time to be counted. So before you jump back on that tractor, take a moment to complete and return your Census."

The Census of Agriculture, conducted every five years, is the only source of consistent and comprehensive agricultural data for every state and county in the nation. That information is used by town planners, policy makers, agribusinesses and others to make important growth-generating decisions.

CORNELL'S NUTRIENT ANALYSIS LABORATORY (CNAL) DEVELOPMENTS



According to Renuka Rao, the director of CNAL, they have developed new and more user friendly sample submission forms and e-soil test reports in collaboration with faculty and staff in the Departments of Crop and Soil Sciences, Horticulture and Horticultural Sciences (Geneva), Cornell Cooperative Extensions offices, and NYS Master-gardeners. The new soil, plant, environmental, and water sample submission forms are now available. The sample submission forms will be categorized into: **Soil** – commercial field crops, vegetables, turf, home-garden, and research; **Plant** – grape, small fruit, and tree fruits and research; **Environmental** – soil, topsoil, manure, compost, and other materials; and **Water** – irrigation, livestock drinking water, and surface and ground water.

All forms will be available for download at the new CNAL website, http://www.css.cornell.edu/soiltest . Also available will be multiple soil sample submission forms for commercial field crops, vegetables crops and turf samples. In addition, the long awaited e-soil test reports and data for Cropware upload will be available in spring 2008.

(Reprinted from: Fruit Notes Volume 8(3), February 2008.)

A DAILY DOSE OF ANTIOXIDANTS?

Erin K. Peabody, *formerly with ARS.*

We've all read about the antioxidant superstars—the blueberries, blackberries, and cherries, for instance—that are so effective at squelching the audacious free radicals that bombard our bodies' delicate cells every day.
But few studies have been aimed at investigating how well our bodies use these antioxidant-rich foods—and whether or not their soaring ORAC (oxygen radical absorbance capacity) scores really translate into practical, disease-fighting capabilities in humans.

The ORAC method, which was developed and refined by ARS scientists, measures the capacity of a food to mop up the destructive free radicals that are generated when we engage in such everyday activities as eating, breathing, and exercising. Our bodies also stir up these unstable molecules when we're battling a cold or a disease—or are exposed to pollution, cigarette smoke, or the sun's ultraviolet rays.

So, to combat such oxidative assaults, is it enough to just feast on foods that researchers tell us are high in antioxidants?
Not necessarily. According to Ronald Prior, a chemist at USDA's Arkansas Children's Nutrition Center in Little Rock, to be clear about which foods offer the best antioxidant delivery system, we need a better understanding of how our bodies absorb and metabolize the many phytochemicals found in richly colored fruits and veggies.

"These plant compounds really vary in their bioavailability and may influence our bodies' biological processes in many different ways," he says.

Kiwifruit, Bing cherries, and many other fruits are packed with healthful antioxidants. But how much of the antioxidants are absorbed once you've eaten the fruit? **(D1051-1)**

And while several studies have linked the increased consumption of fruits and vegetables to a lower incidence of cancer and other diseases, Prior says that scientists haven't really been able to pinpoint which components in foods are responsible for the beneficial effects.

Fruits' Fate in the Body

To learn more, Prior and colleagues recently investigated how various fruits—all known for their impressive antioxidant content—affected the blood antioxidant levels of volunteers. Collaborators included researchers at the USDA Human Nutrition Research Center on Aging at Tufts University in Boston, Massachusetts; the USDA Western Human Nutrition Research Center in Davis, California; and the University of Maine in Orono.

Volunteers were asked to eat varying amounts of the fruits, which included Bing cherries, dried plums, kiwifruit, red grapes, strawberries, and wild blueberries. Most of the servings were relatively large. For instance, volunteers in the cherry study popped down 45 of the small fruits; those enlisted in the kiwi study ate 4 entire fruits. Then, using the ORAC method, Prior and colleagues analyzed each volunteer's blood levels for the fruit's antioxidant capacity.

The grapes, kiwifruit, and wild blueberries were the best performers, according to Prior, whose findings were reported in the April 2007 issue of the *Journal of the American College of Nutrition*.

Wild blueberries are certainly one of the most-heralded antioxidant-rich fruits. But the study revealed that a larger serving of the berries—at least a half-cup to more than one cup—was needed to register a real spike in volunteers' blood antioxidant levels. A so-called high dose, equaling one and one-third cups of the berries, triggered the most significant leap.

Bing cherries—rich in antioxidants and one of the fruits studied for antioxidant bioavailability. **(K11182-1)**

Kiwifruit were among the best performers at increasing antioxidant levels in the blood of study volunteers who ate the fruit. **(K4952-19)**

"The predominant phytochemicals in blueberries are anthocyanins, which aren't readily absorbed or perhaps are unstable in the body and are degraded in the gastrointestinal tract before they are absorbed," says Prior. But there's still more to learn about the digestibility of this important class of compounds, he notes, since at least 27 different anthocyanins are found in wild blueberries.

Kiwifruit also drove up volunteers' blood antioxidant capacity. "But we're not really sure which compounds were responsible," says Prior. "At least part of the increase can be attributed to the high vitamin C content of kiwis. That goes for strawberries as well."

Plums, on the other hand, were a bit of a disappointment. Despite their inherently high levels of an antioxidant called "chlorogenic acid," they didn't induce an uptick in volunteers' antioxidant levels. That's because the pure form of chlorogenic acid isn't readily absorbed by the human body.

The study yielded a few surprises, including the finding that blueberries and cherries increased volunteers' lipophilic, or fat-soluble, antioxidant capacity. "We didn't expect that," says Prior, "since fruits and berries don't contain a large amount of lipophilic antioxidants."

Eating Is Stressful—Antioxidants Can Help

Making wise food choices is hard enough work. But who knew that the mere act of eating can leave our bodies' cells battered and beleaguered?

In the process of breaking down and metabolizing food, our bodies generate a lot of free radicals. "And without any antioxidants present, like those from colorful fruits and vegetables, for instance, there's nothing to counteract this detrimental effect," says Prior.

Antioxidants can almost be viewed as an antidote to the body's problematic, not-100-percent-effective, energy-processing system.
This cause-and-effect relationship between consumption of foods lacking in antioxidants and decrease in antioxidant blood levels was backed up by the study ARS conducted.

In it, volunteers who drank a shake containing carbohydrates, protein, and fat—but no antioxidants—produced blood samples with a reduced ability to counter noxious free radicals.

"We're learning that antioxidants should be consumed with every meal," says Prior. "And if you routinely skip antioxidants in your diet, over time, the excess number of free radicals being produced may begin damaging cellular components, ultimately leading to atherosclerosis, cancer, and other diseases."

Eventually, Prior would like to make preliminary projections of antioxidant needs based on a person's energy intake or calorie consumption. Of course, other factors—such as age, health, and environmental exposures to damaging oxidants—all influence an individual's bodily antioxidant status.

In the meantime, most Americans can do their bodies good by eating the recommended amount of fruits and veggies every day.

(This research is part of Human Nutrition, an ARS national program (#107) described on the World Wide Web at www.nps.ars.usda.gov. Ronald L. Prior is with the USDA-ARS Arkansas Children's Nutrition Center, 1120 Marshall St., Little Rock, AR 72202; phone (501) 364-2747, fax (501) 364-2818. Reprinted from: Agricultural Research Magazine, Vol. 56 (3.) March 2008).

INTEGRATING WEED MANAGEMENT OPTIONS IN STRAWBERRY PRODUCTION

Chris Benedict and Robin Bellinder, Department of Horticulture, Cornell University, Plant Science Bldg., Ithaca, NY 14853

Weed management for perennial strawberries is essential for long-term productivity. Particularly, management during the planting year is especially important to maximize stand establishment and minimize weed pressure in years to come. Reducing weed populations can also reduce disease and insect pressure and drastically lower hand-weeding costs. Different studies have evaluated chemical, mechanical and biological control measures separately. Whereas, commercial growers integrate these tools into a program.

A project was initiated in the spring of 2006 to evaluate the efficacy of 7 different management options. The varieties 'Jewel' and 'Earliglow' were utilized for the study and plots were monitored for weed control, crop injury, and strawberry yield. Treatments compared cultivation (in-between row), banded herbicides, and interseeding fescue grass in various combinations.

Banded herbicides, which decreased herbicide use 50%, in combination with cultivation and the broadcast herbicide combined with fescue treatments, had the greatest reduction of total weeds when compared to other treatments. BY mid-season (July), the broadcast herbicide treatment combined with fescue treatments reduced weed populations more than the broadcast without fescue. This reduced both in-row and between-row and total weeds and weed dry weights for the season. These reductions can be attributed to competition from the fescue. Fescue suppressed between-row weeds as well as between-row cultivation. Some treatments, i.e. banded herbicide + cultivation, had fewer numbers of weeds, but those that escaped tended to be larger. Subsequently, there was no difference between in-row weed dry weights.

Horticultural data suggests that cultivation tools do not have a negative impact on plant development and establishment. Fescue treatments reduced the number of established (rooted) runners by both varieties; although were only significantly lower than the hand-weeded treatment. This reduction can be attributed to the method by which the fescue was managed (weed-whacking) and could be overcome by an alternative management method.

Harvest data outlined different varietal responses to treatments. 'Earliglow' plots containing fescue, regardless of other activities, significantly reduced total yield as compared to a standard broadcast herbicide. In 'Jewel' when herbicides were broadcast in addition to fescue, yields were not significantly reduced as compared to standard broadcast treatment. Yield reductions in fescue plots can be attributed to management practices in 2006 which injured plants. In 'Earliglow' in-row and between-row cultivation resulted in overall higher yields similar to the broadcast program, whereas in 'Jewel' cultivation resulted in overall higher yields. When herbicides were banded in conjunction with cultivation, yields were equivalent to the standard broadcast herbicide.

Strawberry plots with interseeded dwarf fescue (200 lb/A) in fall 2006 prior to straw cover. Photo courtesy C. Benedict, Cornell.

(Reprinted with permission from: Proceedings of the 2008 Empire State Fruit and Vegetable Expo: Growing for the Health of NY, February 12-14, 2008, Syracuse, N,Y pg. 104.)

WANT TO SPEND LESS TIME WEEDING STRAWBERRIES? USE THE POWER OF BUCKWHEAT TO GET AHEAD OF THE WEEDS

Thomas Björkman, Dept. of Horticultural Sciences, Cornell University, Geneva, NY

You can get more out of a strawberry bed by using a cover crop well in the year before planting. A properly managed buckwheat cover crop can reduce how much weeding is required and improve tilth to keep the roots more productive. Buckwheat is well known for its ability to mellow the soil, buckwheat is also good at reducing the annual weed seed bank and weakening perennial weeds

The effective plan starts with a field that is open in the spring, uses a double crop of buckwheat followed by a winter-killed grain. That may seem like a lot of work, it can pay back many times over during the life of the strawberry bed.

The following planting schedule requires the full season to be completed.

1. Till the ground in mid-spring when soil conditions allow the ground to work up easily.
2. Plant in late May or early June. Prepare a good seedbed so the soil is loosened several inches deep and not lumpy. Drill 50 lb/ac, 1 inch deep or less. Broadcasting is possible, but to avoid gaps it must be done with great care to spread evenly using 70 lb/ac. Use shallow incorporation, such as with a drag or chain, to give the buckwheat a faster start than the weeds. Good ground cover is a must for weed suppression.
3. Mow after 45 - 50 days, after immature seed have begun to form.
4. Replant as before, or if the soil is moist and there is time, allow second crop to grow from volunteers. If the soil is dry, irrigate about 1" a few days before planting
5. Mow the second crop within a week of flowering. Plant a winter cover crop (annual ryegrass, oats) in late August or early September.
6. Till in spring and plant a new strawberry crop.

The keys to success with a buckwheat cover crop is to have it start growing quickly, have no gaps in the stand, and to kill it on time. The procedure described here favors all those things.

Preparing the ground for rapid cover crop growth is important. If the field is too hard or dry at planting, the stand will be poor. A stand like the one on the left will not be effective for reducing weeds. It should look like the one on the right.

The winter cover crop is important for maintaining the tilth that buckwheat contributes and for smothering late summer and fall weeds. Grasses do a good job, and there are two that will grow well in the fall and have mostly killed residue in the spring for easy strawberry establishment. These are oats and annual ryegrass. If you need nitrogen, there is another choice.. Medium red clover can be broadcast with the second buckwheat planting. It will grow after the buckwheat is mowed in the fall and provide both winter cover and nitrogen. If it was too dry for the clover to take, plant a conventional grain winter cover.

Perennial weeds are weakened by this buckwheat regime that combines timely cultivation with smother cropping. There is quite a bit of variation in control among the perennial weed based on the limited information we have. Quackgrass is substantially set back for a lot of users. Canada thistle is weakened but not killed. *Oxalis* (yellow woodsorrel) and field bindweed don't grow a lot in the buckwheat but come back the next year from deep roots.

Volunteer buckwheat is likely to appear in the spring. The recommended schedule keeps the volunteer seed to a minimum, but some additional control will be needed. For most strawberry growers, the buckwheat volunteers are killed at planting and with the first cultivation or herbicide application. It's not difficult to control them at this stage. In fact growers have said that they saw the seedlings but did nothing extra to control them and never had them come back. However, if the early cultivation is missed and buckwheat plants set seed in the new strawberry planting, they may keep appearing over the next year or two. Thus timely control works and does not require anything beyond normal weed control in the first season. However, if volunteer buckwheat isn't controlled then, it can become an annoyance.

More information about buckwheat as a summer cover crop is available at
http://www.nysaes.cornell.edu/hort/faculty/bjorkman/covercrops/

BLUEBERRY NUTRITION UPDATE FROM THE NEW ENGLAND CONFERENCE

Laura McDermott, Berry Extension Support Specialist, Eastern NY, Cornell University's College of Agriculture and Life Sciences, Department of Horticulture, based at Washington County CCE, Hudson Falls, NY

This December I was able to attend the New England Vegetable and Berry Conference located in Manchester, New Hampshire. This conference is held every other year and is worth attending especially if you are a fresh market grower with inclinations toward a sustainable or organic production system. It is a full 3-day conference with a nice mix of research presentations and grower talks. They also have a really nice trade show and, perhaps best of all, an active round-table discussion format that is well attended and touches on all kinds of topics that might be unwieldy in a general session.

One of the talks that I attended discussed Blueberry Nutrition. Dr. Gary Pavlis from Rutgers University spoke about basic concepts important to understanding the nutritional needs of blueberries. I had never heard him speak before, but thoroughly enjoyed his presentation. It was rapid fire, somewhat irreverent but very helpful. A few points that were made were as follows:

1. Although a soil analysis provides good baseline information, every grower should make it a point to have foliar analysis done at regular intervals. Dr. Pavlis cited studies that have proven that there is very little relationship between the results of a soil test and the results of a foliar test. The foliar test allows the grower to fine tune the nutritional program so that the plants really benefit. I know that in this world of "feeding the soil" that might not sit well with all growers, but I have to agree, just from some work I've done with small orchardists. Foliar analysis makes all the difference when you are dealing with perennial fruit crops – so look for more information about taking those tests this spring.

2. pH is IMPORTANT for blueberries. Of course you already knew this, but Dr. Pavlis made a point that growers in New Jersey are now struggling with pH levels that are too low, which is just as detrimental as high pH. I have never run into this with our soils, but it's worth considering as you order sulfur this season. pH Levels between 3.2 and 3.5 are just as bad as levels above 6.0. Low pH means that root hairs are not developing, there is very little uptake and therefore, no growth. If your soil pH levels are not between 4.5 and 4.8 then you need to check the pH <u>every</u> spring and <u>every</u> fall. He recommended a Spectrum pH Pro-Meter which he thought was the most accurate of the "quick-test" meters.

3. Consider your nutritional program timing. Fertilization is most needed in May and June – only 1/10 of Nitrogen needs are taken up in the dormant season so there is very little point to making an application before May. Two treatments in May and June provided a much better plant response than did two treatments applied April and May. Trickle fertigation, which could be divided into 6 treatments during May and June, provided even greater plant response. Improved nutrition impacts numbers of fruit more than individual fruit size, which is mostly a response to pruning, but studies have also shown that fertilizer applied through trickle irrigation improves berry firmness.

Providing optimum plant nutrition for perennial fruit crops is a challenging proposition. Reminders of basic principles might help as you look back over last season's records and begin planning for this season.

DEALING WITH DEER CONCERNS IN BERRY CROPS

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Deer may feed upon a wide variety of natural plants and agricultural crops. Although deer feeding injury may occur at any time of the year, it is usually more severe to berry crops during the late winter and early spring months. Deer may also damage plants such as strawberries early in the season after protective mulch is removed. An adult deer can consume 6 to 8 pounds of plant material each day. This may include anywhere from 0.5 to 1.5 bushels of twigs or plants. I t is no wonder a few deer can devastate a berry planting in just a few weeks.

When damage form deer feeding is light, and restricted to just a few weeks early in the growing season, repellents may be the best approach. However, remember that no repellent is 100% effective. If the damage to the plants is moderate to heavy, and deer are feeding in the field for more than a few weeks, repellents may prove inadequate protection. Excluding deer from the crop with fencing or netting may be the most effective method for preventing damage, and some fence designs are more effective than others.

Repellents

The most effective commercial repellents include putrescent egg solids as the active ingredient. However, only a few products (e.g. Deer Off) are registered for direct application to food crops. Most deer repellents are registered for applications to ornamentals or fruit trees during the dormant season. Check pesticide labels and regulations to make certain the products are registered as deer repellents for food crops. There are several deer repellents available that contain “low-risk” active ingredients, and these products are exempt from EPA registration. Most of these repellents have not been adequately tested for efficacy under a variety of field conditions.

Preventing deer browsing requires repeated repellent applications every 4 to 6 weeks while plants are susceptible. This schedule may be very difficult for growers to maintain due to cold weather and spring snow or rain. Repellents may only be effective if the area being damaged is small, damage is light to moderate, and 1 or 2 applications will do the job.

If the fruit planting is small (an acre or less), some growers have had success combining rope fencing with repellents. You can string visible white cotton rope around the planting on wooden or metal stakes about 30 inches above ground level. Tie 2-inche wide strips of cotton cloth around the rope fence every 3 to 4 ft. Spray the cloth strips with an egg-based deer repellent (e.g. Deer-Away or Big Game repellent). Deer repellents registered for ornamentals can be used because application is on cloth strips, not the fruit crop.

Some fruit growers have had success repelling deer from plantings using invisible fencing and trained dogs. This technique can be costly effective and significantly reduce browsing damage. Dogs are usually run in pairs in areas from 5 to 15 acres. However, dogs within invisible fencing systems act as “repellents”, and low levels of deer damage must still be tolerable for growers. Also, landowners must be willing to maintain daily dog care. For low growing crops such as strawberries, dogs may not be suitable because of the potential for trampling damage to the crop.

Physical Barriers

For areas where damage is heavy, or where sp[raying of repellents is difficult, physical barriers maybe a better alternative. Electric fences may not work well in all situations, especially if the fences are not maintained, or if the area to be protected is larger than 5 acres. Deer can easily jump an electric fence, and will do so if feeding pressure is high enough. Deer actually prefer to crawl under fences rather than jump over them. A solar-powered electric fence charger should provide 4,000 to 7,000 volts of current to help train the deer to avoid the area. Use only UL-approved fence chargers designed for

deer control. Although fencing is the most effective means of keeping deer from ruining your crop, the initial purchase and installation costs are high, and continued maintenance is required.

Adding aluminum tabs to an electric fence with a peanut butter attractant may insure the deer come in contact with the fence with their nose or tongue, and learn to recognize and avoid it. Applying an egg-based repellent to cloth strips tied to an electric fence provides another adverse technique, and may be more effective that the electric fence with peanut butter attractants or an electric fence alone. This is very similar to the rope design mentioned above, and deer associate the bad odor with the electric shock.

Some growers that suffer high deer pressure every year use 8-ft-high, woven wire fencing to protect blueberry plantings. These fence designs provide the ultimate in crop protection, but are also very expensive. Installing such a fence may cost $6 to$8 per linear ft. A good quality gate will also be needed. Installing two 4 x 8-ft metal livestock gates can work well.

It may be possible to cover strawberry rows with plastic netting to prevent deer feeding. Good quality netting can be rolled up after harvest season, and be reused for many years. However, applying and removing the netting can be labor intensive.

Deer Population Management

IN rural areas where hunting is feasible, growers should encourage local hunters to harvest female deer. The NYS Department of Environmental Conservation offers Deer Management Assistance Program tags to landowners for taking antlerless deer on their property, in addition to the deer management permits big game hunters may apply for in many counties. Taking female deer during the hunting season will lower the overall population and potential for future damage.

In severe situations where the grower is at risk of losing a crop, NYSDEC may issue Nuisance Deer Permits to the landowner. These tags allow the grower, or their designated agent, to take deer outside of the normal hunting season. The permit may allow shooting at night with lights, or other techniques that are not permitted during the regular hunting season for deer. Contact your regional DEC office for more information about these permits.

There is no one solution that will solve every wildlife problem. As for other crop “pests”, growers should use an integrated management approach, and use as many techniques as possible to effectively manage deer. If you wish to learn more about different deer control options, visit the web site: http://wildlifecontrol.info.

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PRUNING AND TRAINING PRIMOCANE RASPBERRIES

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Primocane raspberries, sometimes referred to as “everbearing” raspberries, is the term used to describe raspberry plants that bear fruit on their first year canes or primocanes. This occurs because the apical meristem of these primocanes changes from vegetative to reproductive during the long day conditions of the first season of growth. After this transition, fruit buds are initiated as the cane grows, so from about mid-way to the top of the cane. Thus the lower fruit is often the earliest and the largest on a primocane variety.

The vegetative buds on the lowest portion of these primocanes behave like floricanes – they differentiate into flower buds during the late fall and the following spring. These buds will flower and bear fruit during the summer season, while newly emerged primocanes will continue to bear fruit in the early fall. Thus the term “everbearing” was derived. The quality of the summer fruit of primocane varieties is poor compared to both the fall primocane crop and the summer crop of normal floricane varieties. This fact combined with the improved ease of managing the primocane plants explains why most growers sacrifice the 2nd year crop and manage the planting for a fall crop only.

The deletion of selective cane removal from a pruning protocol is great news for most berry growers. Now the job can be mechanized and the labor cost is significantly reduced. Still, there are recommendations that will help growers maximize productivity and vigor of the planting.

Old primocanes should be removed as early in the spring as possible so that carbohydrates transported from the canes to the crown in the fall have not had time to move back into the buds. In northern areas of the state, where late snowfall and persistent wet soil pose a spring pruning problem, remove these canes in December, after carbohydrates have moved from the canes to the crown. Old canes should be cut as close to the surface of the soil as possible, so that new canes emerge from crown buds below the soil. This prevents the formation of fruiting lateral canes which are weak and unproductive. Fruiting laterals can facilitate pest infestations that will shorten the productive life of the planting. It is highly advisable to remove cut canes from planting and destroy them. Old canes harbor pest problems and will reduce vigor and yield.

When growing summer bearing (floricane) raspberries it is understood that large numbers of canes will decrease the number and individual size of berries.
This is NOT the case with primocane plants. The yield of a planting is influenced by numbers of canes and the number of berries per lateral. The quality of the fruit is affected by maximizing light interception and minimizing pest problems. How to accomplish both of these goals with one planting system?

Design rows that are narrow, 12-18" is a good goal. In the warmest areas of the state, plants spaced as close as 1 foot apart may result in high first season yields. This higher establishment cost may not translate into profits for northern areas, so a within row spacing of 24" would be advisable. Space rows far enough apart that all mowing and pest management equipment will fit.

In areas with predictably long growing seasons you can pinch the primocane to stimulate lateral growth. This will delay fruiting, so it is not recommended for most of NY. Planting earlier bearing primocane varieties like Autumn Bliss, Autumn Britten, Jaclyn and Polana followed by later varieties including Heritage would help stretch out the season, maximizing profit for the planting.

Many primocane raspberry growers have not invested in trellises for their plantings. Growers still struggle with managing fall bearing plants for pre-frost harvest. New cultivars and the use of row covers in the spring and the fall will help achieve a predictable late summer – early fall harvest window. The trellis might actually provide a support if growers were using row cover for frost protection.

In floricane systems, trellises are important in increasing light availability and thus improving yields. In primocane systems, trellises have mostly been used to facilitate harvest. A simple T-shaped wooden trellis can help tremendously. The end posts are approximately 7' long with a 3-foot cross arm. The ends of the cross arms have screw eyes that holds twine (cheap and disposable). The posts are set in holes dug in the center of the rows, 25-30 feet apart. The holes should be 3 feet deep and slightly wider than the posts. A 3-foot section of PVC pipe is set into the holes immediately. Right before harvest, the trellis posts are set into the PVC lined holes. The twine is strung and pulled tight so that the canes are lifted making it easier for pickers to see fruit and do a good job picking. After harvest, trellis posts are removed and pruning can take place unencumbered.

Proper pruning and training in combination with good fertility and pest management programs will keep your primocane raspberries productive and profitable for many years.

CUTTING EDGE IPM APPROACHES FOR STRAWBERRIES

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Strawberries are hosts for many insect species, some of which can become significant pest problems under certain conditions. Managing insect pests efficiently and effectively requires an understanding of each specie's biology and behavior, so that control strategies can be used to their best advantage. Preventing infestations of insects should be a primary part of any pest management program. Removing alternate hosts of strawberry pests, including weeds in and around the planting, is a critical step in preventing both insect and disease problems. These plants act as hosts and harbors for pest species. Proper row spacing and keeping plant rows no wider than 18 inches allows good air movement through the plants to reduce diseases and plant stress, which can also encourage insect infestations. Finally, encourage natural enemies of pests in your planting, such as predatory mites, lacewings and lady beetles, by using pesticides only when absolutely necessary, and avoiding broad-spectrum compounds that are very toxic to natural enemies whenever possible.

A good integrated pest management (IPM) program depends on monitoring insect populations and/or damage in a field and using action thresholds to determine when insect control is necessary. Monitoring insect populations and/or injury is generally carried out by field scouting. This is a regular examination of plants within the field for the presence of insects or insect damage. A relatively small sample of plants or insects in a field can provide good estimates of the total number of insects or amount of damage present. In order to be accurate, a sample must be representative of an entire field. Typically, when a field is sampled or "scouted", the scout stops at 10 locations in a field following an "X" or "Z" pattern, and will examine a certain number of plants or area at each location, looking for either the presence of pests or the damage they cause.

Once pests or damage is found, the amount is compared to an action threshold to determine if any control measures are necessary. An action threshold is, simply put, the level at which the cost of the damage being caused by the pest will soon exceed the cost of controlling it. If only a few pests are present in a field, controlling them may not be justified by the cost. Using an action threshold is a more efficient way of controlling pests than other methods, such as a calendar schedule (e.g. spray every 5 to 7 days), or the plant stage growth method (e.g. pre-bloom, bloom, petal fall, etc.), because these methods do not take into account whether or not a pest is actually present.

Listed below are some of the major insect pests of strawberries in New England along with some information about their biology and, when available, monitoring and management techniques.

Tarnished Plant Bug, *Lygus lineolaris*
The tarnished plant bug (TPB) is a small (1/4") bronze-colored insect with a triangular marking on its back. The immature stages or nymphs are smaller and bright green. TPB overwinters in the adult stage. In spring these adults move in to strawberry fields to feed on growing points and lay eggs in plant stems. There are typically 2 to 3 generations of TPB per year, but the overwintering adults and first spring generation of adults and nymphs are the most threatening to June-bearing strawberries. When TPB feed during the bloom period, severe deformities of the fruit result, described as buttoning or "cat-facing". The ends of berries are seedy and fruit may be dimpled and small. Both adults and nymphs feed on plant juices with straw-like mouthparts. With day-neutral cultivars, control of TPB can be especially difficult because the insects will remain on the plants throughout the extended bloom period.

Monitoring for TPB in strawberry fields should begin just prior to bloom. Nymphs can be sampled by shaking flower clusters over a white surface (e.g. plastic or paper plate). The shaking causes nymphs to fall out of the flower cluster for counting them. At least 30 flower clusters should be sampled evenly across the field. For example, if you stop at 10 locations, the sample 3 clusters per location. If the average number of nymphs per cluster exceeds 0.25 before 10%b bloom, or more than 4 clusters are infested with nymphs (regardless of how many), then an insecticide application should be made. Monitoring this way should be carried out at least twice a week during the bloom period in a "V" or "X"-shaped sampling pattern across each field. IF TPB nymphs are not found until mid to late bloom the count threshold can be raised to 0.5 nymphs per flower cluster, and sprays can be delayed until just post-bloom.

A sequential sampling method for monitoring TPB also has been developed and can save scouting time in large fields if nymph populations are especially low or high. Using Table 1, scout as many blossoms as necessary to determine if control is required. For example, after scouting 15 blossoms, check the table to see if a decision can be made. If no nymphs have been found, no control is needed. Under the low threshold (2% injury allowed), if 3 or more nymphs have been found, a control should be applied. If you choose to use the high threshold (4% injury allowed), and tolerate more injury, then a control should not be applied until 5 or more nymphs are found. Of 1 or 2 nymphs are found, scouting should continue, i.e.

examine 5 more clusters and move down the chart to 20 clusters examined. Continue scouting until the table provides a control or no control decision for the number of infested flowers.

Table 1. Sequential sampling chart for monitoring tarnished plant bug in strawberries (N.J. Bosnian, Agriculture and Agri-Food Canada, St. Jean-sur-Richlieu, P.Q.).

	NUMBER OF FLOWERS INESTED		
	CONTROL NOT REQUIRED	CONTROL REQUIRED	
No. of clusters examined		Low threshold	High threshold
15	0	3 or more	5 or more
20	0	4 or more	5 or more
25	1 or less	4 or more	6 or more
30	2 or less	4 or more	7 or more
35	3 or less	5 or more	7 or more
40	3 or less	5 or more	8 or more
45	4 or less	6 or more	9 or more
50	5 or less	6 or more	6 or more

Strawberry Bud Weevil or "Clipper", *Anthonomus signatus*
The strawberry bud weevil or "clipper" is a small beetle (2-4 mm) with a copper-colored body and a black head with a long snout. It over winters in the adult stage, either in strawberry fields or in nearby woods or brush. The weevils become active in the spring when air temperatures start to reach about 60 ^{o}F, just as strawberry flowers begin to emerge. After locating a suitable host plant the weevils chew single, small holes in unopened flower buds. They feed on the developing pollen and lay eggs in the flower buds. After an egg is laid the weevil girdles the pedicle just below the bud. The flower bud dries up and dangles from the stem, eventually falling to the ground. The immature stage is a legless grub that develops inside the girdled bud, and later pupates in the soil. New adults emerge in early summer, feeding briefly on other pollen sources, such as brambles and potentilla, then seek out protected sites, usually in the duff under low growing plants, and go into diapause until the following spring.

Because the buds that are clipped will not develop into fruit, the potential yield losses to strawberry bud weevil have been considered quite high. Action thresholds have been developed based on potential yield loss from girdled buds. Scouting is carried out by regularly examining the plants for clipped buds as soon as the buds emerge in spring. The sample size is 2 ft of row length at 5 to 10 locations in a field. Use the larger sample size for larger fields. Count all clipped buds found within the sample areas. If the average number of clipped buds for all the 2 ft samples exceeds 1.2 (or 0.6 clipped buds per ft), a control measure is recommended.

Recent studies of clipper injury in New York have noted some fields with high levels of bud injury appeared to have little yield loss. This is thought to be the result of compensation in fruit size from the remaining buds. The compensation effect varies among cultivars; some have strong compensation ability while others appear to have little or no compensation ability. For example, 'Seneca' and 'Mohawk' had strong yield compensation, while 'Honeoye' and 'Northeaster' had very little, making the latter more susceptible to significant yield loss. This work had led to a proposed modified action threshold that allows a higher level of injury before a control is justified. This new monitoring procedure (Table 2) suggests examining flower clusters rather than just flower buds, evaluating the level of damage in relation to bud position on the cluster. A cluster is considered highly damaged if it has one clipped primary bud, or 2 clipped secondary buds, or 3 clipped tertiary buds. The action threshold for highly damaged flower clusters is 3 per meter. If scouting buds is preferred, the proposed action threshold is 3 or more clipped primary buds per meter or 30 or more clipped secondary or tertiary buds per meter.

Table 2. Proposed monitoring procedure for strawberry bud weevil. (M. Pritts, M.J. Kelly, G. English-Loeb, 1999. HortScience 34(1):109-111)

	Old Method	New Method	New Method
Unit Examined	**Flower buds**	**Flower clusters**	**Flower buds**
Assessment	Clipped buds or Not clipped	Cluster highly damaged or Cluster with low damage	Clipped buds or Not clipped
Threshold	2 clipped buds/meter	3 highly damaged cluster/meter	3 clipped 1^{o} buds/meter or 30 clipped 2^{o} or 3^{o} buds/meter

Strawberry Sap Beetle, *Stelidota geminata*
Sap beetle adults are small (2-3 mm) and dark brown. They chew small holes in ripe strawberries, similar to slug feeding, and often introduce fruit rot organisms as they feed. Although the damage may be obvious, sap beetles can be difficult to find because of their habit of dropping to the ground when disturbed. Adults emerge from protected overwintering sites in the spring to mate. Females lay eggs near fermenting and decomposing vegetation. The larvae feed on this vegetation on or near the soil surface and pupate in 2 to 3 weeks. Adults emerge from the pupae in June and July and look for suitable hosts, especially over-ripe strawberries, on which to feed.

Sanitation is an important part of managing sap beetles. These insects are highly attracted to fermenting and decaying fruit, so keeping strawberry fields free from over-ripe fruit through regular and timely harvests can prevent them from becoming a significant problem. There is some evidence that suggests early renovation of strawberry beds after harvest may reduce sap beetle populations the following year. Trapping beetles using baskets of over-ripe fruit (strawberries or pineapple chunks) placed between the edges of the field and wooded areas may reduce infestations. Insecticide sprays may be applied to control sap beetles, but because this would have to occur during the harvest period, the potential benefits must be weighed against the likely customer resistance to spraying.

Strawberry Root Weevil, *Otiorhynchus ovatus*
Black Vine Weevil, *Otiorhynchus sulcatus*
Strawberry root weevil and black vine weevil are part of a complex of weevils that attacks strawberries. The strawberry root weevil adult is brown to black, about ¼" long with an elongated snout. The black vine weevil adult is larger (1/2") and black with small yellow flecks. Both species emerge from the pupae in the soil in the late spring and early summer. They cannot fly so the must move through a field by walking or on farm equipment. The weevils feed on strawberry foliage at night and spend the day protected in the duff under plants. Adult weevil feeding is distinctive, appearing as hook-shaped notches along the leaf margins, but it is usually not significant. After about 2 weeks the weevils lay eggs in the soil at the base of the plants. Hatching begins in about 10 days. Most of the eggs hatch by early fall and the larvae feed on the plant roots, then migrate deeper into the soil to overwinter. The strawberry root weevil larvae are ¼" long crescent-shaped legless grubs. Black vine weevil larvae are quite similar, but larger (1/2"). They vary in color from creamy white to light pink.

The heaviest feeding damage occurs in the spring when the larvae feed again on the strawberry roots and tunnel into the plant crowns prior to pupating in mid-spring. Infested plants wilt, turn dull and reddish, and become stunted, often collapsing when stressed by a high fruit load or high temperatures. Damaged areas in the field can be large and often have a circular pattern. By the 2nd year of an infestation, damage can become so severe that early termination of a field becomes necessary. To prevent the spread of weevils to other fields, plow under infested fields as early as possible. Repeated disking of the field through the remainder of the season will repeatedly expose grubs to the elements and predators. Fall plowing will also help to eliminate weevils. Rotate the field into non-susceptible crops such as corn or pumpkins for at least 2 years. Plant new beds as far from infested fields and clean all farm equipment before moving from one field to another.

While economic thresholds for root weevils have not been determined, it is known that more than2 weevil larvae per plant can cause economic damage. Insecticides presently registered for root weevil are designed to control the adult stage prior to egg laying in the summer, or the larvae in late summer-early fall, but effectiveness of this strategy is limited. Soil fumigation, which requires first plowing under the bed, is an effective, albeit expensive, chemical means to control the larval stage.

Recent research suggests that applying insect parasitic nematodes to the soil can provide good control of root weevil larvae. A spring (May) application of the species *Steinernema feltiae* at a rate of 1 billion per acre and/or *Heterorhabditis bacteriophora* at a rate of ½ billion per acre are recommended for trial. Applications at the end of August may also be effective. Nematodes are the most effective when populations of root weevil are high, and when used in combination with insecticides applied for adults. Soil conditions must be moist for the nematodes to become established. Plastic barrier fences surrounding un-infested fields are also showing some promise to prevent weevils from moving in but are expensive and challenging to maintain.

HOT WATER TREATMENTS FOR CYCLAMEN MITE CONTROL

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As a follow up to the article "Cyclamen Mites in Strawberries – Are They a Problem in Your Fields?" in the December 2007 issue of the New York Berry News, I would like to share some information from a reader. Ted Mackey, a research technician with the USDA ARS berry breeding program in Corvallis, Oregon reports that he gets excellent control of cyclamen mites, *Phytonemus pallidus* (Banks), by following a protocol initially developed by the University of Florida and explained in the fact sheet found at: http://creatures.ifas.ufl.edu/orn/cyclamen_mite.htm. This protocol calls for using a hot water bath heated to 110F and submerging plants for 30 minutes. Mr. Mackey reports that he has had even better results with mite control at higher temperatures, 115F for 30 minutes and very little tissue death.

This is especially interesting in light of a portable immersion system developed by the University of Maryland with Northeast IPM funding (see http://ipmnet.umd.edu/05HWB.pdf for more complete information). This device has been targeted toward ornamental plants and their pests. Using propane gas and an instant hot water heater, the device rapidly heats a reservoir of water and maintains the specified temperature while circulating the water around plant material. Stanton Gill, the regional extension specialist says that even hard to control pests like cypress scale and soft scale have been susceptible to immersion. The goal of this project was to have the device be affordable (under $3000), portable and practical for treating large numbers of starter plants. The University of Maryland machine is based on a modified model developed by Arnold Hara of the University of Hawaii.

The combination of cyclamen mite immersion protocol from the University of Florida and the portable immersion system developed by the University of Maryland should help strawberry nurseries and growers alike control cyclamen mite in strawberry plants prior to planting.

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www.nysaes.cornell.edu/pp/extension/tfabp