New York Berry News

CORNELL UNIVERSITY

Volume 09, Number 2 February 11, 2010

What's Inside

CURRANT EVENTS

February 17, 2010. *NE IPM Berry Webcast Series #12*: **Bramble Insect Management: crown/cane borers, Japanese beetles and other miscellaneous pests**. More information: Laura McDermott, lgm4@cornell.edu, 518-746-2562, http://www.fruit.cornell.edu/Berries/webinarindex.htm.

February 24-26, 2010. *North American Raspberry & Blackberry Conference*, Monterey, California, preceded by preconference tour. More information: http://www.raspberryblackberry.com/.

February 26, 2010. *Hudson Valley Fruit Program, Processing Berry Meeting*, Holiday Inn, Kingston, NY. More information: Peggy 518-828-3346.

March 2, 2010. *Berry Production in Northern NY*, Clinton County Cooperative extension, Plattsburg, NY. More information: news brief below or Amy Ivy, adi2@cornell.edu or call 518-561-7450.

March 3, 2010. *Berry Production Short Courses*, sponsored by the Capital District Vegetable and Small Fruit Program, Voorhesville, NY. More information: news brief below or call Laura McDermott, 518-746-2562.

March 4, 2010. *3rd annual Small Farms Summit*, Ithaca, NY, and other locations by videoconference. See news brief below for details.

March 9-10, 2010. *Food Safety Training with GAPS*, Albion, NY. Details follow below or call or email Craig Kahlke at 585-735-5448, cjk37@cornell.edu for questions or more information.

March 30, 2010. *2010 Ontario Strawberry School*, Newtonville, Ontario, Canada. More information: news brief below or email info@ontarioberries.com. By phone: 613-258-4587.

June 22-26, 2011. *10th International Rubus and Ribes Symposium, Zlatibor, Serbia*. For more information contact: Prof. Dr. Mihailo Nikolic, Faculty of Agriculture, University of Belgr, Belgrade, Serbia. Phone: (381)63 801 99 23. Or contact Brankica Tanovic, Pesticide & Environment Research Inst., Belgrade, Serbia. Phone: (381) 11-31-61-773.

HEAD RESEARCHER FOR HAYGROVE TUNNELS TO VISIT CORNELL

Graham Moore, the head researcher for Haygrove Tunnels, will be visiting Cornell on February 27th, 2010. He would like to meet with any of us who have interest in this technology (growers, researchers, etc.) for discussion, questions and answers. A meeting had been set for 3:00 pm in Room 22 of the Plant Science Building. From there, we will visit the Ithaca high tunnels and see how the blackberries are doing in mid-winter. Please feel free to pass the word to anyone you know who might be interested.

If you plan to attend, please RSVP by e-mail to Marvin Pritts, mpp3@cornell.edu or by phone at 607-255-5439 so we may plan accordingly.

THIRD NYS SMALL FARMS SUMMIT: JOIN US!

Violet Stone, Cornell University Small Farms Program, 607-255-9227 or vws7@cornell.edu.

The Cornell Small Farms Program invites you to join us for the 3rd NYS Small Farms Summit on Thursday, March 4th, from 9:30am - 3pm. The Summit is an interactive meeting with an opportunity for all participants to take part in lively discussion and provide important feedback, both locally, and across the state. We will be gathering in Ithaca, NY and at 3 other locations around NYS: Voorheesville (Albany County), Canton (St Lawrence County) and East Aurora (Erie County). A video connection will allow us to communicate across sites.

Previous Small Farm Summits in 2006 and 2007 generated valuable feedback regarding opportunities and barriers affecting the success of small farms in NY. In response, the Cornell Small Farms Program launched 4 Statewide Work teams in the areas of: Local market access; Livestock processing issues; Expanded use of grasslands; and Farm energy issues.

Join us to learn about direct outcomes from these Statewide Work team efforts. Then, it will be your turn to voice your observations "from the field". Together we will focus in on the specific opportunities that might warrant increased attention from those of us in research, education and other farm services.

The Summit is free to attend and lunch will be provided. Farmer participation is especially welcome. Register early, as space is limited. For more information or to register, contact your regional cooperative extension host site:

Central NY (Ithaca): Violet Stone, vws7@cornell.edu, or 607-255-9227
Eastern NY (Albany County): Tom Gallagher, tjg3@cornell.edu, or 518-765-3500
Northern NY (St Lawrence County): Bernadette Logozar, bel7@cornell.edu, or 518-483-7403
Western NY (Erie County): Lynn Bliven, lao3@cornell.edu, or 585-268-7644

2008 ORGANIC PRODUCTION SURVEY RESULTS

The 2008 Organic Production Survey counted 827 USDA-certified or exempt organic farms in the state of New York, according to Steve Ropel, Director of USDA's National Agricultural Statistics Service, New York Field Office. Nationally, New York ranks fourth in the number of organic farms behind California, Wisconsin, and Washington. Total area devoted to organic production in New York totaled 168,428 acres. Value of sales of organically produced commodities in the state totaled $105.1 million, ranking seventh nationally and accounting for 3.3 percent of total U.S. organic sales.

This survey, conducted as a follow-on to the 2007 Census of Agriculture, is USDA's first ever wide-scale survey of organic farming in the United States. NASS collected data from operators of farms that were either USDA-certified organic, were making the transition to organic production, or were exempt from certification because of sales totaling less than $5,000.

Complete results of the 2008 Organic Production Survey are available online at www.agcensus.usda.gov/Publications/2007/Online_Highlights/Organics. Tables are available in PDF, Text, and CSV files. For further information or assistance, please call the New York office at 800-821- 1276 or send an e-mail to: nass-ny@nass.usda.gov.

FARM FOOD SAFETY TRAINING WITH GAPs

Register Now for Orleans County Dates!

Craig Kahlke, Robert Hadad, and Betsy Bihn

Two day training - March 9 & 10

Orleans CCE, Trolley Building, 12690 NYS Rte. 31, Albion, NY 14411

Registration 8:30 AM, Programs Start at 9:00, end at 3:30 PM, Lunch & Refreshments Served

This material is based upon work supported by USDA/NIFA under Award Number

The Cornell Vegetable Team, the National GAPs Program at Cornell, and the Lake Ontario Fruit Program with the cooperation of New York State Department of Agriculture and Markets will be presenting workshops on farm food safety training for Good Agricultural Practices (GAPs) certification. The workshops are for farmers who are being required by buyers to provide third party verification of their food safety practices and for farmers thinking about moving in this direction. The workshops are being partially funded by a grant from the USDA Northeast Risk Management Education Center.

This is **3-day training** - the first 2 days at the extension offices, the third in late winter/early spring on a participant's farm (mock audit).

March 9:	**March 10:**
● Understanding GAPs – "Why are we here?" ● A review of produce safety rules and market implications ● GAPs training - manure management, pest control, transportation/traceability, and sanitation in both the field and packinghouse. ● Introduction of the tools needed to develop a successful food safety plan. ● An overview on the USDA GAPs audit program.	Focus on each writing your own, unique farm food safety plan, required for certification. You will need to bring a laptop on day 2, and you may bring another person from your farm (on either or both) days who may be more computer-savVy or who usually handles record-keeping on the farm. If you do not have a laptop, please indicate as such on registration form, a loner will be provided

Pre-registration is required, the deadline is Wednesday, March 3rd. The registration fee of $95 for the two days is to cover lunch, breaks, materials, and other costs of the programs. If you are bringing another person from your farm on either or both days, please add $15 to cover the cost of lunch and refreshments. A private consultation at your farm costs $100/hour, so this is a huge value.

REGISTRATION FORM

Name (s) _____

Business Name_____

Address_____

Phone_____ Fax_____Email_____

Check here **if you are bringing** a laptop computer (needed for Day 2, Mar 10 only) _____

Check here **if you need a laptop** _____ there are loaners available. A portable USB flash drive will be provided loaded with all the necessary forms and information to continue to complete the food safety plan started at the training.

Send registration form and check payable to: Cornell Cooperative Extension, Attn: Kim Hazel, 12690 NYS Route 31, Albion, NY 14411. **Space is limited, so mail your forms and payment in today.**

Call or email Craig Kahlke at 585-735-5448, cjk37@cornell.edu for questions or for more information.

STRAWBERRY & BLUEBERRY PRODUCTION SHORT COURSES

Wednesday, March 3, 2010
8:30 am – 3:30 pm
CCE Albany County, 24 Martin Road, Voorheesville, NY
Bring your pesticide ID card to receive DEC credits

On Wednesday, March 3rd the Cornell Cooperative Extension Capital District Vegetable and Small Fruit program is sponsoring two Berry Production Short Courses at the William Rice Jr. Extension Center, CCE Albany County, 24 Martin Road, Voorheesville, NY 12186.

Registration for the Strawberry Production Short Course will begin at 8:30am with instruction going from 9am to noon. Topics covered will include establishment considerations; disease, weed and insect management; best management approaches to strawberry nutritional needs and variety review with special attention to plasticulture production. Speakers include Dr. Marvin Pritts, Dr. Courtney Weber and Cathy Heidenreich from Cornell University and Laura McDermott from the CCE Capital District Vegetable and Small Fruit program.

Registration for the Blueberry Production Short Course will begin at 12:30 pm with instruction going from 1pm to 4pm. Topics covered will include site selection and fertility considerations; variety review; overcoming pollination challenges; management of weed and disease problems and a review of blueberry pruning techniques. Speakers include Sonia Schloemann from the University of Massachusetts in addition to above mentioned experts.

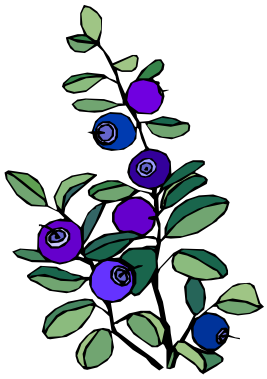
Application for DEC Pesticide recertification credits has been made. Pre-registration for this class will be $15/person for each short course. If you pre-register for both classes your cost will be $25 for the day. Registration at the door is $20 per person for each short course. Lunch is not included, but for those interested, a cold lunch can be pre-ordered, or bring your own bag lunch.

For more information, please contact Laura McDermott, 518-746-2562 or lgm4@cornell.edu.

BERRY PRODUCTION IN NORTHERN NY

Tuesday, March 2, 2010
12:30 – 4:00 pm
Clinton County Cornell Cooperative Extension
6064 Route 22 Suite 5
Plattsburgh, NY 12901

Join state berry support specialist Cathy Heidenreich and regional berry specialist Laura McDermott in person to discuss the production of strawberries, blueberries, and raspberries in northern NY. Topics covered include site selection, pest and disease management, weeds and pruning.



Dr. Marvin Pritts, Cornell CALS Horticulture Department Chair and State Berry Specialist will join us by polycom to discuss the nutritional needs of these 3 crops.

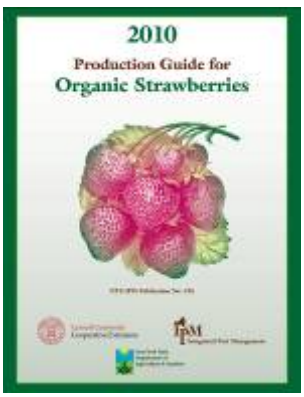
Pesticide recertification credits have been applied for.

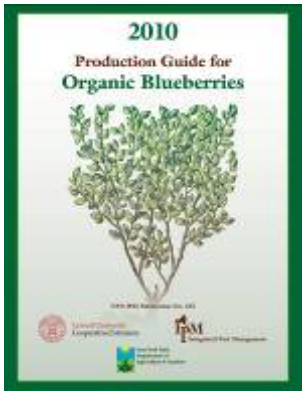
The cost is $15 per person and registration is due by February 26th. For more information or to register contact Amy Ivy, adi2@cornell.edu or call 518-561-7450.

ORGANIC BERRY PRODUCTION GUIDES NOW AVAILABLE

The New York State IPM Program announces publication of two new organic berry guides: 2010 Production Guide for Organic Strawberries, and 2010 Production Guide for Organic Blueberries.

Guide topics in the guides include soil health, site selection, cover crops, variety selection, nutrient management and organic IPM. The guides were written and edited by Juliet Carroll, Marvin Pritts, and Cathy Heidenreich with contributions from Kerik Cox, Greg Loeb, Andrew Landers, Paul Curtis, Michael Helms, Courtney Weber, Laura McDermott, Elizabeth Thomas and Teddy Bucien, and funded in part by the New York State Department of Agriculture and Markets. The free publications are available as a pdf file for reading, printing or downloading.





There are now a dozen organic production guides for fruit and vegetable crops available from the NYS IPM program. You can find them at: nysipm.cornell.edu/organic_guide.

NEW YORK BERRY PRODUCTION DECREASES – BERRY CROP VALUE INCREASES

Strawberry production in New York was down 2 percent from 2008 to 4.40 million pounds, according to Stephen Ropel, Director of USDA's National Agricultural Statistics Service, New York Field Office. The value of utilized production is estimated at $9.02 million, up 21 percent from the $7.43 million in 2008. New York State ranks ninth in strawberry production. Nationally, the strawberry crop for 2009 was placed at 2.80 billion pounds, up 11 percent from 2008.

Production of blueberries for the Empire State was at 2.40 million pounds, down 4 percent from 2008. The 2009 crop is valued at $4.56 million, an 11 percent increase from $4.11 million last year. The U.S. estimate for blueberries is 364 million pounds, up 4 percent from 2008.

Total raspberry production in New York was 1.50 million pounds in 2009, down 17 percent from 2008. The raspberry crop is valued at $4.05 million, a 3 percent increase from last year.

New York's berry crop had a combined total value of $17.6 million. This value is up 14 percent from the $15.5 million in 2008.

Blueberries	Acres of Bearing Age	Production (1,00 lbs) Total	Utilized	Unit Price (dollars)	Value of utilized production (1,000 dollars)
2007	900	2,500	2,300	1.47	3,373
2008	900	2,500	2,300	1.79	4,107
2009	900	2,400	2,100	2.17	4,558

Strawberries	Acres of Bearing Age	Production (1,000 cwt.) Total	Utilized	Unit Price (dollars)	Value of utilized production (1,000 dollars)
2007	1,400	46	46	165	7,590
2008	1,400	45	45	165	7,425
2009	1,400	44	44	205	9,020

IN ORGANIC COVER CROPS, MORE SEEDS MEANS FEWER WEEDS

Ann Perry, ARS News Service, Agricultural Research Service, USDA, (301) 504-1628

January 25, 2010. Farmers cultivating organic produce often use winter cover crops to add soil organic matter, improve nutrient cycling and suppress weeds. Now these producers can optimize cover crop use by refining seeding strategies, thanks to work by an Agricultural Research Service (ARS) scientist.

Horticulturist Eric Brennan records data on weed seedling growth between rows of a young cover crop at USDA's 17-acre certified organic research plot in Salinas, California. Photo by Scott Bauer.

In moderate climates, suppressing weeds in winter cover crops is important because weeds that grow throughout the year produce seed that can increase weeding costs in subsequent vegetable crops. ARS horticulturist Eric Brennan, at the U.S. Agricultural Research Station in Salinas, Calif., conducted studies comparing winter cover crop planting protocols in organic systems along California's central coast.

Brennan looked at how seeding rates and planting patterns affected cover crop performance. He planted rye using three seeding rates: 80 pounds per acre, 160 pounds per acre and 240 pounds per acre. The seeds were either planted in a grid pattern that required driving a grain drill across fields twice, or in traditional rows. All seeding was carried out in October.

Brennan found that planting rye at higher seeding rates consistently improved early-to midseason rye biomass production and weed suppression. But he saw no consistent crop improvement from grid planting.

Brennan also studied seeding rates and planting patterns using a cover crop of legumes and oats. The seeds were planted at densities of 100, 200, and 300 pounds per acre and planted both in grids and traditional rows.

Results were similar to the rye cover crop results. As seeding rates increased, weed biomass production decreased from around 267 pounds per acre to less than 89 pounds per acre. In addition, planting patterns had no effect on cover crop yield or weed suppression.

Brennan's findings suggest that increased seeding rates could provide organic producers with a cost-effective weed control strategy. However, planting in a grid pattern would probably not consistently boost the benefits of cover crops--and since it would require two passes through the field, grid planting would likely double dust production, fuel use, planting time and labor.

The research was published in the Agronomy Journal. ARS is the principal intramural scientific research agency of the U.S. Department of Agriculture.

News from the NYS Berry Growers Association

Have You Talked With Your Legislator Today?

Dale Ila Riggs, Chair, The Berry Patch, Stephentown NY

We all know that the state of NY is in deep trouble when it comes to its financial affairs. We know that NYS needs to reduce its' spending. And we probably all agree that NYS needs to reduce its' spending in the right areas and not cripple the very industries that are expanding or have the potential to expand. But right now, that's exactly what is going to happen. The Farm Viability Institute that has provided funding to create the statewide Berry Extension Program has been zeroed out in the Governor's budget. It's the program that enables Cornell to hire Cathy to produce this outstanding newsletter, conduct workshops throughout the state, answer trouble-shooting calls, help plan the educational program at the NYS Fruit and Vegetable Expo, and do all sorts of other things that I'm not even aware of.

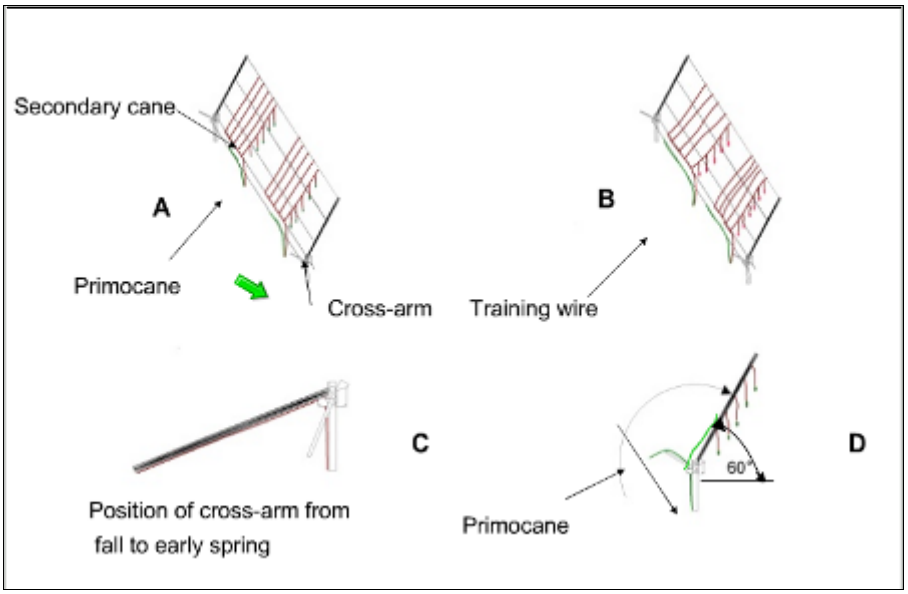
The Berry Industry in NYS has tremendous potential. The expanding interest in locally grown, the increasing knowledge about the positive health effects of eating berries, and a product that people just plain like because it tastes good, are all factors that the industry has in its' favor. But everyone needs education to learn about new information that they can implement on their farm to be more efficient and profitable. So we need the Berry Extension Program to continue which means that funding for the Farm Viability Institute

needs to continue. That means you need to contact your legislator TODAY and tell them that. And you also need to tell them how the proposed Farm Labor Bill would impact your business. How will you adapt to paying time and a half to your employees? The agriculture industry has some very tough hurdles to jump this year. It's going to require a group effort to scale them. If you want our industry to make it into the future in a healthy condition, please do your part today.

BLACKBERRIES IN COLD CLIMATES

Molly Shaw, South Central Fruit and Vegetable Program, Tioga County Cooperative Extension, 56 Main Street, Owego, NY

Cornell has been hosting a series of berry webinars this past fall and winter. They've gotten quite an impressive line-up of speakers, folks who know a lot about their particular subject. The information for this article was from the January 6 Webinar, presentation by Fumiomi Takeda, with the USDA-ARS in West Virginia. To listen to the archived webinars (free!) go to the Cornell Berry webpage, http://www.fruit.cornell.edu/berry.html, and check out archived webinars at the right.



Blackberries, those hot summer delicacies, don't fruit consistently in NY. Like summer bearing raspberries, they produce flowers and fruit on one-year-old canes. This means that the canes that grow in summer 2009, with their delicate flower buds formed in the fall, must be exposed to our harsh winters before they flower and fruit in 2010. Triple Crown and Apache, two erect (upright-growing) cultivars) don't need winter protection in zone 6B. But the southern tier of NY is zone 5A-5B, which means we see average winter minimum temperatures of -15 to -20°F. -10°F kills half the flower buds on these varieties. Trailing blackberries, developed in the pacific northwest, have winter damage at +12°F ("Siskiyou" is one example). No wonder we have trouble getting blackberries to fruit consistently in NY! You'll find wild blackberries that fruit in protected locations near field edges and spots with more snow cover, but we also tend to not notice as much when wild blackberries fail to fruit in a given year. It's a different matter when you've planted canes and are expected a yield to pay the bills!

Side note from Courtney Weber, Cornell berry breeder
In general, most summer bearing blackberries will suffer cold damage in most of NY. Illini (Illini Hardy) is the hardiest and does fruit here most years. It is very thorny and fruit quality is average. Chester and Triple Crown are the hardiest thornless varieties but have fruited here only 1 time in 5 years due to cold damage.

Prime Jim and Prime Jan are two newer primocane-fruiting blackberry varieties. These plants behave like fall-bearing raspberries—they send up shoots in the spring, make flowers on these, and fruit in the fall. The nice thing about them is that canes don't have to make it through the winter above ground before fruiting, but the bad thing is that since they fruit in late September/October, so the frost ends the season before most of the fruit is ripe.

For the last several years, Dr. Takeda has been working out a trellising system for blackberries that allows them to be laid on the ground and covered with row cover for the winter. This added winter protection has allowed blackberries to make it through the winter without damage.

The trellis system consists of an upright post sticking 2 feet out of the ground attached with a moveable joint to a 5 foot long bar ("cross arm"). Trellis wires are run between the moveable cross arms like what is used to trellis wine grapes (see illustration).

Blackberries are planted 5-6 feet apart within the row and trained to the trellis. The first 3-4 primocanes to grow out of the crown are bent horizontally at 24" high to follow the lowest trellis wire, right where the joint is that starts the moveable cross arm. All later-emerging primocanes are cut off. The young canes are flexible enough to make the 90°bend, though when canes get older they loose this flexibility. The primocanes now run horizontally along the trellis, and send out long laterals which grow vertically up the trellis, which is tilted a bit north from the vertical. In the fall these laterals are tied to the trellis wires, and the whole 5 foot cross arm is rotated down to the ground with the vines sandwiched underneath. A heavy row cover is fastened over the row which is now only 2 feet high off the ground and left on for the winter. In spring, the cross arm is rotated back up to the original position, the buds wake up, flower, and fruit. A bonus is that the fruit all ends up on the down-side of the slanted trellis wires, increasing harvest efficiency by 30%.

The Cadillac version of winter protection for blackberries is to grow them in a high tunnel. The unheated tunnel provides enough winter protection that they bear a full crop the next year, basking in the heat of the tunnel. Blackberries are different than raspberries in that they relish hot weather—they're adapted to the southern states after all. Even though the unheated tunnel can see winter temperatures as cold as the open air around the tunnel, the protection from wind and desiccation is enough to keep the buds alive. For full directions on how to do this, see Cornell's High Tunnel Bramble production guide, linked off the Cornell Berry website.

MANAGING ROOT FEEDING INSECTS OF STRAWBERRIES

Richard S. Cowles, Scientist, Valley Laboratory, Connecticut Agricultural Experiment Station, Windsor, CT 06095-0248

Several species of insects feed on the roots of strawberry plants. Among these are three principal groups: root weevils, white grubs, and the strawberry rootworm. White grubs are larvae of scarab beetles (Japanese beetle, oriental beetle, European chafer, and Asiatic garden beetle); along with strawberry rootworm, these larvae have six legs. White grubs are relatively easily managed with an application of imidacloprid (Admire) at the time of renovation, and immediately incorporated with irrigation. Root weevil larvae are distinctive in being legless. Four species of root weevils can be found in damaging numbers: black vine weevil (BVW), strawberry root weevil, rough strawberry root weevil, and the leaf weevil. The leaf weevil adults are a beautiful metallic green, are sexually reproducing, and are capable of flight. The first 3 species mentioned are very closely related to each other (all are *Otiorhynchus* spp.) and have similar life cycles. They consist entirely of females, which after feeding extensively for about a month, lay eggs in the soil. The eggs hatch into larvae, which feed exclusively on the roots of plants and complete 5 molts before pupating. Late instar larvae and pupae overwinter, then transform into adults about the time that strawberries are ripening. Black vine weevil (1/2 inch long) is about twice the size of the other species and consequently can cause much more damage on a per-grub basis. Because root weevils are much more difficult to manage in strawberries than white grubs, their management is emphasized here.

Monitoring methods

To assess whether you have root weevil problems, take a sample of 100 leaves from across each field. The best time to do this is immediately following harvest, when weevils have had the longest time to feed on the leaves, but before mowing the leaves for renovation. Count the number of leaves with characteristic notches along their edges of the leaves. If more than 50% of the leaves are notched, then you probably should consider spray(s) to control the weevils. In our surveys of strawberry fields in Connecticut, only 1 field out of 48 did not have any evidence of root weevil activity, but only 12 had sufficient populations to be concerned about economic losses from weevil activity. Leaves with holes may signify activity of Asiatic garden beetle (one of the white grub species).

Another sampling method is to walk through the field at night with a flashlight mid-way through harvest. You can then directly observe which species of weevils are present (presence of notched leaves doesn't tell you *which* species is feeding), and whether Asiatic garden beetles are abundant. The presence of only the smaller weevil species indicates that a spray of bifenthrin may be needed, as these are more difficult to kill with nematodes. An alternative to nighttime observation is to trap weevils in a pitfall trap. Use a thin film of motor oil to coat the top inch of the inside surface of a plastic 18 fluid ounce drinking cup. Set this cup into the soil near injured strawberry plants, so that the top of the cup is flush with the soil surface. Weevils can't fly, so when they stumble into the pitfall trap they cannot climb back out. Predatory ground beetles are also caught, so you can also monitor how active these beneficial predators are in your field.

Check parts of strawberry fields that change color in the fall earlier than the rest of the field – this is an indication of poor root function. Of course, any disorder that causes loss of root function, such as root rot, lesion nematodes, or feeding by white grub or strawberry rootworm will also cause plants to turn red. Dig up the plants to observe whether larvae have

been feeding on the roots and check to see what species are present. Finding larvae with legs signifies that an insecticide (Admire) application to target white grubs is justified during the next year.

Control strategies

Foliar sprays to kill adults. Adult weevils must feed extensively at night for about four weeks before being able to lay eggs. This period for BVW coincides with the time that there are strawberry fruits present in the field. Evidence of their feeding can be found as irregular notches along the edges of leaves. This distinguishes root weevil foliar feeding from most other insect pests, which usually chew holes through the leaves. Root weevils have become very difficult to kill with insecticides, probably due to the evolution of insecticide resistance. Furthermore, these foliar sprays can have unintended effects on beneficial insects and mites, making management of root weevils and spider mites more difficult after spraying.

The most effective adulticide currently appears to be bifenthrin, a pyrethroid. Applying bifenthrin virtually eliminates predatory mites; so effective mite control has to be implemented before applying bifenthrin. Be aware that weevils can recover from bifenthrin poisoning if they land in a protected location. Adult weevils may appear to be "dead" for 5-6 days, but may only be knocked out.

A management program entirely dependent on foliar sprays to control adult root weevils is risky. If the weevils are insecticide-resistant, or if they recover following poisoning, then they can still reproduce. If the sprays also eliminate their predators from the field, the root weevils can then reproduce to even larger numbers. Bifenthrin appears especially effective against the smaller root weevils (strawberry root weevil and rough strawberry root weevil). Growers in some locations have continued to suffer losses from black vine weevil even after applying bifenthrin against adults.

Biological control to suppress larval populations. Biological control of root weevil larvae with insect pathogenic nematodes (EPNs) can be an effective component in an integrated management program where soils are relatively sandy. Heavy clay soils will interfere with insect pathogenic nematodes. Of the several species tested, *Steinernema carpocapsae*, *S. feltiae*, *Heterorhabditis bacteriophora*, *H. marelatus*, and *H. megidis* all have the ability to keep root weevil populations low. The species *Steinernema kraussei*, marketed as Nemasys L, is said to be active against black vine weevil larvae under colder soil temperatures. Most nematodes require minimal soil temperatures of 55 F to find and infect hosts (and for their bacteria to reproduce), while *S. kraussei* is claimed to infect larvae at 40 F. The normal use rates for nematodes are 3 billion per acre for Steinernematids and 1 billion per acre for Heterorhabditids. If you have the ability to band the nematodes directly over the row, you can immediately realize a savings of about 50% of the cost of the application, because you'll reduce the area treated to only the planted rows. Expect to pay ~$250 per acre for nematodes, but don't expect immediate results. From my experiments, nematodes have worked very well when applied in early May. This has allowed nematodes to have one infection cycle in the spring, leading to sufficient populations of beneficial nematodes in the soil to virtually eliminate the next (fall) generation of black vine weevil larvae. It is unknown whether EPN applications are economically justified where root weevil numbers are already low. They may only work well in causing additional cycles of infection where there is a critically high population density of larvae available to infect.

To use insect pathogenic nematodes, find a commercial source through the web site http://www.oardc.ohio-state.edu/nematodes/biologyecology.htm. Much lower application rates may also be effective because nematodes continue to propagate in repeated infection cycles. When you apply nematodes, be sure to take fine screens out of your sprayer, and do not use a sprayer with a piston pump. Irrigate the field before and after nematode application, and avoid application in sunny conditions (the nematodes are very sensitive to UV light). Nematodes can effectively be applied in early May or in late August. Nematodes work especially well against black vine weevil, particularly when there are high populations of larvae. Control is poorer for the smaller root weevil species.

Cultural control

Importance of healthy roots. Researchers elsewhere have determined that strawberry plants can support approximately 2 larvae per plant without showing any signs of injury. How many larvae a plant can support is determined by the health of the root system. When strawberry plants are growing vigorously and have extensive root systems, root weevil feeding amounts to insignificant grazing. However, when the root systems are poor, perhaps due to root rot or feeding by other insects, then any feeding by black vine weevil can cause the plant to collapse. This is especially true when root weevil larvae are starving for roots, whereupon they resort to feeding on the strawberry crowns, which destroys plant vigor. Planting cultivars tolerant to black root rot and black vine weevil should help to reduce problems associated with these pests.

Exclusion barriers. Fields eventually need to be plowed under and hopefully rotated to an intervening crop before being replanted to strawberries. I have observed that weevils displaced from plowed fields will readily walk through to infest an entire adjacent planting of strawberries, and can cause large outbreaks of weevils. This is especially damaging when the nearby planting is a newly planted strawberry field. One way to avoid this problem is to leave some rows of strawberries completely surrounding the perimeter of a field being plowed under. Weevil adults then are left with a place to feed and lay their eggs, and these last rows can be tilled in September after all the egg laying has ended. I feel that this trap row

concept could prevent many of the disasters I have observed in relatively young strawberry plantings. These trap rows could be used in conjunction with an exclusion barrier, which should be more effective than either method used by itself. Inexpensive plastic film can be used as an exclusion barrier (http://www.fruit.cornell.edu/Berries/strawpdf/strawberryrootweevilexclusion.pdf); spray the top with horticultural oil to further reduce the number of weevils able to cross the barrier.

Summary

Strawberry growers can manage white grubs with imidacloprid. This insecticide should be expected to provide other benefits through reduction of plant stress (through a plant growth regulator effect), and reduced populations of tarnished plant bug, spittle bugs, and whiteflies. However, it is only partially effective against Asiatic garden beetle and is ineffective against root weevils. Root weevils can be managed by preventing infestations of new plantings with exclusion barriers, planting tolerant varieties, using a foliar spray of bifenthrin at the end of harvest, and/or applications of insect pathogenic nematodes: none of these approaches are effective for managing white grubs. Therefore, different tools need to be used to manage these two groups of root-feeding grubs.

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SITE CONSIDERATIONS FOR STRAWBERRIES AND RASPBERRIES

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Choosing a site for a perennial fruit planting can be daunting. The investment is significant both in time and money. There are many factors to consider, so time should be taken to be thorough. Growers should consider developing a 5 year rotational plan that would accommodate adding long-term crops periodically.

Perhaps the most important site consideration for strawberries and raspberries in the northeast is your market. Most berries in NYS are sold for the retail fresh market, and many of those berries are actually picked by the customer. U-pick operations pose unique challenges to growers because of the need to handle crowds of people and their vehicles in a safe, efficient manner. Because both strawberries and raspberries are extremely perishable, berry fields should be located as close as possible to a cooler.

Second in priority would be the quantity and quality of water available for irrigation, frost protection and even cooling. All berry crops have very shallow root systems leaving them particularly vulnerable during drought. Yield will be dramatically reduced if irrigation is not available. Weed control can also be impacted by lack of water as many preemergent herbicide need to be watered in to be effective.
From a disease prevention standpoint good soil drainage is the most important site consideration. Berry crops will not thrive in a site that has standing water at any point during the year. Raspberries and strawberries are particularly susceptible to a number of soil-borne diseases that are exacerbated by wet soils – these include Phytophthora, verticillium and anthracnose among others. If a prospective site that fits all other parameters is selected, remediation of inadequate drainage is a prerequisite to success. Subsoil drainage or raised beds would be appropriate actions.

The northeast climate offers plenty of chilling to fill the requirement of berry crops. Like fruit trees, berry crops need to receive the appropriate chilling in order to break dormancy: for strawberries it is between 200-300 hours and raspberries need from 800 to 1700 hours.

Our cool climate does pose constraints for winter hardiness. In the Adirondack region of NYS, growers are challenged by a short growing season which makes it more difficult to ripen fall bearing raspberries. Summer raspberries may suffer winter damage in exposed and windy areas throughout the state, and strawberries need to be mulched to prevent desiccation and cold damage. Still, the biggest problem for spring berry crops is erratic temperature swings in the spring. Frost protection is a huge labor effort for strawberry growers so care should be taken to avoid frost pockets when choosing a site for the planting. Moderate slope is sometimes helpful to allow sold air to move away from the planting.

Other site considerations that will be covered in the talk include the site cropping history, the weed status of the field, and the soil properties. Developing a crop rotation with annual vegetable crops and cover crops will also be discussed.

The Northeast Regional Agricultural Engineering Service publishes a series of production guides for strawberries (NRAES-88) and brambles (NRAES-35) that contain detailed information on marketing and site location.
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BREEDING STRAWBERRIES FOR TOLERANCE TO ROOT PESTS

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The profitability of strawberry plantings is largely determined by the number of years that a planting is fruitful, which in turn depends on maintaining a robust root system. A complex of root diseases and root-feeding insects are responsible for reduced yield and planting longevity. Black root rot is a complicated disease, in which a soil-dwelling fungus, commonly found growing on the outside of healthy strawberry roots, invades the root subsequent to aging of the root, damage from drought, water logging, and especially injury by lesion nematodes. Black root rot is not promoted by use of terbacil (Sinbar) herbicide. Rather, the association found in surveys that black root rot is found where more terbacil is applied is evidence that weed management becomes more difficult when strawberries are weakened by root diseases. Insects feed on strawberry roots and crowns, including white grubs and black vine weevils. Black vine weevils are the largest and most important of several species of root weevils. They reproduce parthenogenically (only females are known); when the adults emerge in May they have to feed on leaves for about a month before they can start laying eggs in the soil. Pesticides are often inadequate for managing black root rot and black vine.

New cultivars that are tolerant of both root weevils and black root rot would have great likelihood for rapid adoption by growers: they would cost as much as other commercial cultivars but could be more productive. Developing new cultivars first requires finding suitable plant material with traits that can be combined and improved upon. Starting in 1999, we (RSC and Dr. James LaMondia, Plant Pathologist at CAES) independently assessed 21 commercially available strawberry cultivars to determine their susceptibility and tolerance to these pests. Strawberry plants grown in artificial potting media and with healthy root systems had no differences between cultivars in the qualities of their roots for black vine weevil larval development. Every variety was able to support large numbers of larvae before showing any signs of injury. Therefore, differences in susceptibility observed in the field must be due to differences in the numbers of eggs laid around plants, and in the size of their root systems when subjected to root diseases. Therefore, for black vine weevil, tolerance is mediated by the palatability of foliage to adult weevils, and indirectly to the plant's susceptibility to root diseases. Cultivars with unpalatable foliage do not support the development of eggs by the adult weevils. Feeding preference is easily measured in the laboratory: a weevil is placed overnight in a Petri dish with leaf disks cut from a test hybrid and a standard cultivar (‘Delmarvel’). If there is less feeding on the test hybrid, based on 10 replicate comparisons, then that hybrid is deemed to be non-preferred.

Tolerance of strawberry cultivars to black root rot was tested in a field naturally infested with the black root rot pathogens. The gradual decline of plants over four years paralleled the development of disease we observe in commercial strawberry fields. Strawberry cultivars differed in root weight, shoot weight, and fruit yield. Plant shoot weights ranged from an average weight of over 200 g per plant over 3 years for ‘Earliglow’, ‘Latestar’ and ‘Northeaster’ to only 29.2 g for ‘Tristar’. Root weights ranged from over 30 g per plant for ‘Primetime’, ‘Latestar’, ‘Idea’ and ‘Earliglow’ to under 10 g per plant for ‘Tristar’ and ‘Marmolada’. Strawberry fruit yields ranged from over 800 g per plant (‘Earliglow’ and ‘Latestar’) to just over 100 g per plant for ‘Marmolada’ and ‘Tristar’. The yield of some cultivars increased by as much as 35% over time (‘Latestar’), while yields decreased for 14 of the 21 cultivars (by as much as 86% for ‘Marmolada’).

The overall assessment of commercial cultivars for their susceptibility to black vine weevils and black root rot is given in Table 1. Varietal differences in the tolerance of strawberries to black root rot are independent of the plant’s tolerance to black vine weevils (see Table 1). Therefore, the best strategy for long-term production of strawberries will be to plant varieties that have a combination of black root rot and black vine weevil tolerance. Plants with poor tolerance to both root weevils and root rot can be expected to collapse quickly when challenged with both pests, but may perform well if grown in the absence of these pests (e.g., 'Marmolada'). From field experience, plants with especially good tolerance to both pests and good vigor include the cultivars 'Allstar' and 'Annapolis'.

Since 2001, I have been hybridizing the cultivars with existing tolerance characteristics to further improve upon these traits. In 2001, parents used in the crosses were ‘Delmarvel,’ ‘Idea,’ ‘Allstar,’ and ‘Lester,’ cultivars previously identified as being non-preferred by black vine weevils. Additional data on the root rot tolerance of ‘Primetime’ and ‘Annapolis’ in 2003 led to additional crosses with these two cultivars. Out of the 1,346 hybrid progeny produced in 2001, approximately 100 were identified with exceptional traits combining good fruit size and flavor, poorly accepted foliage for black vine weevil adults, and tolerance to foliar diseases. Out of these, only one, an 'Idea' × 'Primetime' hybrid, has stood up to longer-term tests of vigor and fruit quality; it is currently undergoing propagation and will possibly be patented with the name 'Rubicon,' recognizing its brilliant vermillion fruit color and where it was developed. It has uniform medium-large primary fruit with an excellent balance of sweetness, tartness, and aromatic quality. At this point, 'Rubicon' plants are being propagated for field testing by cooperating growers to determine their horticultural acceptability under commercial conditions. Grower field trials with 'Rubicon' will commence in 2010.

Additional hybridization in 2005 focused on root rot tolerance. These seedlings were rapidly screened by inoculating them with a mixture of anastomosis groups of black root rot fungi and visually examining the roots 100 days later. A small proportion of seedlings were obviously resistant to Rhizoctonia. Later field evaluation of these crosses was disappointing though, suggesting that characteristics observed in juvenile plants may not be representative of traits observed later as plants mature. Ultimately, the best test for resistance to black root rot appears to be long-term growth performance in soils containing high levels of disease inoculum.

Protecting strawberry plants from root diseases will promote healthier roots, which in turn will mean a higher economic threshold for root weevils, and consequently increase the chances for successful biological control of root weevils.

Table 1. Strawberry varietal preference by black vine weevils and black root rot susceptibility.

Variety	Black Vine Weevil susceptibility[a]	Black Root Rot susceptibility[b]
Allstar	1	
Annapolis	1	1
Cavendish	1	2
Delmarvel	1	4
Earliglow	2	
Honeoye	2	2
Idea	1	2
Jewel	1	3
Kent	2	3
Latestar	3	1
Lester	1	1
Marmolada	3	4
Mesabi	2	
Mira	2	4
Northeaster	2	
Primetime	1	1
Redchief	2	
Seneca	1	4
Sparkle	2	
Tristar	3	4
Winona	2	

[a]*Black vine weevil ratings: 1, low preference; 2, moderate preference; 3, highly preferred by black vine weevil for foliar feeding.*
[b]*Black root rot ratings (Courtesy of Dr. James LaMondia): 1, high yield and low black root rot; 2, high yield and moderate BRR; 3, good yield and high black root rot; 4, poor yield and high BRR.*
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UNDERSTANDING THE ROLE OF ROOT DISEASES IN STRAWBERRY AND RASPBERRY DECLINE

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Root diseases are particularly devastating and frustrating to manage in small fruit production operations. This is especially the case for established operations because the most effective management practices must be implemented prior to planting. The pathogens causing root diseases are all soil-borne and remain protected within the soil. In addition, the most diagnostic symptoms are also below ground, which prevents one from recognizing the problem during time when action could be taken to save the planting.

In NY, the most common root diseases and disorders affect both raspberry and strawberry. Indentifying the characteristics of these problems will help one understand their role in seasonal plant decline. These root diseases and disorders include:

Winter Injury (raspberry & strawberry): Decline from winter injury occurs when plants aren't well insulated against freezing during winter or when young tissue isn't protected against frost in the spring. Plants stressed by disease or abiotic factors prior to dormancy will be more susceptible to winter injury. Winter injury can result in reduced in vigor and productivity, or kill plants outright. Winter injury to the roots can be diagnosed by cutting longitudinally through the crown of dying (not dead) plants. Initially, the cortex of roots and crown tissue will appear brown while the vascular tissue remains white and healthy. By contrast, most root diseases will preferentially affect the vascular tissue, and decay in the

cortex occurs by secondary pathogens. In raspberries, winter injured plants will send up new canes that remain healthy through the season, while root disease will cause decline of canes throughout the season.

Phytophthora root rots (raspberry & strawberry-red stele): Phytophthora is an aquatic pathogen that prefers cool weather and free moisture (e.g. wet spots in the field). During Phytophthora infections, fine/lateral roots will decay first leaving only large primary roots, resulting in a rattail appearance. When the roots and crown are sectioned longitudinally, the vascular tissues will be reddish brown. As infection progresses and the plant dies, secondary decay fungi will rot the cortex of roots and the crown. Following plant death, infective propagules remain in dead plant tissue and the soil. These are capable of causing infections in later seasons after replanting. In both strawberries and raspberries there are resistant varieties to Phytophthora root rot.

Verticillium wilt (raspberry & strawberry): Verticillium wilt has the most distinctive symptoms of the root diseases presented here, and is easiest to diagnose. In strawberries, plants wilt and decline more slowly than other root diseases. The outer and older leaves wilt first, while the younger leaves remain small and stunted in the center. One will often find bluish streak-shaped lesions on the runners and petioles. In raspberry, the youngest canes will wilt first beginning from the base to the tip. On such canes, the petioles will remain attached with the oldest leaves at the base looking scorched and youngest leaves at the tip looking stunted, but often still green. Similar to strawberries, infected raspberry canes will also have bluish streak-shaped lesions within infected canes. In both strawberries and raspberries there are resistant varieties to Verticillium wilt.

Black root rot (strawberry): Black root rot of strawberry is a root disease caused by a complex of several pathogens. One of the pathogens, Pythium, is another aquatic organism similar to Phytophthora. Because of the similarities, the management practices for Phytophthora root rot are often effective for managing black root rot as well. Decline from black root rot usually occurs during the year of establishment, and like Phytophthora root rot, this disease primarily occurs in wet spots or in compacted soils with poor drainage. By harvest, infected plants will have decreased vigor, are stunted, and lack productivity. However, severely infected plants may be killed prior to harvest. Below the soil, the lateral/feeder roots will have decayed (similar to Phytophthora root rot), and the large primary roots will have dark lesions that expand overtime. Initially, the vascular tissue of infected roots appears white and healthy, but ultimately turns black as infection progresses. It is important not to confuse the black root rot with the natural blackening of strawberry roots that occurs with age. Older roots will have a black epidermal covering, but the cortex and vascular tissue will be firm and white instead of having dark lesions.

The Role of Root Diseases in Plant Decline During the 2009 Season

The beginning of the 2009 season was fairly dry, but the summer remained cool with considerable rainfall from late May through July. Disease pressure across all fruit commodities was extreme, and disease losses were unmanageable in many situations. There were many reports of small fruit plant decline, especially in strawberries. Unfortunately, the majority of the samples diagnosed by this program had progressed to a stage of decline where it was impossible to confirm root disease as the cause. Some samples provided clear indications of Verticillium wilt and signs of Phytophthora infected tissues, but others were simply winter injury. Although, many root diseases remained unconfirmed in 2009, the cool summer temperatures and heavy rains would have been quite conducive for Phytophthora root rot and black root rot complex of strawberry.

Preparing for Root Diseases and Decline in 2010

Given the overall high disease pressure and favorable environmental conditions for disease in 2009, there could be considerable root disease inoculum present in small fruit plantings in 2010. In plantings with severe plant decline in low-lying wet areas, a phosphorous fungicide program may be warranted to prevent additional loss to Phytophthora or black root rot. In addition to diseases, winter injury could be more severe in 2010. Plants with high levels of disease (even foliar diseases like leaf spot) at harvest may be stressed or weakened as they enter dormancy and would be more susceptible to winter injury. In order to avoid plant decline in 2010, producers would be best served by ensuring plant insulation during winter and scouting during spring and early summer for the first signs of plant decline (e.g. wilting). If recognized early, the extent of losses could be mitigated.

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STRAWBERRY TRIALS AND VARIETY REVIEWS

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Strawberries are one of the most variable and temperamental of the fruit crops and the choice of varieties is extensive because individual varieties are often adapted to a relatively small growing region. The most commonly grown varieties in north-central and northeastern North America are June-bearing types and many new varieties have been released in recent years. Most varieties have weaknesses so growers are advised to try new ones on a limited scale to determine how they will perform in each situation. As part of the small fruits breeding program at Cornell University, strawberry yield trials are planted to compare older, standard varieties with new releases. The latest trials include 10 varieties as well as 3 advanced selections from Ontario, Nova Scotia and the USDA-ARS (L'Amour, Clancy, Honeoye, Winona, Earliglow, Jewel, Mira, Mohawk, AC Wendy, Darselect, KRS10, B1033 and V151). The standard varieties Earliglow, Honeoye and Jewel performed as expected. AC Wendy shows very good potential for the early season with good yields and fruit quality. Mira had very impressive yields but relatively soft and light red to red/orange in color. Mohawk had very good early fruit size and very good flavor but the fruit is somewhat irregular making it less attractive in a container than others. Yield comparisons, fruit quality aspects and general observations on these varieties and other standard varieties will be discussed. New selections from the Cornell breeding program that are nearing release will also be discussed.

RESULTS OF A NYS BLUEBERRY IPM SURVEY

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A survey of blueberry plantings was conducted in 2007, 2008, and 2009 for canker fungi and other pest management issues. Specifically the prevalence and distribution of Phomopsis and Fusicoccum (Godronia) cankers was investigated.

Infection of canes and branches by canker fungi causes leaves to turn reddish-brown, wilt and remain attached to shoots, typically, when fruit is present and temperatures are warm. Fungal spores, produced on infected wood, are released during rain events of as little as 0.15 inches. The period of spore release for Fusicoccum is essentially all season long; for Phomopsis it spans pink bud to late August. Wounds are not required for infection, though for Phomopsis, mechanical wounding or freeze-damage favors infection.

Extension educators assisted with the surveys and received reports on the results found. During June and July, 33 farms were visited, 7 in 2007 (Tioga, Orleans, and Niagara counties) 12 in 2008 (Essex, Washington, Saratoga, Albany, Columbia, and Dutchess counties), and 14 in 2009 (Oswego, Onondaga, and Yates counties). Plantings were traversed randomly and plants examined. Suspicious canes were removed, brought back to the laboratory, and subsamples incubated in moist chambers to encourage sporulation of fungi which were identified microscopically. Samples with suspected virus infection were tested with virus-specific antisera and via indicator plants.

Phomopsis was the most prevalent canker disease in the New York blueberry plantings surveyed, especially in Eastern NY where Fusicoccum was not found. By contrast, in Western NY farms, Fusicoccum canker was more frequently found (Table 1). Typically, incidence of cankers within a planting was low (2-5% infected plants). Phomopsis canker was found in the most severely affected plantings (10-50% infected plants). When incidence in the planting exceeded 10%, several canes per plant were infected (Fig 1).

Botryosphaeria stem blight, not previously described from NY, was tentatively identified from four farms (Table 1). Other twig blights found included Colletotrichum spp., anthracnose ripe rot, and Botrytis cinerea, Botrytis blight. Other problems found included mummy berry which was quite severe in 2009, found in half the farms surveyed, and affecting up to 5-70% of the fruit.

Symptoms of viral disease were found on 12 farms surveyed and infection by tomato ringspot virus (ToRSV) (4 farms) and tobacco ringspot virus (TRSV) (1 farm) confirmed. TRSV was identified for the first time on blueberry in NY. Our results have prompted us to consider research on fungicide treatments for Phomopsis canker and to undertake a survey for viral diseases in blueberry.

Table 1. Prevalence of canker and dieback diseases identified in samples taken from 33 blueberry farms surveyed during the summers of 2007 (Western NY), 2008 (Eastern NY), and 2009 (Central NY).

Canker / Dieback	Western NY Farms	Eastern NY Farms	Central NY Farms	Total of Disease
Phomopsis[a]	3	12	8	22
Fusicoccum[b]	5	0	4	9
Anthracnose[c]	2	0	3	4
Botryosphaeria[d]	1	3	0	4
Botrytis[e]	0	2	1	3
Number of Farms	7	12	16	

[a] *Phomopsis canker, Phomopsis vaccinii Shear.*
[b] *Fusicoccum canker or Godronia canker, anamorph (conidial stage) Fusicoccum putrefaciens Shear and teleomorph (ascospore stage) Godronia cassandrae Peck. Ascospore infections are relatively unimportant in the disease cycle.*
[c] *Twig blight caused by the anthracnose fruit rot or ripe rot pathogens, Colletotrichum gloeosporioides (Penz.) Penz. & Sacc. or C. acutatum J.H. Simmonds.*
[d] *Botryosphaeria stem blight, putative identification of Fusicoccum aesculi Corda (conidial stage) of Botryosphaeria dothidea (Moug.:Fr.) Ces. & De Not.*
[e] *Botrytis blight, Botrytis cinerea Pers.:Fr.*
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EXPAND YOUR FALL MARKET WITH BERRY CROPS

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There are several specialty small fruit crops that may be added to commercial berry operations in order to expand the fall berry market. These include Aronia, and elderberries, hardy kiwifruit, primocane-fruiting blackberries, day-neutral strawberries, and cranberries. Commercial production of these crops is beginning to catch on in NY and you may want to consider adding one or more of these to your small fruit repertoire. They are also an excellent compliment to other fall crops such as apples, pumpkins, squash, and other fall ornamentals. What follows is an overview of these small fruit crops. For more in depth information on commercial production of these and other small fruit crops visit: http://www.fruit.cornell.edu/berry.html.

Aronia - Aronia (black chokeberry) is a member of the Rosaceae family, and the cultivars used for fruit production are from the species *Aronia melanocarpa*. 'Viking' and 'Nero' are cultivars that are commonly available in North America; cultivars are self-fertile.

Aronia is adaptable to a wide variety of neutral to slightly acid soils. Less fertile soils are desirable to keep plants smaller in size. It is suggested that plants be placed 0.8-1.0 meters apart and mulched with plastic to prevent weed growth. Plastic can be removed after two to three years as plants sucker and fill in the hedgerow. At five to seven years, selective pruning is done to remove the oldest, thickest branches, and keep the center open. Frost protection is not necessary since plants bloom so late, mid May in New York. Aphids on shoot tips, and leaf-eating beetles are possible pests, but plants are so vigorous that pest damage does not have much of a negative effect. Fire blight is a potential problem, but has not been reported as such.

Aronia is mechanically harvested between August and September. Five to ten tons per hectare can be expected in about five years, once plants have matured. Some yield can be expected in the first years, but plants often have weak branches that fall over in the ground.

Elderberries – Elderberry is a member of the family Caprifoliaceae with 13 species native to North America. Commercially, we are interested in *Sambucus nigra L. ssp. canadensis* (North American, formerly classified as a separate species), and *Sambucus nigra L.* which is native to Europe. The fruit clusters (cymes) of the *S. nigra* cultivars are larger than those of *S. n. canadensis*. In addition, some of the *S. nigra* cultivars have superior growth habits. Elderberries are only partially self-fruitful, and planting of two or more varieties within 60 feet of one another is beneficial. It is assumed that any pair of cultivars will function as mutual pollenizers.

Elderberry prefers a sandy to heavy loam soil with a pH of 5.5-6.5. It is recommended that plants be set out at 0.75 to 1.0 meter spacing, and that every other plant be removed after three to four years. This will improve chances of getting an economic return faster. The 'Samdal' and 'Samyl' cultivars have a nice growth habit where they throw canes from the base every year in good numbers. Six to eight canes are maintained per plant to fruit the following year. Flowering takes place in mid June in New York. In the fall after fruiting, the spent canes are removed, and a rotation is maintained. This way, canes are never left for more than a year, and plants are maintained as a five to seven foot bush. Aphids, leaf wrinkling mites, birds, cane borers, mildew, and botrytis blossom blight can be pest problems. Tomato ringspot virus has been a problem in the past with *S. n. canadensis* cultivars, but is less of a problem with *S. nigra*.

Elderberry is picked by hand in the US, although mechanical harvesting is a possibility. Twenty tons per acre are produced in Denmark, while four to twelve tons per acre are recorded in New York. The *S. nigra* cultivars are higher yielding, especially when grown as hedge-rowed bushes. Fruits are picked as whole cymes and frozen until ready to use. A premium is paid for stem-less frozen berries. Harvest takes place from August through September. Flowers can also be harvested around June 15 and sold fresh, or processed.

Hardy kiwifruit - Another small fruit delicacy ripening in fall is hardy kiwifruit (*Actinidia arguta* or *A. kolmitka)*. These emerald green, grape sized fruit are not hairy like their Kiwi cousins and may be eaten whole, skin and all. Hardy to zones 3 and 4, they are a sweet and flavorful addition to a fall fruit or cheese plate. Grape growers may find these vine crops an easy addition to their operations as they are best grown on a trellis system. Both male and female vines must be planted together at a ratio of approximately 1 male for every 10 female plants. Hardy kiwifruit are not for the impatient berry grower as they do not produce fruit until years 4 to 6. Once hardy kiwifruit begin fruiting however, they more than compensate for their delay in maturity. Recorded yields indicate a single plant may produce up to 300 lbs of fruit annually. Hardy kiwifruit maintained in cold storage remains in good condition for 2 to 3 months, further extending the marketing window for these luscious, bite-size beauties. With no significant pest problems, they are also well-suited to organic production.

Day Neutral Strawberries - Day neutral strawberry production is an excellent way of extending your strawberry harvest through midsummer into early fall. These berries are uniquely different from their traditional June-bearing cousins as they are insensitive to day-length, flowering and fruiting continuously when temperatures are moderate (June through October). Day neutrals are typically planted at a density of 20,000 plants/A. They may be grown in annual or perennial production systems. Annual production is perhaps best accomplished on raised beds with plastic mulch. Another annual production system used by some growers is a hydrostacker system.

Perennial production may also be done on plastic or in more traditional matted row systems. Perennial plantings are typically fruited for only 2 seasons as pest management problems build up rapidly over time. In both systems, flowers are typically removed for the first 6 weeks after planting; runners are removed as they appear for best production. Suggested varieties include 'Seascape', 'Albion', 'Tribute', and 'Tristar'.

Consumer education is needed whether day-neutral production is to be a u-pick operation or they are to be sold retail; consumers do not traditionally expect to pick NYS strawberries after July 4th. Day neutrals enjoy excellent success when grower harvested and sold through farm stands, farmers' markets, grocery chains, restaurants, etc.

Cranberries - Cranberries are another unique berry crop for extending your fall harvest. Soil pH for cranberries should range between 4.0 and 5.0; sulfur should be added to make the adjustment. A planting machine and a weighted roller are used to set unrooted cranberry cuttings at a density of between 1 and 1.5 tons of cuttings to the acre. These cuttings root easily if properly watered; each stem produces up to 200 uprights per square foot. New plantings need to grow three years before they will bear harvestable fruit; full production should be reached in year four. Once established, an acre of well-managed cranberries will produce fruit indefinitely, yielding approximately 20,000 lb berries annually. Overhead irrigation is essential both for good growth and frost protection. Pest management concerns are relatively low; pests of concern to date in NY include black-headed fireworms and weeds.

Cranberry acreage in NY is now at approximately 260 acres and includes both bog and upland production. Bog cranberry production is currently centered in Franklin County (60 acres). Heavy clay soils there naturally impede the vertical movement of water, forming an impermeable base layer for the bog, allowing it to be flooded for harvest and for winter protection. Once a site is leveled, 6 to 8 inches of sand are placed on top of the clay base layer, providing sufficient drainage for proper aeration, root development and prevention of Phytophthora root rot. Bog cranberries may be hand harvested for fresh fruit; bogs are flooded for mechanical harvest for processing (frozen fruit for juices, other value-added products).

Upland cranberries grow best in areas of the state where snow cover provides consistent winter protection for plants. Current upland production (200 acres) centers in Oswego County, NY. Upland cranberries may be hand-harvested (with rakes) for fresh fruit or machine (dry) harvested and shipped to commercial processors for "sweet and drieds" (craisins).

Primocane-fruiting blackberries – In contrast to the floricane-fruiting blackberries, primocane blackberry fruit is borne on canes produced during the current growing season. Newly released primocane varieties include 'Prime Jim' and 'Prime Jan'.

Select sites that have good internal water drainage along with an ample supply of high-quality irrigation water. Well-drained sandy loam soils with a pH of 6.0 to 6.5 are ideal. When starting from tissue culture plants (2 ft in-row spacing, 10 ft between row spacing) do not expect a commercial primocane crop the planting year. Allow plants to grow un-trained and un-manipulated during the planting year using a simple 2-wire trellis system (wire spacing 1 ft, 5.5 ft) to reduce wind breakage and bending over of vigorous canes. Weed management may be done using preemergent herbicides and/or mechanical methods. Row width should be maintained at 18' using cultivation. Soil moisture should be maintained weekly through drip irrigation.

Recent research indicates primocane blackberry berry weight may be increased 33% when primocanes are double tipped (soft-tipped at 20" then subsequent laterals soft-tipped at 20" in length. The same research indicated high tunnel production also increased yield as well as offering a method of season extension (3 weeks) and winter protection for primocane-fruiting blackberries. Double-tipping/protected production (tunnel) gave the most favorable response in growth, time of harvest, and yield overall.
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Questions or Comments about the New York Berry News?

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NEMATODES – A MINI SERIES

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Parts I and II of this series debuted in the December 2009 issue with information on "Nematology 101" and "Nematodes and Small Fruit...the Rest of the Story", gleaned by the author from an all day nematology workshop she attended in November 2009.

Part III of this nematode mini-series aired in the January issue with an in-depth article by Jim LaMondia, one of the workshop instructors, on strawberry black root rot complex.

Parts III, IV, and V follow below and are comprised of 3 resources provided through the nematode workshop including a factsheet on soil sampling for PPN assessment by George Abawi and Beth Gugino (also workshop instructors), and informational brochures on setting up and evaluating results of simple on farm bioassays for Root-Knot and Root Lesion Nematodes, by Beth Gugino, John Ludwig, and George Abawi.