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NEW HAMPSHIRE VEGETABLE, BERRY & TREE FRUIT NEWSLETTER

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WIREWORMS

I have gotten quite a few questions about problems with wireworms recently. Wireworms damage root and tuber crops such as potatoes and carrots by tunneling, causing unsightly holes as well as providing an entry point for pathogens. Young seedlings with small root systems can be weakened or killed.

Life of the Wireworm. Wireworms are the larvae of click beetles (family Elateridae). There are many species of wireworm. The larvae have slender, hard, ¾ -2 inch long bodies that range from tan to orange to brown in color. The larvae pupate in the spring, and the adult beetles emerge and are active in the summer. The adult beetles are not typically pests. Female click beetles lay eggs during May and June. They lay eggs in the soil, primarily in weedy or grassy fields. The eggs hatch in 3-4 weeks, and the larvae then look for food. The larvae can live for several years, depending on the species, availability of food, temperature, and soil moisture. Because eggs are typically laid in grassy fields, wireworm problems are usually most severe in fields that were recently sod. However, because the larvae can live for several years, problems can persist in fields that have not been sod for some time. And grassy cover crops can attract adults for egg laying. Wireworms are often more prevalent in moist areas of fields, and in areas with high organic matter.

What they Eat. Wireworms are omnivores. They feed on the roots of grasses or weeds and on other soil insects. It is hard to starve wireworms out of a particular area, because of their diverse diet. Crops that tend to increase wireworm populations include potato, carrot, sweetpotato, small grains (wheat, barley), onion, beet, and clovers. A clean (non-weedy) alfalfa crop can reduce populations. This may be in part because of alfalfa's deep root system reduces soil moisture, making the environment less favorable for the larvae.

Minimizing Damage. Rotation into alfalfa or crops that are not preferred can reduce wireworm populations. Avoid planting highly susceptible crops such as potato and carrots into sites with a high potential for damage, such as fields previously planted to grass sod, pasture or small grains, or fields with a prior history of wireworms. The edges of fields (near sod) can also be a problem, because the larvae can move through the soil in search of food. Baits can be used to determine wireworm pressure prior to planting a susceptible crop. This can be done by placing carrots or potatoes in a softball-sized hole about 4-6" deep, covering with loose soil, and then covering the area with a piece of black plastic to warm the soil. Wait 4-7 days, and dig up the bait to check for the presence of wireworms before planting. Another version of this method involves burying a fist-sized clump of corn, wheat, or rolled oats. It may also help to harvest crops as soon as possible. Some reports indicate that the wireworms seek out the

Wireworm larva near a corn kernel, Clemson University Photo

moisture in potato tubers if soil conditions become dry, and wireworm damage increases over time in potato crops left in the ground.

Chemical Control. Insecticides used to control wireworms are applied preventatively to the soil, either by broadcasting before planting, at the time of planting in the furrow, or as seed treatments. The insecticides currently labeled for use on potato include carbamates such as phorate (Thimet) and ethoprop (Mocap), neonicotinoids such as imidacloprid (Admire, Gaucho), and thiamethoxam (Cruiser), and the reduced-risk pyrethroid bifenthrin (Capture). Refer to specific pesticide labels for rates, methods of application, and any restrictions. Note that not all of these materials are labeled for other crops (e.g. sweetpotato), and that days-to-harvest restrictions may prevent use of some labeled materials on some crops.

Good Agricultural Practices (GAP) Training

UNH Cooperative Extension will hold a workshop on Food Safety and Good Agricultural Practices (GAP) in Concord, NH on June 26.

The goal of this workshop is to introduce New Hampshire fruit and vegetable growers to food safety principles and the USDA GAP audit and verification program. GAP audits are used to verify that practices are conducted on the farm to minimize microbial contamination in the production of harvested produce. Speakers from UNH Cooperative Extension, the New Hampshire Department of Agriculture, and the University of Massachusetts will teach you the basics of farm food safety known as Good Agricultural Practices (GAP), how to write a GAP plan, and how to prepare for a farm audit. Thanks to funding provided by the New Hampshire Department of Agriculture, this workshop is being offered at no cost. You will receive course materials including copies of presentations and reference materials that you can use to write your GAP plan. Lunch will be included.

Who Should Attend? Growers that currently sell produce to supermarkets (or that are thinking about doing so) should learn about this voluntary verification program. Those growers who are (or soon will be) required by their wholesale buyers to write a food safety plan or to undergo GAP-verificationare strongly encouraged to attend.

Meeting Location: The meeting will take place at the NHAFF (NH Higher Education Assistance Foundation) Campus, located at **4 Barrell Court**, Concord NH. Registration Details: Registration forms and fliers will be available and mailed soon. You must pre-register by June 12 to reserve a seat. Please contact Suzanne Hebert at Suzanne.hebert@unh.edu or 603-862-3200 with any questions or to get registration information.

Value-Added Producer Grants – Get Ready To Apply!

The USDA Rural Development Office has announced that the next funding cycle of the Value-Added Producer Grant (VAPG) program will begin shortly. Application requirements and deadlines are expected to be posted later this spring. If you want to apply, the USDA-RD office suggests that you start getting ready now, so that you are able to get your proposal submitted during the short window for applications (usually 30-60 days).

Value-Added Producer Grants may be used for planning activities and for working capital for marketing value-added agricultural products and for farm-based renewable energy. Value-added products are created when a producer increases the consumer value of an agricultural commodity in the production or processing stage. Eligible applicants are independent producers, farmer and rancher cooperatives, agricultural producer groups, and majority-controlled producer-based business ventures.

You can review last year's notice at: http://www.rurdev.usda.gov/rbs/coops/vadg.htm. Click on "Applicants" at the right of the screen to access forms and other information. From here you can access forms, checklists, guides, and templates. The website will be updated with current information as soon as it is available.

Last year, businesses and producers throughout the U.S. received over $4.2 million in grants to assess the feasibility of marketing ethanol and bio-diesel, cooking oil, wind and other types of renewable energy. For example, G. David MacGregor in Cascade, Idaho, was awarded a $100,000 grant to determine the feasibility of converting a geothermal resource into renewable electricity to use in aquaculture, greenhouse heating and to develop a marketing plan for other geothermal uses.

USDA Rural Development also funded several non-energy ventures. For example, The Chef's Garden, Inc., in Huron, Ohio, received a $97,500 grant to explore the feasibility of marketing products made from locally-grown produce. Cultivos Larenos, Inc., in Lares, Puerto Rico, received a $150,000 grant to fund operating and marketing expenses for hydroponics commodities such as romaine lettuce and coriander. Deep Root Organic Cooperative, in Johnson, Vt., received a $33,440 grant to conduct a feasibility study, business and marketing plan to provide Vermont-grown, ready-to-use fruits and vegetables to Vermont schools throughout the year.

For more information about the program, contact the New Hampshire Rural Development Office to obtain additional information and assistance. Steven Epstein is the Business Programs Specialist for USDA-Rural Development in New Hampshire. He can be reached by email at Steven.Epstein@nh.usda.gov or 603-223-6041.

Managing Powdery Mildew On Cucurbits In 2009

By Margaret Tuttle McGrath, Cornell University, Long Island Horticultural Research & Extension Center

Editor's Note: *The article below is the first in a couple of articles focusing on disease management in cucurbit crops; a perennial problem. Dr. McGrath gives excellent background information about powdery mildew and how it evolves, and emphasizes the importance of an integrated management program. The gist is that strategies that have worked in the past for managing powdery mildew may not work anymore – research at Cornell is showing that some fungicides are no longer effective (Topsin M, Amistar, Quadris, Flint, and Cabrio), and that the remaining effective materials (Procure, Pristine, Quintec) should be used at high rates to preserve their efficacy AND should be used in combination with an appropriate protectant (Sulfur, chlorothalonil, copper, or oils). - BG*

Powdery mildew is the most common disease of cucurbit crops in the northeast. It cannot be avoided because the pathogen produces an abundance of spores easily dispersed by wind and it develops under a broad range of conditions, including those occurring throughout the cucurbit production season. Inadequate control can result in reduced yield and/or fruit with poor quality, including low sugars, poor taste, sunburn, oedema, shortened shelf life for winter squashes, and poor fruit color plus shriveled handles for pumpkins.

Resistant varieties and fungicide applications are the management practices for powdery mildew. They can be highly effective tools; however, the pathogen is prone to adapting by developing strains able to tolerate these management practices. It has demonstrated this ability through developing resistance to mobile fungicides. The powdery mildew fungus has demonstrated a high potential for developing resistance. It has developed resistance to every chemical class at risk for resistance following repeated use somewhere in the world. Presence of resistant strains has been associated with control failure. The fungus causing powdery mildew has also developed new races in response to powdery mildew resistant cantaloupe varieties. As powdery mildew resistant squash and pumpkin varieties increase in number and become more widely used, there has been growing concern that the pathogen will evolve new races in response to this selection pressure.

An integrated management program with fungicides applied to resistant varieties is a preferred approach to achieve effective control (one of these practices alone may not be sufficient) and to minimize selection pressure on the pathogen to evolve to overcome these practices.

Variety evaluations conducted on Long Island have shown that best suppression is achieved using squash and pumpkin varieties with resistance from both parents (homozygous) and melon varieties with resistance to pathogen Races 1 and 2. In recent trials melon varieties with resistance to just Race 1 and many heterozygous squash varieties have not provided as good suppression, in contrast with previous years, suggesting the pathogen is adapting. Tables of resistant varieties and reports are available at: http://vegetablemdonline.ppath.cornell.edu/Tables/TableList.htm.

Mobile fungicides are needed to effectively control powdery mildew on lower surfaces of leaves, where powdery mildew develops best, but mobile fungicides are at-risk for development of fungicide resistance because of their single-site mode of action. These fungicides affect one site in a biochemical pathway of the pathogen. The pathogen only needs a mutation at this one site to become less sensitive or even resistant to the fungicide. Sometimes a simple change in the pathogen is enough to render strains with this mutation completely resistant, resulting in control failure with the fungicide. This is qualitative resistance. In contrast, with a multi-site fungicide like Bravo the pathogen needs mutations at several sites to be able to survive, which are highly unlikely to occur simultaneously as needed for resistance to develop. With other mobile fungicides resistance is quantitative. One mutation in the pathogen at the site of action of the fungicide renders the pathogen less sensitive and able to survive on the plant where fungicide concentration is very low, such as a leaf low in the canopy where little spray material is deposited. With additional mutations the pathogen becomes less sensitive. Thus with quantitative resistance, mutations occur in several interacting genes and pathogen isolates exhibit a range in sensitivity to the fungicide depending on the number of gene changes. Variation in sensitivity within the pathogen population is continuous. Resistance in this case is seen as an erosion of disease control that can be regained by using higher rates or more frequent applications. Long-term selection for resistance in the pathogen by repeated applications may eventually result in the highest labeled rates and shortest application intervals not providing adequate control. Pathogen strains are described as having reduced sensitivity until control failure occurs, at which point the pathogen is considered resistant. With quantitative resistance, sometimes after control failure due to fungicide resistance occurs with one fungicide in a chemical class it is possible to successfully control the pathogen with another, inherently more active fungicide in that same class. This has happened with cucurbit powdery mildew. FRAC Code 3 fungicides **Rally** and **Procure** have been effective for years after **Bayleton** became ineffective due to resistance in the late 1980s. FRAC codes are used to group fungicides that have a common mode of action.

Current recommendations for managing powdery mildew with fungicides are to alternate among effective mobile fungicides with different FRAC codes, use high label rates, tank mix these with protectant fungicides, start preventively or at the action threshold of 1 leaf with symptoms out of 50 older

leaves, maintain a 7-day spray program, and monitor disease severity on the lower surface of leaves.

Research is conducted yearly on Long Island to enable development of specific recommendations. Based on these results, **Quintec** (FRAC Code 13) is the best choice of mobile fungicides because it has typically been among the most effective fungicides in efficacy evaluations and the pathogen is more sensitive to its active ingredient than other registered fungicides. Unfortunately it is only labeled for use on melons. Pumpkin and winter squash are anticipated to be labeled in late 2009. It will not be labeled for use on edible-peel cucurbit types due to phytotoxicity. Like Code 3 fungicides, **Quintec** is only effective for powdery mildew.

Procure (Code 3) and **Pristine** (7 + 11) are also recommended. They should be used at high label rates to ensure effective control and to manage resistance. Pathogen strains have been found on Long Island and elsewhere with low sensitivity. Procure is recommended over **Rally** (previously named **Nova**) and **Inspire,** the other labeled fungicides in this group, because at their highest label rates, **Procure** provides almost twice the rate of active ingredient as **Rally** and it is more active than **Inspire.**

FRAC Code 1 and 11 fungicides are not recommended because of resistance. Resistance to these is qualitative, thus resistant strains are not controlled by these fungicides, regardless of rate or spray interval. Resistant strains were found to occur, often commonly, even in spring squash in July when powdery mildew is starting to develop in main season crops and there has been limited use of mobile fungicides that season. Even when the initial frequency of resistant strains is low, the pathogen population in a field being treated with the fungicide can change greatly during the growing season resulting in control failure at the end. Although **Topsin M** (Code 1) is not thought to have been used much for powdery mildew or other diseases in cucurbits for several years, common occurrence of resistant strains is not entirely surprising because resistance to this fungicide group has been found to persist in other pathogen populations after fungicide use ceases. Unfortunately this means it will not be possible to return this fungicide to the arsenal for powdery mildew in cucurbits. Resistance to FRAC Code 11 fungicides (the QoIs, **Amistar, Quadris, Flint, and Cabrio**) at the start of the season has been variable among fields and years, and sometimes low, however by the end of the season resistant strains are often very common. This change is at least partly due to use of **Pristine**, which contains a Code 11 as well as a Code 7 active ingredient. All of the isolates collected from pumpkin fields in September 2008 in PA and NY were QoI resistant. Bioassays conducted in IN and OH in 2008 also revealed resistance to Code 1 and 11 fungicides.

There are several protectant fungicides to choose from, including **sulfur, chlorothalonil, copper, and oils.** Monitor powdery mildew development, focusing on the lower leaf surface, to assess degree of control and decide when to stop applying mobile fungicides based on the amount of symptom-free leaf tissue on lower surfaces that remains to protect, considering that affected tissue cannot be cured with fungicides.

At A Glance
UNH Cooperative Extension Vegetable & Fruit Resources

Soil Testing Call 862- 3200 or visit:
http://extension.unh.edu/Agric/AGPDTS/SoilTest.htm

Plant Diagnostic Lab Call 862-3841 or visit:
http://extension.unh.edu/Agric/AGPDTS/PlantH.htm

Arthropod Identification Call 862-3200 or visit:
http://extension.unh.edu/Agric/AGPDTS/ArthroID.htm

Fruit Pest Phone Update (seasonal): 603-862-3763

Subscriptions – This newsletter is free online at http://ceinfo.unh.edu/Agric/AGFVC.htm. Email becky.grube@unh.edu if you would like to receive email notification when a new issue is available. You can subscribe using the form available at the website above if you would prefer to receive a paper copy via U.S. mail.

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Upcoming Meetings And Events

Wed Jun 10. **New Hampshire Tree Fruit Twilight Meeting.** Cardigan Mountain Orchard, 1540 Mt. Cardigan Rd., Alexandria NH. 5:30-8:00pm. For info, contact George Hamilton at george.hamilton@unh.edu or 603-641-6060. **TF.**

Sat Jun 13. **Putting Oilseeds and Grains into Your Rotation: Organic No-Till and Cover Cropping.** Barton Hall, UNH Thompson School of Applied Science, Durham NH. 9:30am-2:30pm. Topics include organic no-till developments at Rodale Institute, organic weed management and cover crops for small grains growers, NRCS soil science and tools available for growers, and a demonstration of organic no-till equipment. $20 registration fee includes lunch. For info, contact Barclay Jackson at 498-8252 or Suzanne Hebert at 862-3203. **G, O.**

Tues Jun 16. **New Hampshire Vegetable & Berry Twilight Meeting.** Emery Farm, Route 4, Durham NH. 5:30-8:00pm. The meeting will focus on marketing, production & pest management of vegetable crops and small fruit (raspberry, strawberry and blueberry). For info, contact Geoffrey Njue at geoffrey.njue@unh.edu or 603-749-4445. **SF, V, PAT.**

Tues Jun 23. **UMass Twilight Meeting.** Pleasant Valley Farm, Methuen MA. starts at 5:00pm. The meeting will focus on Phytophthora capsici management, drip irrigation systems, GAP/food safety and all-season lettuce production. For info, contact 413-545-3696. **V.**

Fri Jun 26. **GAP Training for Vegetable Growers.** Location TBD. 10:00 am-3:00 pm. This meeting will introduce the basics of USDA/FDA's GAP (Good Agricultural Practices) Verification Program for wholesale fruit and vegetable growers. For info, contact Becky Grube at becky.grube@unh.edu or 603-862-3203. **SF, TF, V.**

Thurs Jul 2. **New Hampshire Vegetable & Berry Twilight Meeting.** Picadilly Farm, Winchester NH. 5:30-8:00pm. This meeting will focus on developing integrated pest management (IPM) plans for organic diversified vegetable producers, CSA marketing, and more. For info, contact Carl Majewski at carl.majewski@unh.edu or 603-352-4550. **V, O, PAT.**

Tues Jul 7. **Farm to Restaurant Twilight Meeting.** Monadnock Berries, West Hill Rd., Troy NH. 6:30-8:30pm. This meeting will focus on providing producers with information on marketing to local businesses, and on giving area businesses and restaurants a view of farm production in NH. For info, contact Carl Majewski at carl.majewski@unh.edu or 603-352-4550. **SF, V.**

Wed Jul 8. **New Hampshire Tree Fruit Twilight Meeting.** Brookdale Fruit Farm, Rte 130, Hollis NH. 5:30-8:00pm. Features Tracy Leskey and Starker Wright from the USDA-ARS Appalachian Fruit Research Station in Kearneysvill, WV. For info, contact George Hamilton at george.hamilton@unh.edu or 603-641-6060. **TF, PAT.**

Thurs Jul 16. **University of Massachusetts Crops Research & Education Center Field Day**, South Deerfield, MA. 4:00-8:00pm. Topics and demonstrations will include zone tillage in sweet corn, organic beetle management in cucurbits and eggplant, and specialty ethnic crops. Dinner will be provided. For info, contact 413-545-3696.

Thurs Aug 20. **New Hampshire Vegetable & Berry Twilight Meeting**, Blueberry Bay Farm, Stratham NH. 6:00-8:00pm. Emphasis will be on pesticide-free growing of mixed vegetables, raspberries, and blueberries. For info, please contact Nada Haddad at nada.haddad@unh.edu or 603-679-5616. **V, SF, O, PAT.**

Tues-Thurs Dec 15-17. **New England Vegetable and Fruit Conference.** Manchester, NH. Three days of informative sessions and farmer-to-farmer networking! More details to come. Mark your calendars now! Get the latest info at http://www.newenglandvfc.org/.

Meeting topics: F = flower, G = grains, O = certified organic, SF = small fruit, TF = tree fruit, V = vegetable, AC = all crops. PAT = pesticide applicator recertification credits available, CCA = certified crop advisor credits available