VEGETABLE CROPS HOTLINE

A newsletter for commercial vegetable growers prepared by the Purdue University Cooperative Extension Service

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No. 460
March 16, 2006

<http://www.entm.purdue.edu/entomology/ext/targets/newslett.htm>

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Scouting Wireworms in Spring before Planting Vegetables - (*Frankie Lam*) - Wireworms are occasional pests on vegetables and their outbreaks mainly occur during the cool season. Last year because of the cool spring we have more wireworm problems in southern Indiana. If a relatively high wireworm injury has occurred in the past, in the spring you should set bait traps in fields to estimate the wireworm populations before planting the crops. This is because the decision to use soil insecticides for wireworm management must be made prior to planting.

Wireworms (Fig. 1) are larvae of click beetles (Fig. 2). Wireworms, which are named after their long, wire-like appearance, are slender, jointed, usually hard-shelled, and tan to dark brown in color. The larvae have chewing mouthparts and three pairs of legs. The pests take two to six years to complete their life history, depending on species. Wireworms and click beetles overwinter in soil about 9 to 24 inches deep. During spring when soil temperature reaches 50 to 60°F, the insects move nearer the soil surface and feed on seeds, seedlings, tubers, and roots within 6-inches of the soil surface (Figs. 3 and 4).

Fig. 1. Wireworms. *(Photo by Frankie Lam)*

Fig. 2. Click beetle. *(Photo by Frankie Lam)*

Once the field is infested with wireworms, not much can be done to cure the problem. The only thing we can do is to wait for warmer weather and replant those plants which have been killed by the worms. When soil temperatures become hot (>80°F) or dry, wireworms will move deeper into the soil and seek cooler conditions. That is the reason why wireworm problems seldom occur during hot weather.

Wireworms attack seeds of corn, beans, and peas; tubers of potatoes; and roots of turnips, sweet potatoes, carrots, radish, sweet corn, cabbage, cucumber, tomato, watermelon, and many other vegetables. Two to four weeks before planting, follow the procedures below to set bait traps for wireworms.

Fig. 3. A wireworm feeding and boring into a cucumber transplant. *(Photo by Frankie Lam)*

Fig. 4. A wireworm feeding on potato tuber. *(Photo by Frankie Lam)*

1. Pre-soak an equal amount of untreated corn and wheat seeds in water for 24 hours.
2. Dig a hole in the field with six inches deep and four inches wide.
3. Put one cup of the seed mixture in the hole, then fill the hole and mound a "soil dome."
4. Cover the mound with an18-inch-square black plastic mulch, and cover the edges with soil to hold the plastic sheet down.
5. Place one trap for each acre or at least ten traps in the field.
6. About one week before planting, remove the plastic and soil that is covering the bait and count the number of wireworm at each trap.
7. With an average of one wireworm per trap, application of soil insecticide should be considered before seeding or transplanting crops. With 2-4 wireworms per trap, the risk of economic damage to potato is considered very high.

Not many soil insecticides are labeled for wireworms on vegetables; from my experience carbofuran (Furadan) has relatively good control of wireworms. However, imidacloprid (Admire) and thiamethoxam (Cruiser) are labeled for seed-piece protection of potato. Please read the label carefully before the application of insecticides. Growers with questions on setting up the bait traps or wireworm management, please call me at the Southwest Purdue Agricultural Program at (812) 886-0198.

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Fusarium Wilt of Watermelon Transplants - *(Dan Egel)* - Commercial watermelon growers in Indiana are very familiar with the symptoms of Fusarium wilt. A few weeks after transplant, a wilt begins to exhibit itself, often on a portion of the vine (Figure 1). While the roots of affected plants appear white and healthy, the vascular tissue is discolored (Figure 2).

Fig. 1. Watermelon plants with a "one-sided" wilt are characteristic of plants infected with Fusarium wilt. *(Photo by Dan Egel)*

Fig. 2. Brown discoloration in the vascular tissue is characteristic of Fusarium wilt of watermelon. *(Photo by Dan Egel)*

Fusarium wilt is caused by *Fusarium oxysporum* fsp. *niveum* (FON), a fungus that forms resilient resting spores that survive in soil for years in the absence of a host. The only host that FON causes a disease on is watermelon; other members of the cucurbit family such as muskmelon and cucumber can be infected by closely related but distinctly different Fusarium fungi.

It has been accepted in pathology circles for many years that Fusarium wilt may be seedborne. If asked

a few years ago, I would have given the standard line that Fusarium wilt of watermelon could be important in spreading the disease or new strains of the disease between regions of the world, but was not much of a factor in producing observable disease within one season.

During the last several seasons, however, I have made some observations that lead me to question the previous statement. I began to observe flats of watermelon transplants that included wilted plants not much beyond the true leaf stage (Figure 3). The Fusarium wilt fungus, FON, is easily isolated from such seedlings using standard laboratory techniques (Figure 4).

Since the Fusarium fungus survives so well in soil, it is possible for a greenhouse mix, once contaminated,

Fig. 3. Watermelon seedlings with Fusarium wilt occur in a random pattern in a transplant greenhouse. *(Photo by Dan Egel)*

Fig. 4. A watermelon transplant with Fusarium wilt. *(Photo by Dan Egel)*

to harbor the pathogen for some time. In a well-maintained greenhouse using new trays and pasteurized greenhouse mix, such contamination would be unlikely. Although I did not have access to seeds, the pattern and evidence suggests the nature of the Fusarium wilt in greenhouses has been seedborne in the majority of cases.

The overall occurrences of the disease outbreaks described above were few in numbers. The incidence of the seedlings affected within each greenhouse was likewise not great. These disease events, however, did seem to me to offer an opportunity for FON to be introduced into fields or portions of fields where it had not occurred previously. In addition, it is possible that the overall amount of FON in the soil could be increased by such means. Finally, if the race or strain of the fungus in the seed differed from the original strain or race in the region or field, an introduction of this sort could potentially produce yield losses for years to come.

In May of last year, many watermelon growers reported recently transplanted watermelon with wilt symptoms. I was able to isolate FON out of these seedlings. In some cases, roots of the plants in question had barely begun to grow outside of the transplant soil mix so it seemed unlikely that Fusarium in the soil had caused the plant deaths. Fusarium wilt was also diagnosed in seedlings still in transplant trays. One particular lot number from one variety of 'fruitless' pollenizer was linked to all of the reports referred to here.

The company involved in the most recent incident above recognizes the problem and has taken corrective action. However, the watermelon industry may have a new transplant disease of concern. The photographs and disease descriptions here may help in recognizing Fusarium wilt of seedlings. Fusarium wilt of seedlings should be scouted for at the same time as foliar diseases such as anthracnose, bacterial fruit blotch and gummy stem blight.

When I reused transplant trays that had contained transplants with Fusarium wilt, many of the seedlings were infected with the disease, apparently from the soil that still clung to the trays. Therefore, one should be careful to use new trays and practice other forms of sanitation to avoid this problem. I am convinced that Fusarium wilt of watermelon can also result from poor sanitation practices.

Those individuals involved in raising watermelon transplants should learn to recognize Fusarium wilt symptoms and scout seedlings regularly. Transplant producers should use well sanitized or new trays, pasteurized soil mix and keep greenhouse surfaces and tools sanitized.

As always growers who have questions may call me. I will do my best to inspect watermelon seedlings that may have symptoms.

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Oberon - A New Pesticide for Mites and Whiteflies on Vegetables - (*Frankie Lam*) - Oberon 2 SC, which was registered by the U.S. Environmental Protection Agency last year, is a new pesticide for vegetables from Bayer CropScience. This new product is registered as a foliar spray on cotton, field corn, cucurbits (cucumber, muskmelon, pumpkin, summer squash, winter squash, and watermelon), fruiting vegetables (eggplant, pepper, and tomato), leafy green vegetables (celery, dan-

delion, endive, head and leaf lettuce, parsley, spinach, and Swiss chard), brassica leafy vegetables (broccoli, Chinese broccoli, cabbage, Chinese cabbage, cauliflower, collards, and kale), tuberous and corm vegetables (artichoke, chayote, ginger, potato, and sweet potato), and strawberry for the management of mites, whiteflies, and psyllids.

The active ingredient of Oberon is spiromesifen, which is the first member of a new class of chemistry called tetronic acids. The product provides a brand new, unique mode of action that is known as lipid biosynthesis inhibition. The chemical prevents the pests from maintaining a necessary water balance. Oberon may be an important product for the resistance management of mites and whiteflies because we have more choices in rotating to pesticides with different modes of action. Furthermore, the translaminar activity of spiromesifen allows the chemical to penetrate the leaf surface and move through the cells inside the leaf. This activity means it can be sprayed on the top of leaves and will travel through to kill pests feeding underneath. The product is formulated as a 2 SC (suspension concentrate) and is a contact pesticide. The label signal word for Oberon is "Caution", however the product is toxic to fish and aquatic invertebrates.

Studies from universities had found that Oberon is highly active against all stages of mites including eggs, although juvenile stages are more susceptible than adults. The product is also highly effectively against whitefly and psyllid nymphs. For best results, it is recommended that mites and whiteflies should be treated at the beginning of population build-up and before a damaging population becomes established. The re-entry interval of Oberon is 12 hours. For cucurbits and most vegetables, the application rate is 7 to 8.5 fl oz per acre and the pre-harvest interval is 7 days. Be certain to read the label carefully before using any pesticide.

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A New Label for Baythroid Insecticide - (*Frankie Lam*) - Bayer CropScience has announced that there is a new label for Baythroid insecticide. The active ingredient of Baythroid insecticide is 25% Cyfluthrin, which is a pyrethroid insecticide that offers good control of a broad range of insects at low application rates. The new label of Baythroid insecticide is recommended to a variety of crops including newly added the cucurbits (cucumber, edible gourd, muskmelon, pumpkin, summer squash, winter squash, and watermelon), the fruiting vegetables (eggplant, pepper, and tomato), and the leafy vegetables (celery, dandelion, endive, head and leaf lettuce, parsley, rhubarb, spinach, and Swiss chard).

The insect pests that are recommended to be controlled by Baythroid are mainly caterpillars, leafhoppers, whiteflies, stinkbugs, grasshoppers, flea beetles, cucumber beetles, and Colorado potato beetle. The re-entry interval of the insecticide is 12 hours. The pre-harvest interval varies between crops, however it is 0-day for cole crops, cucurbits, and fruiting and leafy vegetables. The application rate is not the same for different pests on different crops, please read the new label carefully before applying Baythroid insecticides.

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Preseason Greenhouse Heating Check - *(Chris Gunter)* - Now is the time to start getting your greenhouses ready for the upcoming season. The maintenance of gas-fired greenhouse systems should be done by you or a service technician prior to the growing season. Here are some suggestions about things to check prior to the growing season.

Fans and Components: Check bearings on electric motors, Check and adjust belt tension, Check physical condition of belts, Tighten or replace missing bolts and nuts, Check and adjust belt pulley alignment, Clean fan blades/housing, check and service fan-jet distribution system and convection tube.

Heat Exchangers, Burners, Gas Controls, and Thermostat: Check for cracks and corrosion, Clean heat exchanger if necessary, Inspect and clean burners, Inspect and clean inside of burner tubes, Inspect all gas lines and tubing for tight fits, Check electrical connections to gas valve, Check thermocouple for cleanliness and tighten connections, Check thermostat for cleanliness, Check wiring to and from thermostat, Check thermostat setting.

Vent systems/Chimney: Check for obstructions, Check connections for tightness and security, Check vent support system for security, Check joints for signs of leakage, Check vent pipe drip leg and clean-out cap, Check weather cap.

Gas Supply: Check that gas mains are turned on, Check propane level, Check heater combustion air inlets for obstructions, Turn on gas, light pilots and observe burner flame, Activate or cycle heater unit to insure proper operation.

This information is adapted from "Greenhouse service and maintenance bulletin (Greenhouse heating – Pre-season checklist)", Missouri Vocation Agriculture Teachers Association, Service and Information Bulletin No. 3, Spring 2002.

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Muskmelon and Watermelon Scouting School – *(Dan Egel)* - If you want to know who the 'bad boys' are in your neighborhood, you can find a bulletin board down at the post office with their photographs. Pest and nutrition problems are the 'bad boys' of muskmelon and watermelon production. These pests include diseases, insects and weeds as well as nutrient imbalances. While you won't find any photographs of these pests at the post office, the vegetable specialists at the Southwest Purdue Ag Center are holding a scouting school on Tuesday March 21 from 6:00 to 9:30 pm 4369 N. Purdue Rd. Photographs of important pests and nutrient disorders will be shown and discussed. Private applicator (PARP) credit and Commercial 1A CEU's have been applied for. Light refreshments will be served.

Contact: Dan Egel, 812-886-0198, egel@purdue.edu

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An Introduction to Starting a Specialty Food Business in Indiana - Tuesday, April 25, 2006, Indiana Farm Bureau, Inc., 225 S. East Street, Indianapolis, IN; sponsored by Purdue University's Dept. of Agricultural Economics, and Dept. of Food Science, Southeastern Indiana Small Business Development Center and Indiana State Dept. of Health. Registration fee is $75 per registrant and the deadline is April 18, 2006.

About the Workshop - Developing and selling specialty ingredients and foods is one alternative for homemakers and farms to add value to Indiana commodities. This workshop was developed to serve as a comprehensive overview of the issues associated with starting a specialty food business in Indiana.

The overall purpose of this workshop is to provide knowledge, contacts, and resources about starting a new food business in Indiana through formal lectures and questions and answer session with speakers and entrepreneurs, as well as written materials with information and resources.

Who Should Attend - This workshop was developed for people interested in developing a specialty food or food ingredient business. Participants may be small farmers interested in vertically integrating, homemakers, and current/former entrepreneurs who need a comprehensive overview of topics to be covered when starting a new food business in Indiana.

For interested individuals, participation in this workshop will allow an easier start-up at Ohio River Valley Food Venture, the shared-use commercial kitchen facility at the Small Business Development Center in Madison, Indiana

For additional **registration** information contact: Marsha Prichard, Dept. of Agricultural Economics, Purdue University, West Lafayette, IN 47907, Phone: (765) 494-4268, Fax: (765) 494-9176.

For additional **program content** information contact: De Bush, Dept. of Food Science, Purdue University, West Lafayette, IN, Phone: (765) 496-3832, email: djbush@purdue.edu or Maria Marshall, Dept of Agricultural Economics, Purdue University, West Lafayette, IN, Phone: (765) 494-4268, email: mimarsha@purdue.edu.

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Integrated Pest Management Surveys for Indiana Vegetable Growers *(Jim Jasinski)* - The Great Lakes Vegetable Working Group (GLVWG) committee, University personnel who specialize in vegetable research and Extension programming, along with industry stakeholders have been developing vegetable IPM adoption surveys. This is the first major initiative of the GLVWG formed in October 2004. The mission of the working group is to foster communication and collaboration between vegetable specialists in the Great Lakes region, including Ontario, Canada, and to address priorities in vegetable production through research and Extension programs. For more information about this working group and our mission, visit our website at <http://glvwg.ag.ohio-state.edu/>.

The GLVWG decided that understanding IPM adoption in key vegetable crops across the region is essential to focus our resources and direct our outreach and research efforts. To that end, with input from both University and industry representatives, we have developed state and crop specific IPM adoption surveys. The intent of the surveys is to determine which IPM practices are commonly used among growers. The results of this survey will be a major influence in future research and Extension efforts. By completing the survey, you help us continue to serve you.

These surveys are designed to be taken over the Internet. Most questions require only a click to select the proper response(s); very little typing is involved. Your responses will be kept confidential. Sections of each survey will evaluate general pest management knowledge, training needs, and actual pest management practices from a pre-plant through post harvest time frame. These surveys are designed to take 10-15 minutes to complete. One completed survey per state per crop will be chosen at random to receive a free gift such as a current vegetable production guide or sweatshirt from that state or province.

To begin the survey, either double click the link directly below in this article or cut and paste the link into your web browser's URL address bar (Netscape, Internet Explorer, Fox Fire, etc).

The crops selected for the IPM survey in (ADD STATE) and their web address are as follows:

Pumpkin -
<www.surveymonkey.com/s.asp?u=330741063607>,
Muskmelon -
<www.surveymonkey.com/s.asp?u=622231483727>
Processing Tomato -
<www.surveymonkey.com/s.asp?u=757651574753>

These surveys will remain on line and active until the end of April 2006 at which time they will be taken off line. Results of these surveys will be analyzed and reported in a future edition of this newsletter. For more information concerning the survey or if you do not have access to the Internet and need a hard copy, please contact Jim Jasinski, at jasinski.4@osu.edu or (937) 484-1526.

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Opportunity for Free Publicity of Locally Grown Food - *(Corinne Alexander, Agricultural Economics)* - Do you sell locally grown food products? Maybe it's through a farm market, a farmers' market, a restaurant, a CSA (community supported agriculture), a grocery store or coop, or even an online store. Perhaps you have produce, grass-fed meat, honey…Perhaps it's organic, all natural, conventional...As long as it's a locally grown and sold food product, you can list your business for free at <www.localharvest.org>.

Why list yourself on LocalHarvest.org? The localharvest.org website is designed to help consumers interested in buying locally grown food products to find producers of those products. This is a national website, so it might be used by customers in your community, or

visitors from other parts of Indiana or even out of state. And, since it's a free website, the only cost of this free publicity is your time to enter your information. Currently, there are about 170 Indiana locally grown food businesses listed.

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Attention Produce Coolers and Packers - *(Rya Panos, Graduate Student)* - Your organization could benefit from research Cal Poly is conducting in the processes at produce coolers and packing houses.

Companies that participate will receive a free and confidential report making process improvement suggestions based on best practices established in the study. There is also an opportunity to gain free publicity in the white papers written from this research for those companies that want their participation public*.

Please contact me for more information, Ryan Panos, Graduate Student, Industrial and Manufacturing Engineering, California Polytechnic State University, San Luis Obispo, CA; email: rpanos@calpoly.edu; phone (805) 481-2068 home/office; study web site: <www.polygait.calpoly.edu/ProdSCStudy.htm>.

* Some organizations prefer to remain anonymous and all data from organizations will be hidden through aliases and ratios in the reports. Quotes from agreeing participants will help to establish best practices and give groups exposure.

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The Electrical Conductivity Meter: A Tool for Monitoring Soluble Fertilizer Levels - *(Liz Maynard)* - Getting transplants off to a good start provides the basis for a healthy crop. Some growers use an electrical conductivity meter, or EC meter to help them do this. The EC meter can be used to check the level of soluble fertilizer in an irrigation solution or in the transplant growing medium. Used on a regular basis, it can help detect problems before plants are seriously set back. It can also be helpful in diagnosing a problem after it is noticed. Some typical uses for an EC meter include: 1) checking solution coming out of the hose end to make sure the fertilizer injector is working as it should be and the proper amount of fertilizer has been added to the concentrate, 2) weekly checking the growing medium to make sure EC is in the desired range, and 3) checking the growing medium for a plant that is not doing well, to see whether high or low EC might be part of the problem.

EC meters are used to estimate the amount of fertilizer because the electrical conductivity of a solution is closely related to the level of dissolved salts in that solution. Many synthetic fertilizers contribute to the level of dissolved salts. Soluble fertilizers often include on the packaging information about expected the EC measurements for various fertilizer concentrations. For instance, one brand of 18-8-17 fertilizer mixed to provide a concentration of 100 parts per million (ppm) nitrogen would have an EC reading of 0.68 mmhos/cm, assuming pure water were used. Because most water used in irrigation has some background level of dissolved salts, when measuring EC in practice it is necessary to measure EC of the water alone and subtract that from the measurement of water plus fertilizer.

A number of Extension bulletins that explain the use of EC meters in more detail are available on the web and are listed below.

How to Use pH and EC "Pens" to Monitor Greenhouse Crop Nutrition (UMASS) <www.umass.edu/umext/floriculture/fact_sheets/greenhouse_management/phecpens.html>.

pH and EC Meters - Tools for Substrate Analysis (NCSU) <www.ces.ncsu.edu/depts/hort/floriculture/Florex/PH%20EC%20Meter%20Comparison.pdf>.

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