VEGETABLE CROPS HOTLINE

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

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

IN THIS ISSUE

PROTECTING THE US FOOD SUPPLY: FDA REQUIRES REGISTRATION OF FRUIT AND VEGETABLE FACILITIES - *(Liz Maynard)* - Another regulation, I can hear the groans and sighs already. But this one doesn't seem too taxing (let me know if I'm wrong). It requires a one-time no-cost registration, and many Indiana fruit and vegetable operations will be exempt. So read on!

The Bioterrorism Act of 2002 requires facilities that pack, hold or process human and animal food to register with the Food and Drug Administration (FDA). According to the FDA, in the event of a potential or actual bioterrorism incident or an outbreak of food-borne ill-ness, the registration information will help FDA to determine the location and source of the event and permit the agency to notify quickly facilities that may be affected.

The FDA published an Interim Final Rule in Oct. 2003 detailing who must register and how to register. The FDA strongly encourages online registrations at <www.access.fda.gov/>.

Many Indiana fruit and vegetable growers will be exempt from registration, but others will need to register. A single farm business may include more than one facility, for instance a farm, a packing facility, and a retail farm stand. Each facility should be considered separately to determine whether it needs to be registered. Even if the facilities are part of one partnership or corporation, they can still be considered separate facilities under this rule. This is important because retail food establishments, such as farm stands, do not need to register even if they pack, hold or process fruits and vegetables produced on other farms. In contrast, a facility that packs or holds produce grown on other farms and then sells it wholesale DOES need to register. Most Indiana fruit and vegetable growers will probably fall into one of the following groups.

Facilities that don't need to register (excerpted from "What You Need to Know about Registration of Food Facilities", US-FDA and US-DHHS, Nov. 2003):

Farms, i.e., facilities in one general location devoted to growing and harvesting of crops (washing, trimming of outer leaves and cooling produce are considered part of harvesting) and/or raising animals (including sea-food). The term "farm" also includes facilities that man-ufacture/process, pack or hold food, provided that all food used in those activities is grown, raised, or consumed on that farm or another farm under the same ownership.

Retail food establishments, such as groceries, delis, and roadside stands, that sell food directly to consumers as their *primary function*, meaning that annual food sales directly to consumers are of greater dollar value than annual sales to other buyers.

Facilities that do need to register:

Facilities that pack, hold, or process fruits or vegetables and do not fit one of the descriptions above. Operations that pack or hold produce grown on another farm and sell the produce wholesale need to register.

For more information, see the FDA Web site "FDA Actions on New Bioterrorism Legislation" <www.cfsan.fda.gov/~dms/fsbtact.html>. Good summary documents available on that site include:

- Booklet: What You Need to Know About Registration of Food Facilities
- Slide Presentation: Overview of Registration Interim Final Rule Implementing the Bioterrorism Act
- Guidance for Industry: Questions and Answers Regarding Registration of Food Facilities (Edition 3) February 17, 2004

A toll-free number is also available for questions: 800-216-7331. Be sure to take notes on the information you receive. If you need assistance accessing on-line materials, contact your local County Extension Office, or call: 219-785-5673.

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ID-56 UPDATES - *(Chris Gunter)* - Hours of writing and editing go into making the *Midwest Vegetable Production Guide for Commercial Growers* (ID-56) the fantastic publication that it is, but Murphy's Law says something will slip through the cracks. So we've reprinted an updated version of pages 29 and 100. Simply tape these pages into your production guide. If you don't use the *Guide* (ID-56), please ignore them.

Relative Effectiveness of Herbicides[1] for Vegetable Crops

Ratings Key

G=Good
F=Fair
P=Poor
N=None/ Not Labeled

		Barnyard Grass	Crabgrass	Fall Panicum	Foxtails	Goosegrass	Yellow Nutsedge	Annual Morningglory	Galinsoga	Jimsonweed	Lambsquarter	Nightshade	Pigweed	Purslane	Ragweed	Smartweed	Velvetleaf
PREPLANT INCORPORATED HERBICIDES	Balan	G	G	G	G	G	P	P	P	P	F	P	G	P	P	P	P
	Devrinol	G	G	G	G	G	N	N	P	N	F	N	G	G	N	P	N
	Dual (II) Magnum	G	G	G	G	G	F	N	G	P	F	G	G	G	P	P	N
	Eptam	G	G	G	G	G	F	P	P	N	F	F-P	G	G	P	P	F
	Frontier/Outlook	G	G	G	G	G	F	N	G	P	F	G	G	G	P	P	N
	Prefar	G	G	G	G	G	N	N	N	N	F	N	F	F	N	N	N
	Prowl/ Pendimax	G	G	G	G	G	N	N	N	N	G	P	G	G	P	P	P
	Pursuit Plus	N	N	N	N	N	N	N	N	N	N	G	G	N	N	N	N
	Ro-Neet	G	G	G	G	G	F	N	F	N	F	P	G	F	P	P	P
	Sonalan	G	G	G	G	G	N	N	N	N	F-G	F	F-G	F-G	N	P	N
	Trifluralin	G	G	G	G	G	N	F	N	N	G	P	G	G	P	P	P
PREEMERGENT SURFACE APPLIED HERBICIDES	Alanap	P	P	P	P	P	N	F	F	F	G	P	G	F	F	F	F
	Atrazine	G	G	P	F	G	F	F-G	G	G	G	G	G	G	G	G	F
	Command	G	G	G	G	G	N	F	P	F	G	P	P	G	G	G	G
	Curbit	G	G	G	G	G	N	N	F	N	F	F	G	G	P	P	N
	Dacthal	G	G	G	G	G	N	N	N	P	G	N	F	G	N	N	N
	Dual (II) Magnum	G	G	G	G	G	F	N	G	P	F	G	G	G	P	P	N
	Frontier/Outlook	G	G	G	G	G	F	N	G	P	F	G	G	G	P	P	N
	Goal	P	F	F	P	P	N	F	G	F-G	G	G	G	G	G	G	F
	Karmex	G	F	F	G	G	P	G	G	G	G	G	G	G	G	G	G
	Kerb*	F	F	P	F	F	P	P	P	P	F	P	P	G	F	F	P
	Lasso	G	G	G	G	G	F	N	G	P	F	G	G	G	P	P	N
	Lorox	F	F	F	F	F	N	P	G	F	G	F	G	G	G	G	G
	Matrix	G	P-F	G	G	G	P	P	N	F	F	P	G	F	P-F	F	F
	Prowl/Pendimax	G	G	G	G	G	N	N	N	N	G	P	G	G	P	P	P
	Pursuit	P	P	P	G	P	P	P	G	F	F	G	G	G	P	G	F
	Sandea	P	P	P	P	P	G	G	G	P	G	P	G	F	G	G	G
	Sencor	F	F	F	F-G	F	N	N	G	F	G	N	G	G	G	G	G
	Sinbar	G	G	G	F-G	G	P	F-G	G	G	G	G	F-G	G	G	G	G
	Solicam	G	G	G	G	G	F	N	G	N	F	F	F	F	G	F	F
	Strategy	G	G	G	G	G	N	F	P	F	G	P	F	F	F	F	G
POSTEMERGENT HERBICIDES	Accent	G	P	G	G	G	P	G	P	G	P-F	P	G	P	P	G	P
	Aim	N	N	N	N	N	N	G	N	N	G	G	F-G	N	F	F	G
	Assure II	G	G	G	G	G	N	N	N	N	N	N	N	N	N	N	N
	Atrazine + oil	G	G	F	F-G	G	G	F-G	G	G	G	G	G	G	G	G	G
	Basagran	N	N	N	N	N	G	F	G	G	F	P	P	F-G	F	G	G
	Buctril	N	N	N	N	N	N	G	N	G	G	G	F	P	G	G	G
	Clarity	N	N	N	N	N	N	G	G	F	G	G	G	G	G	G	G
	2,4-D	N	N	N	N	N	N	G	G	F	G	G	G	P	G	P	F
	Evik**	G	G	G	G	G	F	G	G	G	G	F	G	F	G	G	G
	Fusilade	G	G	G	G	G	N	N	N	N	N	N	N	N	N	N	N
	Glyphosate	G	G	G	G	G	F	G	G	G	G	G	G	G	G	G	G
	Goal	P	P	P	P	P	N	F	G	G	F	G	E	G	G	F	F
	Lorox	F	F	F	F	F	N	G	G	F	G	G	G	G	G	G	G
	Matrix	G	P-F	G	G	G	F	F	N	N	F	P	G	F	P-F	F	F
	Paraquat	G	G	G	G	G	G	G	F-G	G	G	G	G	G	G	G	G
	Permit, Sandea	N	N	N	N	N	G	N	G	N	P	N	F-G	N	G	F-G	G
	Poast	G	F-G	G	G	G	N	N	N	N	N	N	N	N	N	N	N
	Pursuit	G	G	N	G	N	P-F	P-F	N	G	F	G	G	F	P-F	G	G
	Raptor	G	G	N	G	N	P-F	P-F	N	G	F	G	G	F	P-F	G	G
	Reflex	N	N	N	N	N	N	N	N	N	N	F-G	N	N	F-G	N	N
	Select	G	G	G	G	G	N	N	N	N	N	N	N	N	N	N	N
	Sencor	F	F	F	F	F	N	F-G	G	F	G	P	G	G	G	G	G
	Spin-aid	N	N	N	N	N	N	F	G	F	G	F	P	G	G	G	F
	Stinger	N	N	N	N	N	N	N	G	G	P	F	P	N	G	F	N

WEEDS CONTROLLED*	TREATMENT**	COMMENTS
Broadleaves and grasses, not emerged	Command 3ME at 0.67 to 2.67 pts. per acre. Lower rates on coarse soils; higher rates on fine soils. Apply before transplanting.	Do not use on banana peppers. May cause temporary bleaching of crop leaves.
	Devrinol 50DF at 2 to 4 lbs. per acre. Use lower rate on coarse soil. Apply and incorporate before seeding or transplanting.	After harvest or prior to planting succeeding crops, deep moldboard or disk plow. Do not seed alfalfa, small grains, sorghum, corn or lettuce for 12 mo. after application.
	Products containing trifluralin at 0.5 to 1 lbs. a.i. per acre. 4EC at 1 to 2 pts. per acre. Use low rate on soils with less than 2% organic matter. Broadcast and incorporate before transplanting.	Not effective on muck or high organic matter soils.
Broadleaves and nutsedge, not emerged or emerged	Sandea at 0.5 to 1 oz. per acre. Use lower rates on coarse soils with low organic matter. Add 0.5 to 1 pt. nonionic surfactant per 25 gals. spray solution if emerged weeds are present. Apply between rows of crop, avoiding contact with crop.	Avoid contact with surface of plastic mulch if present. Maximum 2 oz. per acre per crop-cycle per year. 30 day PHI.
Grasses, not emerged	Prefar 4E at 5 to 6 qts. per acre. Use low rate on soils with less than 1% organic matter. Apply and incorporate before planting.	
Emerged grasses	Poast 1.5E at 1 to 1.5 pts. per acre plus 1 qt. COC per acre. Spray on actively growing grass.	Use high rate on quackgrass. Maximum 4.5 pts. per acre per season. 20 day PHI.
	Select 2EC at 6 to 8 fl. oz. per acre for annual grasses; 8 fl. oz. per acre for perennial grasses; plus 1 qt. COC per 25 gals. spray solution (1% v/v). Spray on actively growing grass.	Wait at least 14 days between applications. Maximum 32 fl. oz. per acre per season. 20 day PHI.

* For specific weeds controlled by each herbicide, check table on page 29.
** Rates given are for overall coverage. For band treatment, reduce amounts according to the portion of acre treated.

INSECTS CONTROLLED	TREATMENT	COMMENTS
European corn borer and flea beetles	Orthene 75S at 1 to 1.33 lbs. per acre.	Do not exceed 2.67 lbs. per acre per season. 7 day PHI.
	OR	
	Ambush at 6.4 to 12.8 fl. oz. per acre, or Pounce 3.2EC at 4 to 8 fl. oz. per acre or Pounce 25WP at 6.4 to 12.8 fl. oz. per acre.	Bell peppers only. Do not exceed 1.6 lbs. a.i. per acre per season. Use higher rate for European corn borer. 3 day PHI.
	OR	
	Baythroid 2E at 1. to 2.8 fl. oz. per acre.	Do not exceed 16.8 fl. oz. per acre per season. Allow 7 days between applications. 7 day PHI.
	OR	

Spray Pressure and Nozzle Types - *(Dan Egel)* - Foliar diseases such as Alternaria leaf blight of muskmelon, bacterial spot of tomato or gummy stem blight of watermelon remain constant threats to vegetable growers in the Midwest. For the diseases listed above, an adequate source of commercial host resistance does not exist. Rotating crops and fall tillage will lessen the severity of foliar diseases however; most commercial growers find it necessary to apply fungicides to insure satisfactory yields and profits.

If fungicides are a part of life for vegetable growers, how should such compounds be applied? In particular, what nozzle type and spray pressure is the most effective for managing foliar diseases of vegetables?

At the Southwest Purdue Agricultural Center (SWPAC), we have conducted experiments on Alternaria leaf blight of muskmelon, using the variety Eclipse, to answer these questions. The fungicide we used to try to manage this disease was the protectant fungicide chlorothalonil (trade names include Agronil, Bravo, Echo and Terranil). During three years of experiments, chlorothalonil was applied with either flat fan or hollow cone nozzles and spray pressures ranging from 30 to 150 psi. Disease was rated weekly and yields were tallied for each treatment. It's worth noting that our SWPAC engineer, Dennis Nowaskie, built a sprayer for us from our exacting specifications.

Regardless of the popular opinion that high spray pressures and hollow cone nozzles are necessary to control foliar diseases, we were unable to find statistical differences in disease severity or yields in any of the three years of study.

Surprisingly little research has been done by other researchers on this subject (there just isn't much money to support such research). However, the little research that has been done has resulted in similar findings. University of Florida researchers lead by Tom Kucharek found that regardless of whether flat fan or hollow cone nozzles were used, no difference in disease severity was observed in the following diseases: early or late leaf spot of peanut, bacterial spot of pepper and blast or purple blotch of onions. Kucharek also found that spray pressures ranging from 50 to 250 psi made no differences in disease control in early or late leaf spot of peanut.

Certainly, not all vegetable diseases have been investigated. However, the evidence is that nozzle types and spray pressures are not as important as once supposed. If I may offer an opinion, it is more important *when* fungicides are applied rather than *how* they are applied. There will be more information on fungicide timing in a future article.

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Managing Insect Pests on Cucurbits Update - (*Frankie Lam*) - The insect pests on cucurbits in southern Indiana are striped and spotted cucumber beetles, seedcorn maggot, squash bug, squash vine borer, aphids, and two-spotted spider mite. Cucumber beetles are the main pests on muskmelons, whereas squash bug is the main pest on pumpkins and squash. The cucumber beetle can be found in all cucurbit fields and if not managed properly the bacterial wilt, transmitted by the beetle, will cause significant yield loss in musk-

Stripped cucumber beetle (picture by D. Egel)

melons. Currently, the squash bug is suspected to be the vector of a yellow vine decline disease on pumpkins and squash, more insecticides are expected to be applied in the field for the control of the bug. However, applying insecticides frequently for the control of main pests might destroy the natural enemies and cause the

Spotted cucumber beetle (picture by F. Lam)

outbreak of secondary pests, such as aphids or spider mites. Thus, this is the time to design a program for the management of the pests in the coming season.

Seedcorn maggots (Picture by G. Brust)

Secondary pests are pest species that are usually present at low numbers and are held in check by the action of natural enemies. These secondary pests usually can complete their life cycle in a short period, under favorable weather conditions, such as cool, dry weather for aphids and hot, dry weather for spider mites. These pests can assume full pest status on cucurbits especially when natural enemies are destroyed by the application of insecticides in a regular schedule.

Squash bug (picture by F. Lam)

To manage the main pests on cucurbits application of soil insecticides, such as Furadan and Admire, are recommended at planting, and foliar sprays are justified when the main pest number is above the economic threshold. For example, the economic thresholds for cucumber beetle and squash bug are: one beetle per muskmelon plant; five beetles per watermelon or pumpkin plant; and one egg mass of squash bug per pumpkin or squash plant. However, some growers might spray their fields with insecticides at a regular schedule or on a "present and spray/see one and spray" tactic to control the main pests. This strategy might increase the chance of aphid or spider mite outbreak in the field.

Squash bug eggs (picture by F. Lam)

Last summer, studies conducted on the management of pumpkins and watermelons at SWPAC, indicated that application of soil insecticides at planting and weekly foliar spray of insecticides from early through mid-season had significantly greater numbers of aphids than other treatments with lower insecticide input. Repeated use of insecticides such as imidacloprid, carbaryl, or pyrethroid can cause secondary pest outbreaks. This is because these insecticides that are used to control main pests had no

Squash vine borer (picture by F. Lam)

adverse effects on these secondary pests. Some entomologists have concluded that the reasons for the outbreaks are: 1) the destruction of natural enemies by pesticides, 2) the pesticides induced irritation that causing pest dispersal, 3) the pesticides increased their reproductive rate, and 4) the host-plant quality was altered by the chemicals.

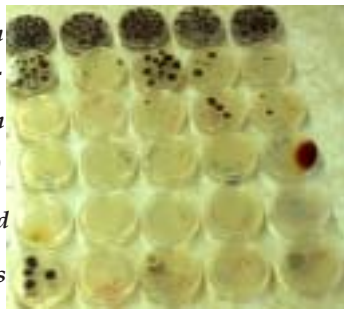
Melon aphid (picture by F. Lam)

During this early spring, I recommend the growers setup a sampling program for the main insect pests on cucurbits. Sample 2-3 times per week and check 5-10 plants at 10 locations in a "Z" pattern for each 20-acre field. Spray the field only if the numbers of the main pests are equal to or above the economic threshold. This strategy not only saved the insecticides used at a regular schedule to manage the main pests, but also avoided the elimination of natural enemies and decrease the chance of the secondary pest outbreak in the field. More information on sampling and the biology of insect pests on cucurbits can be found at <www.entm.purdue.edu/entomology/ext/targets/e-series/EseriesPDF/E-30.pdf>, Cucurbit Insect Management E-30-W.

Greenhouse Sanitation - *(Dan Egel)* - Disease causing microorganisms reside in the dirty corners of every greenhouse. Limit the amount of damping-off in your greenhouse by following the steps below.

- If trays or pots were used last year, they should be cleaned well before use. Clean trays or pots with water and then disinfected with a 10 minute soak in a 10% bleach solution (0.5% Sodium Hypochlorite) or 10 minutes in a quaternary ammonium solution such as Green-Shield or Physan 20. Always use gloves when using these products as severe skin irritation can occur. Be sure to read the labels carefully before using. My research shows that Green-Shield or Physan 20 is as effective as 10% bleach in disinfecting transplant trays. My research also shows that it is beneficial to leave trays in for the entire 10 minutes.
- Always use sterile soil mix. Use only clean tools. Do not dump your clean sterile mix onto a dirty surface.
- Greenhouses are easier to keep clean if the greenhouse floor is gravel or plastic that can be cleaned or replaced between transplant generations. Keep transplants off dirt floors where disease causing microbes may survive.
- Water early enough in the day to allow plant surfaces to dry out before nightfall. Water only when needed. On cloudy days when the soil surface is wet, let the hose rest!
- Scout greenhouses regularly for problems. Transplant trays with diseases should be thrown-out. Neighboring trays may look healthy but are very likely diseased and should be trashed.
- It may be helpful to keep specific lots of seeds in one area of a greenhouse so that if seed-borne problems arise, the lot involved can be identified. Keep good records of which lots were planted when.

In a future issue of the *Vegetable Crops Hotline* I will discuss the symptoms of various common transplant diseases.



This photograph shows the results of a laboratory experiment in which polystyrene transplant trays were sprayed with a solution of the Colletotrichum obiculare spores (casual agent of anthracnose on watermelon and muskmelon). The trays were then left unwashed, washed with water, 10% bleach, Physan 20 or Greenshield. One set of trays were not sprayed with spores (no spores). Either the 10% bleach, Physan 20 or Greenshield solution provided adequate sanitation. (Picture by D. Egel)

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Correction - (*Frankie Lam*) - In *Midwest Vegetable for Commercial Growers Production Guide (ID-56)*, by Purdue Extension on the chapter of *Cucurbit Vegetables* (P.71) the application rate listed for Furadan in the control of cucumber beetles is incorrect. Furadan 4F should be applied at 2.4 fl. oz. per 1000 linear feet of row. The staff regrets the error.

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