

# VEGETABLE CROPS HOTLINE

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

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**DOWNY MILDEW OF CUCURBITS** - (Dan Egel) - *The following article was written as a Vegetable Crops Hotline-BULLETIN, July 18, 2006.* This disease has been confirmed in Kosciusko County, Indiana on cucumbers. All cucurbits (the cucurbit family includes cucumbers, muskmelon, squash, pumpkin and zucchini) are susceptible to this disease.

Management of downy mildew on cucurbits will consist of frequent fungicide applications of either contact fungicides, broad-spectrum systemic fungicides or specialized downy mildew fungicides. The combination of management options chosen depends on one's distance from the outbreak, the value of one's crop and the amount of risk one is willing to take. Careful scouting of cucurbit crops is critical to making the best management decisions.

The simplest and most cost effective management option is to apply contact fungicides on a 5 to 7 day schedule. Contact fungicides include chlorothalonil (e.g., Bravo, Echo, Equus), mancozeb (e.g., Dithane, Mancozeb, Penncozeb) and maneb (e.g., Maneb, Manex).

Broad-spectrum systemic fungicides include the strobilurins (e.g., Amistar, Cabrio, Flint, Quadris). While some of these fungicides have provided excellent control

of downy mildew in the past, some strains of the downy mildew fungus may be resistant to this group of fungicides (group 11). Therefore, if applying these fungicides where downy mildew threatens, I recommend that a contact fungicide be tank mixed with the systemic.

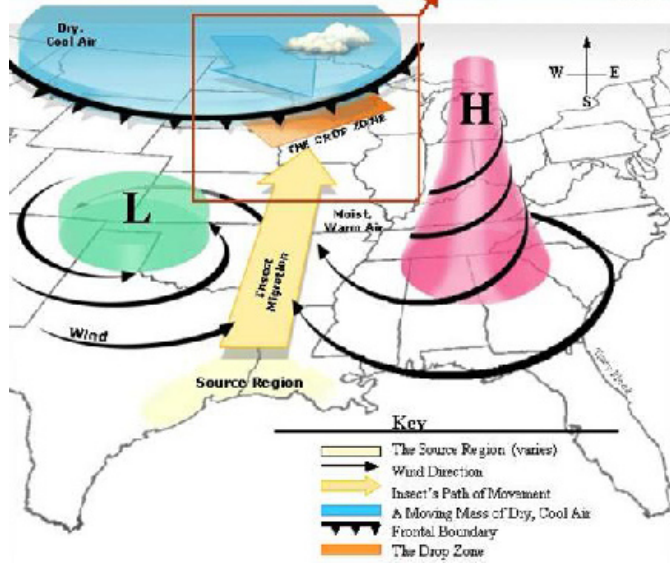
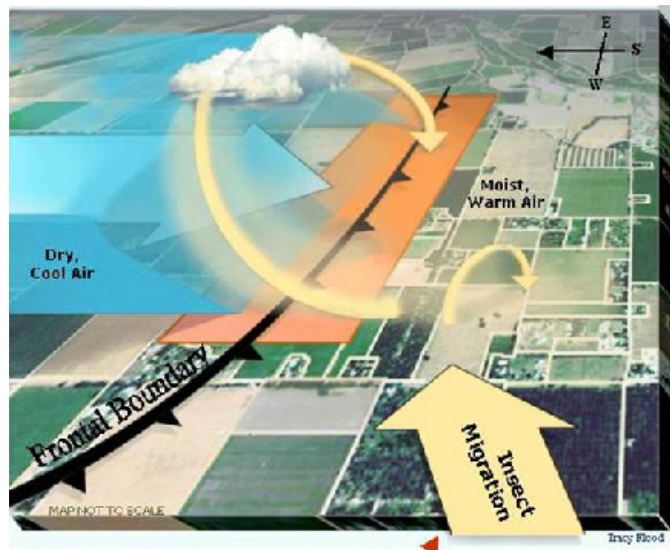
Several specialized systemic fungicides offer excellent control. However, many of these compounds will not control any disease other than downy mildew. Therefore, to apply these fungicides in the absence of downy mildew is expensive and wasteful. Only apply these fungicides where there is a reasonable expectation that downy mildew will strike soon or downy mildew has been confirmed in one's crop. When applying specialized systemic fungicides, growers should remember to apply regularly scheduled fungicides as well. Specialized fungicides include Curzate, Previcur Flex, Ranman, Reason, Ridomil Gold, and Tanos (Reason and Tanos are also labeled for Alternaria leaf blight).

Consult the Midwest Vegetable Production Guide for Commercial Growers <[www.entm.purdue.edu/entomology/ext/targets/ID/index.htm](http://www.entm.purdue.edu/entomology/ext/targets/ID/index.htm)> for further information on downy mildew management measures. Please consult the label for important application and resistance management instruction. The weather-based disease-forecasting program MELCAST was not designed for down mildew. Therefore, if downy mildew threatens, apply fungicides on a regular 5 to 7-day schedule.



**CORN EARWORMS** - (Rick Foster) - The first generation flight of corn earworms is pretty much over. Counts of moths in pheromone traps were relatively low, although higher in the southern part of the state than in areas further north. We are between generations in the northern part of the state now, although moths are still being caught in southern Indiana. We can expect the second generation of moths to begin flying in late July or early August.

The other way that corn earworm moths can reach our sweet corn (or tomato or green pepper) fields is to be blown up from the southern US. The proper weather conditions for bringing moths up here from Texas or Louisiana is when there is a high pressure system to the east of us and a low pressure system to the west (Fig. 1). The clockwise motion of the winds from the high pressure system and the counter clockwise motion of the winds from the low pressure



**Fig. 1.** Weather conditions favorable for bringing moths from Texas and Louisiana. (Figure by Rick Foster).

system will meet in the middle and form an insect pump that brings corn earworm moths and other insects up north. When this bug laden, warm, moist air meets a cold front coming down from the north, two things happen. First, it will probably rain. Second, the insects being carried up from the south will drop out. When this happens, moths will be present to start laying eggs if your crop is in the vulnerable stage. For sweet corn, that means if fresh, green silks are present and for tomato and green pepper, the crop is vulnerable if fruit are present. Watching these weather patterns can give you a heads up that corn earworms are on the way. Of course, monitoring a pheromone trap daily will also tell you that they are here as well.

In previous Hotlines, I discussed the possibility that corn earworms are developing resistance to the pyrethroid insecticides (Warrior, Capture, Mustang Max, Asana, Baythroid, Ambush, Pounce, etc.). Although admittedly numbers of corn earworms have been low so far, we have received no reports of field failures of pyrethroids this year. I continue to recommend these products just as I have in the past. For most of the season, European corn

borer is a more consistent problem, and the pyrethroids are still excellent corn borer control materials. If the situation changes, I will let you know as soon as possible.



**SQUASH BEETLE IN SOUTHWESTERN INDIANA** - (Frankie Lam) - In early June we found squash beetles on squash in southwestern Indiana and I published an article, *Squash Beetles on Cucurbits*, describing the pest in the *Vegetable Hotline No. 465*. In mid-July, small populations of squash beetle adults and larvae were observed on squash, pumpkin, muskmelon, and watermelon in Southwest Purdue Agricultural Center.

Squash beetle (Fig. 1) and Mexican bean beetle, which belong to the lady beetle family, are the pests of cucurbits and beans, respectively. The adults of these



**Fig. 1.** A squash beetle is about 3/8-inch long. (Photo by Frankie Lam)

two pests (about 3/8-inch) are usually larger than most of the beneficial lady beetles (Figs. 2 and 3). The adult squash beetle has seven black spots on each wing cover, whereas the Mexican bean beetle has eight black spots. The larvae of these pests are yellow, oval-shaped and have rows of long branching spines at the back (Fig. 4). However, the larvae of beneficial lady beetles usually look like a small "alligator" and do not have long branching spines (Fig. 5). The squash beetle larvae usu-



**Fig. 2.** A seven-spotted lady beetle is about 5/16-inch long. (Photo by Frankie Lam)

ally feed on the underside of leaves and cut a crescent in the leaf before they feed (Fig. 6). Moreover, the larvae only feed on the tissue between veins on the underside and leaving the upper surface of the leaves more or less intact. As a result, their feeding gives the injured leaves a characteristic lace-like skeletonized appearance on the upper surface (Fig. 7).



**Fig. 3.** A convergent lady beetle is about 1/4-inch long. (Photo by Frankie Lam)



**Fig. 4.** A squash beetle larva has rows of long branching spines at the back. (Photo by Frankie Lam)



**Fig. 5.** Different species of beneficial lady beetle larvae, which look like small "alligators". (Photo by Frankie Lam)



**Fig. 6.** The squash beetle larva cuts a crescent in the leaf before feeding on it. (Photo by Frankie Lam)



**Fig. 7.** Lace-like skeletonized appearance on the upper surface of an injured leaf. (Photo by Frankie Lam)

Although the beetle populations found on crops in our Center were not high in number, growers having cucurbits in fields should pay attention about this pest. If large numbers of the beetle are observed on crops, please call me at (812) 886-0198.



**WESTERN BEAN CUTWORM, A NEW CORN PEST FOR INDIANA** - (Rick Foster and John Obermeyer) - In late June, western bean cutworm moths were caught in blacklight and pheromone traps in Indiana for the first time (Fig. 1). For decades, western bean cutworm has been a sporadic dry-land bean and corn pest in Colorado and Nebraska. In the early 2000's, damage from this pest was reported in western Iowa. Since that time moth numbers, monitored by pheromone and black light traps, and damage has progressively moved eastward. Last year, Illinois pest managers participated in an organized pheromone program and the numbers trapped were higher than anticipated. Most notably were a small number of moths that were captured in a county butting up against the Indiana state line. As a result, we began an organized trapping program this year to determine if western bean cutworm had made it to Indiana.



Fig. 1. Adult western bean cutworm. (Photo by John Obermeyer)

The first report of a western bean cutworm a pheromone trap was from Jon Leuck, superintendent of the Pinney-Purdue Agricultural Center in Wanatah on June 30. Since then, we have positive catches from Newton, Jasper, Porter, Starke, Fulton, Whitley, Benton, Lake, Tippecanoe, and White counties.

Unlike many cutworm species, western bean cutworm's biology and feeding habits are similar to corn earworm. Prior to tasselling, small larvae migrate to the whorl area and feed on the pollen in the tassel. After tassel emergence, the larvae either feed on developing florets and pollen and/or migrate to ears where they enter through the silk channel, or by boring through the husks. Young larvae entering the ear may feed on the silk causing poor pollination (Fig. 2). As the larvae mature, they feed directly on developing kernels which causes the most damage in corn. Since the larvae are not cannibalistic, several cutworms can be observed on one ear.



Fig. 2. Western bean cutworm larvae. (Photo courtesy University of Nebraska)

It is important to note a new insect pest species in the state, but these moth captures must be kept in perspective. Our moth catches are much lower than those in the western corn belt where damage from western bean cutworm is considered a sporadic pest. It is possible that larval damage may be noted in a few Indiana corn ears this season, but widespread devastation will not occur. Sweet corn growers are especially unlikely to notice the few western bean cutworms that may attack their crops because the

insecticides use to control European corn borer and corn earworm will also control western bean cutworm. You can track future Indiana and other Midwestern state captures via the Western Bean Cutworm Monitoring Network, at [www.ent.iastate.edu/trap/westernbeancutworm/](http://www.ent.iastate.edu/trap/westernbeancutworm/).



**SQUASH BUGS ON SQUASH AND PUMPKIN** - (Frankie Lam)  
 - Squash bug (Fig. 1) is a serious pest of squash and pumpkin in the Midwest. In mid-July moderate to high



Fig. 1. Female squash bug laying eggs on the underside of leaf. (Photo by Frankie Lam)

numbers of squash bug egg masses were observed on squash and pumpkin in southern Indiana. In most fields that I have sampled in the past two weeks, the numbers reached the economic threshold of one egg mass per plant. This is the time to check and manage squash bug on your squash and pumpkin fields.

Squash bugs have piercing and sucking mouthparts and belong to the order of "true" bugs. In summer the bugs mainly feed on plant sap in leaves and stems, whereas in fall the bugs may feed on fruits and cause direct damage the crop. In July the female adults lay egg masses on the upper surface (Fig. 2) or the underside (Figs. 1 and 3) of leaves and on flowers (Fig. 4). The freshly laid eggs are tan or light brown in color (Figs. 1 and 2); however, after hours the eggs become reddish brown (Fig. 3). Eggs usually hatch in five to seven



Fig. 2. Freshly laid light brown egg mass on the upper surface of leaf. (Photo by Frankie Lam)



**Fig. 3.** Reddish brown egg mass on the underside of leaf. (Photo by Frankie Lam)



**Fig. 4.** Egg mass on flower. (Photo by Frankie Lam)



**Fig. 5.** Newly hatched nymphs have greenish abdomen and red legs and antennae. (Photo by Frankie Lam)

days, depending on the temperature. The newly hatched nymphs have greenish abdomens and red legs and antennae (Fig. 5) and they stay together as a colony. After the first molt the nymphs become grayish color and have black legs and antennae (Fig. 6) and the nymphs scatter among plants.

The squash bug has one generation per year and the adults overwinter in all kinds of protective shelters, including dead leaves, vines, stones, buildings, and dwellings. Most insecticides have relatively good control on the early nymph, but not the late nymph and adult.

Therefore, if one egg mass per plant were found on squash and pumpkin, an insecticide should be applied in the next few days for the control of the newly hatched nymphs. For insecticidal management of squash bug, please read *The Midwest Vegetable Production Guide for Commercial Growers* (ID-56) <[www.entm.purdue.edu/entomology/ext/targets/ID/index.htm](http://www.entm.purdue.edu/entomology/ext/targets/ID/index.htm)>. Be certain to read the label carefully before using any pesticides.



**Fig. 6.** Late nymphs have grayish abdomen and black legs and antennae. (Photo by Frankie Lam)



**FURADAN ON CUCURBITS** - (Rick Foster) - The US EPA is proposing to eliminate the use of Furadan (carbofuran) on cucurbit crops such as melons, cucumber, pumpkins, and squash. The Biological and Economic Analysis Division (BEAD) issued the following summary of their analysis.

“Carbofuran is a systemic insecticide registered for use on cucurbits through multiple Special Local Needs labels to control striped and spotted cucumber beetle. Early season control of cucumber beetles is important in minimizing damage from direct feeding and from bacterial wilt which is vectored by cucumber beetles. Soil applied insecticides applied at planting, such as the neonicotinoids imidacloprid and thiamethoxam, are the best alternatives for carbofuran for many cucurbits. BEAD does not expect yield or quality losses from the use of these alternatives although BEAD received a number of comments indicating that carbofuran is important for resistance management because the most likely alternatives are both neonicotinoids. For cucurbits that are resistant or are less susceptible to bacterial wilt, such as watermelons, foliar insecticides, such as endosulfan and synthetic pyrethroids, may be used by some growers in place of carbofuran. BEAD believes it is unlikely that most cucurbit growers would experience significant negative economic impacts if carbofuran is no longer available.”

Growers who would like to comment to US EPA about the economic impact that eliminating the use of Furadan on cucurbits would have on their operations should send their comments to: [Plummer.Stephanie@epamail.epa.gov](mailto:Plummer.Stephanie@epamail.epa.gov).



**SYMPTOMS OF SQUASH BEETLE INJURY AND GUMMY STEM BLIGHT DISEASE ON WATERMELON LEAVES -**

(Frankie Lam and Dan Egel) - We observed small populations of squash beetles on cucurbit fields in Knox and Vigo Counties. Please read the article, *Squash Beetle in Southwestern Indiana*, in this Hotline about the biology of the beetle. We found that the feeding damage of the beetle on watermelon leaves may look like gummy stem blight disease. Growers should pay attention on how to distinguish the symptoms between the beetle damage and the disease.

Gummy stem blight is caused by a fungus that attacks watermelons and other cucurbits. Symptoms of gummy stem blight on leaves often appear as irregularly shaped brown areas. The key diagnostic feature of the disease is the presence of small black fungal structures called pycnidia embedded in the diseased tissue. However, the squash beetle adults and larvae mainly feed on the underside of the leaves and leave the upper surface more or less intact. Hours after the beetle feeding, the intact tissue turned brownish black and the symptom looked like the gummy stem blight disease.

The symptoms of squash beetle feeding injury (left) and gummy stem blight (right) on the upper surface of watermelon leaves are showed in Fig. 1. The easiest way

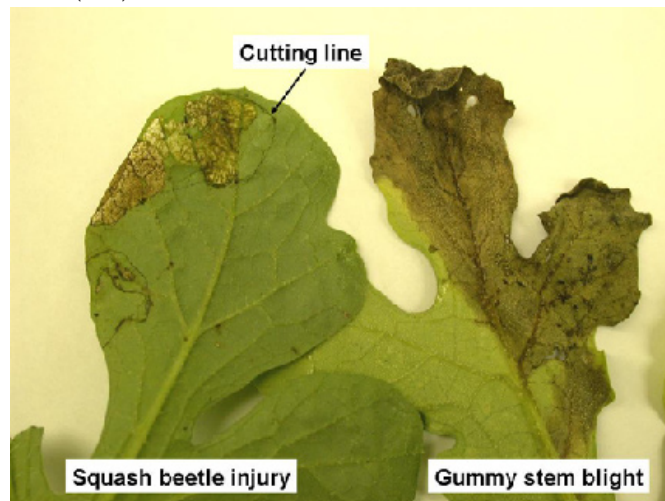


**Fig. 1.** Symptoms of squash beetle injury (left) and gummy stem blight disease (right) on the upper surface of watermelon leaf. (Photo by Frankie Lam)



**Fig. 2.** The squash beetle larva cut a crescent in the leaf before feeding on it. (Photo by Frankie Lam)

to distinguish the two symptoms is to look at the underside of the leaf. The squash beetle adult and larva cut a crescent in the leaf before they started to feed on the leaf (Fig. 2). Therefore, if the leaf was damaged by the insect, there would be a thin cutting line encircling the brown area of the leaf (Fig. 3). Growers who have problems identifying the symptoms on the melons, please contact us at (812) 886-0198.



**Fig. 3.** Symptoms of squash beetle injury (left) and gummy stem blight disease (right) on the underside of watermelon leaf. (Photo by Frankie Lam)



**BITTER CUCUMBERS A TEMPORARY PROBLEM -** (B. Rosie Lerner) - If you've notice that your cucumbers are a little (or a lot) bitter lately, don't give up hope. A little water, mulch and patience will provide relief.

Most cucumber plants contain a bitter compound called cucurbitacin, which can be present in the fruit as well as the foliage. Bitterness in cucumbers tends to be more prominent when plants are under stress from low moisture, high temperatures or poor nutrition.

For some cucumber eaters, the bitter taste can be accompanied by a digestive discomfort known as a burp. Some of the newer cultivars of cucumbers do not have the bitter compound and, thus, no burp. So, some seed companies called their bitter-free cukes "burpless."

The amount of bitterness in the cucumber depends on the severity of the heat and drought. In most cases, cutting off the stem-end and removing the skin of bitter cucumbers will remove much of the bitterness. Some fruits will be bitter all the way through and should be discarded. Bitter cucumbers will not taste any better when pickled!

Watering during droughty periods to provide 1 to 1 1/2 inches of water in a single application will help keep bitterness out of subsequent fruits. Using plastic mulch, (or straw, shredded bark or newspaper) will help cool the soil, conserve moisture and keep weeds under control.

Next year, your best bet is to plant bitter-free cultivars and provide optimum growing conditions, when possible. Many cultivars are listed as being bitter-free, including Carmen, County Fair, Diva, Green Knight,

Sweet Slice, Sweet Success and Tasty Green. New cultivars arrive each year, so be sure to read through next season's seed catalogs and trial reports to find the bitter-free types.



**REFLEX HERBICIDE LABELED ON SNAP BEANS** - (*Liz Maynard and Steve Weller*) - Reflex herbicide has been labeled for snap beans. It may be used as a postemergence broadcast application to control many annual broadleaf weeds. Maximum allowable use rates depend on where it is used. In Indiana, south of I-70, the maximum rate is 1.5 pints per acre in alternate years. North of I-70 in Indiana the maximum rate is 1.25 pints per acre in alternate years. The preharvest interval is 30 days. The label also includes dry beans. Check the label for additional information.

In recent years Reflex has been available for snap beans under a Section 18 label; that special label will no longer be necessary.



**UNDERSTANDING THE PERISHABLE AGRICULTURAL COMMODITIES ACT** - (*Christa Hofmann and Jennifer Dennis*) - Growers or other intermediaries that sell or ship produce should be aware of the Perishable Agricultural Commodities Act or PACA, a set of regulatory trade practices that was created in 1930. PACA is a law that enforces fair trading practices throughout the supply chain (i.e. growers, shippers, and buyers). The United States Department of Agriculture (USDA) is the enforcing agent examining shipper-related issues such as enforcing market contracts, fair business practices, and timely payment.

Who needs a PACA license? - PACA affects almost all those who buy and sell produce within the fruit and vegetable industry. Intermediaries, resellers, as well as contractual buyers and sellers within the fruit and vegetable industry are required by law to have a PACA license. This license is an agreement indicating that all parties involved in fresh fruit and vegetable industry trade will follow the rules set forth from PACA.

There are only a few people that are exempt from carrying the PACA license including:

- Producers that sell only products they grow themselves
- Retailers that purchase less than \$230,000 of fresh produce for retail sales in a calendar year
- Truckers who only transport produce from one location to another, regardless of the product being traded intrastate or interstate
- Food processors or others who transform products before it reaches the end consumer

All other businesses marketing commercial quantities of fresh produce must have a PACA license. A fining policy is set up for those who are required to have a PACA license, but disregard the law.

How to obtain a license - PACA has a National Licensing Center in Virginia. For more information on how to obtain a PACA license, call 1-800-495-PACA (7222) or visit the website for a PACA application at <[www.ams.usda.gov/fv/paca.htm](http://www.ams.usda.gov/fv/paca.htm)>.

Costs - PACA licenses are \$500 per year as of July 2005. Businesses with more than one location (multiple branches) are required to pay an additional \$200 fee per branch. However, the fees are capped and the maximum amount charged is \$4,000 per year per license. Retailers and grocery wholesalers obtaining a license for the first time also incur a \$100 one-time fee for administrative costs.

For example, John Q. is a wholesaler that wants to buy produce, he has three locations, all will resell produce. The costs he will incur to obtain a PACA license include:

- \$100 for administrative costs
- \$500 for the first branch
- \$400 for the two additional branches (\$200 \* 2 branches)

The total cost of the license would be \$100 + \$500 + \$200 + \$200 = \$1,000 for the first year. The next year, the cost would be (\$500 + \$200 + \$200 =) \$900. Since the license is a renewal in year two, the administrative fee is dropped.

If grower Allen W. ships produce and has a contractual agreement with Marsh Supermarket, he would need a PACA license. The costs incurred would include:

- \$100 for the administrative costs
- \$500 for the single location

The total cost of the license would be \$600 (\$100 + \$500) for the first year. The next year, the cost would be \$500 (\$600 the \$100 one time administrative fee).

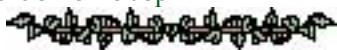
Benefits of PACA licensing - There are many benefits that come from owning a PACA license. They include:

- Enforcement of Contracts
  - When produce is bought or sold under contractual agreement, the buyer is required to take the produce subject to the terms of the contract.
  - PACA laws make it illegal to reject produce without a reasonable cause and outlaws dumping, discarding, and destroying of produce by the buyer.
- Timely Payments
  - The laws enforce timely payment for all produce, as set up by the contract.
  - If a business goes bankrupt, PACA enforces the bankrupt company's obligation to pay for the product it received.
  - The laws also regulate the timeliness of producers to make their shipments in accord to the terms of the contract.
- Settling Disputes
  - If there are disputes over quality between any two PACA licensees with a contractual agreement, PACA will send a USDA agent to grade and inspect the product in question to determine if the product meets the terms of the contract.
  - If a buyer rejects a shipment and does not have a USDA agent's report stating the produce does not meet contractual agreements, they are violating their PACA license agreement.
  - If a dispute between a buyer and seller arises, PACA has neutral facilities where all parties can meet and a PACA representative will serve as a mediator to resolve the discrepancy.

PACA licensing is required for most produce intermediaries and is similar to buying insurance. This license helps to protect the product in question and ensures growers get paid for their products and fair business practices are enforced from all parts of the supply chain.



**2006 PRODUCE GUIDE NOW AVAILABLE** - (*Jennifer Dennis*) - The Packer has distributed the 2006 Produce guide. This guide is a great resource for new fruit and vegetable growers as well as others who are transitioning into the industry. Information provided includes merchandising information by commodity, commodity availability by competing states, commodity promotion tips, food service recommendations, shipping requirements, USDA grades, common PLUs, handling (varies by commodity), nutritional facts, and shippers by state. Select specialty crop information is also available. Other resources include food safety tips, food inspections, load compatibility, and a Red Book Buyers guide. The 2006 Guide is available online at [www.thepacker.com/TheGuide/TheGuide-home.asp](http://www.thepacker.com/TheGuide/TheGuide-home.asp).



**USDA OFFERS GUIDE TO HELP AGRICULTURAL PRODUCERS PROTECT FOOD SUPPLY** - (*Announcement*) - USDA has released a guide titled "Pre-Harvest Security Guidelines and Checklist 2006" to help agricultural producers enhance security at the farm level. These practical measures help to protect against natural disasters, as well as the unintentional or intentional introduction of plant or animal diseases.

The voluntary guidelines and checklists were developed based upon recommendations made by producers throughout the U.S. Guidelines have been developed for general agriculture, dairy, crops, cattle and poultry security. This guide is the latest in a series of materials produced by USDA to bolster food and agriculture security. USDA's local Farm Service Agency Service Centers are distributing the guide to agricultural producers throughout the country. Agriculture and food account for 13 percent of the U.S. gross domestic product, 18 percent of its employment and \$140 billion in revenue. More information about USDA's homeland security efforts can be obtained at [www.usda.gov/homelandsecurity](http://www.usda.gov/homelandsecurity).

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