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

FUSARIUM WILT OF WATERMELON - *(Dan Egel)* - This disease is beginning to show up in some southern Indiana watermelon fields. The first symptoms observed are clusters of wilted plants scattered across a field. Often affected plants wilt in one stem or leaf while the rest of the plant appears healthy (Figure 1). The roots and exterior of the stem of wilted plants appear to be unaffected; however, the internal stem tissue of affected plants often appears brown.

Figure 1. Fusarium wilt of watermelon (Picture by D. Egel)

The fungus that causes Fusarium wilt of watermelon will not spread within the field during the course of a season. That is, the disease will not spread from a plant that is wilting to a healthy plant. This disease is not likely to affect every plant in a field. Contrast Fusarium wilt of watermelon with a disease such as gummy stem blight of watermelon, which may spread with splashing water to nearly every plant in the field.

Management of Fusarium wilt of watermelon may be accomplished through a combination of hybrid selection, rotation and fumigation.

- Information on hybrid selection for Fusarium wilt management can be found in the Midwest Vegetable Production Guide for Commercial Growers 2003 (ID-56) <www.entm.purdue.edu/entomology/ext/targets/ID/index.htm>. However, no hybrids are completely resistant to the Fusarium wilt fungus. High populations of the soil fungus will cause many varieties to show symptoms.
- Crop rotations of 5 to 6 years will help lessen the incidence of Fusarium wilt; however, the fungus will survive upwards of 10 years in the soil without watermelon. It is unlikely that conventional rotations of 3 to 6 years will eliminate Fusarium wilt. However, shorter rotations will cause the disease to increase.
- Fumigant formulations sold for soil borne disease management normally have 35 percent chloropicrin.

Transplants replanted in affected fields may later show symptoms of Fusarium wilt. Growers desiring to replant can help lessen the impact of the disease by using varieties with partial resistance to Fusarium wilt. The fungus that causes Fusarium wilt of watermelon does not affect muskmelon, cucumbers and pumpkins. Therefore, these plants may be replanted into affected fields.

Finally, several growers have reported serious problems with Fusarium wilt of watermelon although careful attention has been paid to watermelon hybrid selection and the fields have been fumigated with appropriate chemicals. There are at least two possible explanations for these problems: 1) Fumigations may lose effectiveness if soil temperature and moisture are not considered before applying the fumigant; 2) Purdue researchers are investigating the possibility that a new race of the Fusarium wilt fungus is present in Indiana. This would explain why watermelon hybrids with high partial resistance sometimes appear susceptible.

Please contact me if you believe you are having unusually serious Fusarium wilt of watermelon problems.

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BORON, AN ESSENTIAL ELEMENT - *(Chris Gunter)* - Recently boron has been getting a lot of press attention. Lets find out a little more about this essential element. The name boron, is derived from the Arabic *buraq*, the name for borax. You may find it interesting to note that boron is frequently combined with metals to make turbine blades, high temperature reaction containers, and even rocket nozzles. Elemental boron is also mixed with a polymer and is used to regulate nuclear reactors. This

article focuses on the importance of boron to plant growth and development.

Boron is the one essential element for plant growth, which has not been found to be essential for animal growth. Boron is essential for cell wall integrity, cell division, pollination, fruit set and, seed development. Boron is relatively immobile in plants and is transported primarily in the xylem.

The accepted range of boron available for plant growth is narrow, with deficiencies showing up at 1 ppm and toxicity appearing at 5 ppm. In North America boron deficiency occurs mainly in the eastern and northwestern United States.

Although several factors play a role in boron availability, some of the more important are soil texture, organic matter content and pH. Boron exists in the soil solution as the negatively charged ion borate, similar to nitrate, and this means that it is readily leached out of the soil by excessive rainfall or irrigation. Fine-textured soils, with higher amounts silt and clay, are less readily leached than sandy soils. It is no surprise then that fine textured soils will not be as deficient as sandy soils.

Organic matter is a rich source of boron in the soil. As soil organisms break it down, it provides one of the primary sources of available boron for crop use. Crops growing in low organic matter soils, need more frequent boron fertilization.

The pH of the soil also effects boron availability. As soil pH increases, boron availability decreases (Figure 1). Boron deficiencies are more apt to occur in soils

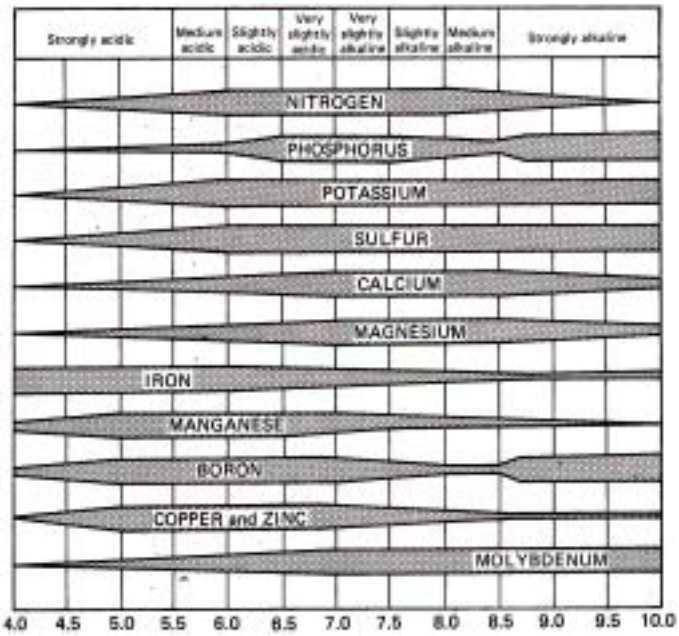

Figure 1. Boron availability changes with soil pH

with pH levels near 7.0 and above. Liming acid soils sometimes induces a temporary boron deficiency and can increase the need for a boron application to optimize crop growth.

Work has been done to explore the boron requirements of various crops based on the amount of boron in the soil (Table 1). In addition, some crops are more sensitive to the presence of boron or over fertilization with boron than others (Table 2).

Table 1. Boron Requirements of Vegetables Arranged in Approximate Order of Decreasing Requirements

High Requirement (more than 0.5 ppm in soil)	Medium Requirement (0.1-0.5 ppm in soil)	Low Requirement (less than 0.1 ppm in soil)
Beet	Tomato	Corn
Turnip	Lettuce	Pea
Cabbage	Sweet potato	Bean
Broccoli	Carrot	Lima bean
Cauliflower	Onion	Potato
Asparagus		
Radish		
Brussels sprouts		
Celery		
Rutabaga		

Table 2. Relative Tolerance of Vegetables to Boron, Arranged in Order of Increasing Sensitivity to Boron

Tolerant	Semitolerant	Sensitive
Asparagus	Celery	Jerusalem artichoke
Artichoke	Potato	Bean
Beet	Tomato	
Muskmelon	Radish	
Broad bean	Corn	
Onion	Pumpkin	
Turnip	Bell pepper	
Cabbage	Sweet potato	
Lettuce	Lima bean	
Carro		

Deficiency symptoms show up first as abnormal growth of the growing points. Since boron is not readily moved from old to new growth, it is usually these younger tissues that are affected first (Figure 2).

Figure 2. Young foliage of sugar beet affected by boron deficiency (Nutrient Deficiencies & Toxicities in Crop Plants)

Symptoms of over application of boron (toxicity), appear as yellow leaf tips, followed by necrosis and a scorched appearance and, ultimately the leaves may prematurely drop off (Figure 3). A listing of different

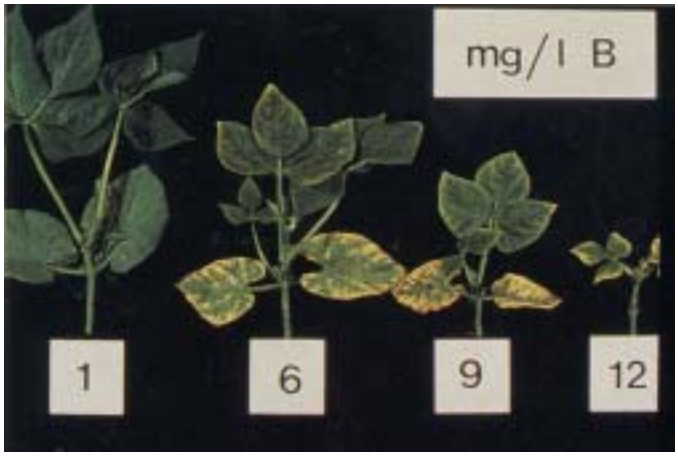

Figure 3. Symptoms of boron toxicity on bean foliage (Nutrient Deficiencies & Toxicities in Crop Plants)

vegetable crops and the symptoms of boron deficiency are given in Table 3. Boron recommendations for various crops are presented in Table 4.

Table 3. Boron Deficiency Symptoms for various vegetalbe crops (Adapted from Heckman, 2000)

Vegetable Crop	Deficiency Symptoms
Beets	External spotting Cracking Canker
Broccoli	Hollow stems Internal discoloration Brown curds
Cabbage	Hollow stem Watery areas Heads yellow and stunted
Carrots	Reddening of leaves Splitting of roots
Cauliflower	Leaves curled Hollow stem Curds dwarfed and Brown
Celery	Stem cracked with brown stipes Heart blackened
Lettuce	Stunted growth Discoloration of leaves Brittle
Tomato	Thickened leaves Brittle leaves Fruit fails to set
Radish	Pale roots Brittle stems Watery flesh and Flecked
Spinach	Roots dry and dark Leaves small and yellowish

Table 4. Boron Recommendations Based on Soil Tests for Vegetable Crops

Interpretation of Boron Soil Tests			Crops That Often Need Additional Boron	Boron Recommendation (lb/acre)
ppm	lb/acre	Relative Level		
0.0-0.35	0.0-0.70	Low	Broccoli, cauliflower, celery	3
			Asparagus, beet, cabbage, carrot, eggplant, horseradish, rutabaga, squash, sweetcorn, tomato, turnip	2
			Pepper, sweet potato	1
0.36-0.70	0.71-1.40	Medium	Broccoli, cauliflower, celery	1 1/2
			Asparagus, beet, cabbage, carrot, eggplant, horseradish, rutabaga, squash, sweetcorn, tomato, turnip	1
>0.70	>1.40	High	All crops	0

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Section 18 for Reflex in Snap Beans - *(Steve Weller)* - The Office of the Indiana State Chemist just received notification from the US EPA that a Section 18 Emergency Exemption for Reflex Herbicide (fomesafen) for postemergent control of various weeds in Snapbeans was approved on May 14, 2003. This exemption allows the use of Reflex in snapbeans from May 14 until September 1, 2003.

Directions for use on target weeds:

- Pigweed: Apply Reflex at the 2-4 leaf stage at 0.5-1 pint of Reflex/acre. A single application below 1 pint/acre may only provide suppression.
- Common ragweed: Apply Reflex at the 2-4 leaf stage at 0.5-1 pint/acre. A single application at rates below 0.75 pint/acre may only provide suppression of ragweed.
- Morning-glory: Apply Reflex at the 2 leaf stage at 1 pint/acre.

All these applications can be made by ground equipment or air. There is a maximum application allowed of 1 pint Reflex per acre per year.

The snap beans should be at the 1 to 3 trifoliate stage of growth at the time of Reflex application and the last Reflex application can not be closer than 30 days prior to harvest.

Spray additives:

Add nonionic surfactant containing at least 75% surface active agent at 0.25 to 0.5% (1/2 to 1 pint per 25 gallons) of finished spray, or a nonphytotoxic petroleum based crop oil concentrate containing 15% approved emulsifier at 0.5 to 1% (1 to 2 pints per 25 gallons) of the finished spray. Use of Crop oil concentrate can improve weed control but may slightly reduce crop tolerance to Reflex.

Thorough spray coverage is essential for best control. Reflex requires a 1-hour rain free period for best results.

Restrictions:

Do not exceed 1 pint of Reflex per acre per year on snapbeans. Refer to the EPA-registered product label for rotational crop restrictions. In Indiana, Reflex (fomesafen) may not be applied to the same acreage more than once every 2 years. Application must be made prior to snap-bean bloom. Do not apply within 30 days of harvest.

This product is toxic to birds and mammals. Do not apply directly to water, or to areas where surface water is present. Do not apply to sites where run-off is likely to occur to aquatic habitats. Drift and runoff may be hazardous to aquatic organisms in neighboring areas. Do not contaminate water when disposing of equipment wash water or rinsate.

Do not make applications when weather conditions favor drift from treated areas. In areas where soils are permeable and the water table is shallow Reflex (fomesafen) may leach to ground water. Livestock may not be grazed in treated areas.

Applicators must be in possession of a Reflex product label at the time of application and all applicable directions, restrictions and precautions on the EPA-registered product labels (EPA Reg. No. 10182-83 - Zeneca Product or EPA Reg. No. 100-993 - Syngenta Product) are to be followed. Any adverse effects resulting from the use of Reflex under this emergency exemption must be immediately reported to the Office of Indiana State Chemist.

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Insect Pests in Melons and Cucumber During the Early Season - (*Frankie Lam*) - The insect pests that commonly attack melon and cucumber plants in the early season are seedcorn maggot, striped cucumber beetle, and aphids. Occasionally, wireworms feed on germinating seeds and transplants if the spring is cool. This early season I have had fewer phone calls from growers, so it seems that there may have been less insect problems compared to the previous season. Perhaps the cold temperatures of this past winter really knocked down the insect populations of this spring.

Seedcorn maggot prefers to lay eggs in soil with plenty of organic matter (Figure 1). Cool weather is favorable for the development of the maggots. My muskmelon studies were transplanted into the field at

Figure 1. Seedcorn maggots (Picture by G. Brust)

the end of April. In one of the studies more than 20% of the plants were killed by the maggots in early May. If growers had transplanted muskmelons into a field with heavy soil before the end of April, they might also have a relatively high infestation of seedcorn maggot. From late April to mid-May, wilting of early transplanted muskmelons in fields might be due to the infestation of the maggot, frost, or flooding. The only method to verify infestation by seedcorn maggot is to dig up the wilting plant, split the crown and the main root with a pocketknife, and carefully examine for the presence of maggots. The curative tactic to manage the seedcorn maggot is to replace the damaged transplants (Please read article on Vegetable Crops Hotline May 16, 2003).

In early May, some of muskmelon fields had a relatively high infestation of striped cucumber beetles (Figure 2). Among the muskmelon fields that I sampled, the highest number of cucumber beetles was about three beetles per plant. However, after mid-May

Figure 2. Cucumber beetle feeding damage to muskmelon leaves (Picture by D. Egel)

the number of beetles in the field dropped dramatically, last week most of the muskmelon fields we sampled had an average of less than one beetle per plant. The economic thresholds of striped cucumber beetle are 1 beetle per plant for muskmelons or 5

beetles per plant for watermelons and pumpkins. Pounce, Ambush, Capture, Asana, and Sevin are foliar insecticides recommended for the control of cucumber beetles. It seems that starting in early June we entered a time between two beetle populations. The next population of striped cucumber beetle will begin in mid-July.

One of my studies has cucumber direct seeded into bare ground. It was attacked by wireworms (Figure 3). At least 10-20% of the seeds were destroyed by the insects. Wireworm damage usually occurs in the early season when the temperature is cool. Wireworms are the wire-like larvae of the click beetle. There are several species of wireworms that attack crops, including corn, small grains, vegetables, and melons. The larvae feed

Figure 3. Wireworms (Picture by J. Obermeyer)

on the seeds, seedlings, and roots of transplants. Wireworms eat the germ of the seed and also bore into the under-ground part of stem. The larvae spend 2 to 6 years in the soil feeding on roots, depending on the species. Wire-worms are among the most difficult insects to control. There is no effective rescue treatment once the damage has occurred in the field. The best insecticide treatment seems to be to apply carbofuran at planting. Wireworms cannot stand hot soil conditions; during hot summer the insects move deeper into the soil. Using plastic mulch for planting melons may warm up the soil quickly and decrease the chances of wireworm damage in spring.

Small colonies of aphids were found in muskmelons and watermelons at the end of May (Figure 4). Melons are usually attack by the melon aphid, green peach aphid, and cowpea aphid. Check the underside of leaves of melon plants located on your field border first, because most infestations will start at the border. If aphids are found on the field border, then also check inside the field. Leaves damaged by aphids have a distorted, cupped appearance. Melons with a heavy infestation have a mottled appearance or necrotic spots on the leaves and plants are stunted. All aphids can transmit viral diseases to cucurbits. Mark the infested areas with flags and recheck the field after 5 to 7 days. If the aphid population is not increasing and predators or parasitized aphids are found, no treatment is necessary. If the infested area is expanding, then spot spray the infested areas and 100 feet beyond the edges of the infestation. Thiodan, Endosulfan, Phaser, Dimethoate, Capture, Fulfill, and Actara are insecticides recommended for aphid control. Be certain to read and follow the label carefully before using any pesticide.

Figure 4. Aphid colony on melons (Picture by G. Brust)

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Seedcorn Maggots - *(Rick Foster)* - The cool, wet weather we have been experiencing has been perfect conditions for seedcorn maggots (Figure 1). Seedcorn maggots are generally most serious when 1) The weather is cool and wet, 2) The crop is planted early, and 3) There is a considerable amount of decaying organic matter present to attract the adult flies. We have received reports of seedcorn maggot problems with losses up to 90% from both southern and northern Indiana. At least one problem field had large amounts of manure applied, which no doubt increased the problem. In some cases, the grower used systemic insecticides, such as Admire, that we would normally expect to provide some control of seedcorn maggots. However, with the extremely cool temperatures we have been experiencing, it is possible that the chemical was not being taken up by the plant in sufficient amounts to kill the maggots. Once you have a problem, I would advise you to wait a few days to let the existing maggots complete their development or die before replanting. When you do replant, use an insecticide such as Furadan or Admire, but not the same

Figure 1. Seedcorn maggot inury to muskmelons (Picture by G. Brust)

insecticide you used the first time you planted. Once soil temperatures reach 70° F, seedcorn maggots will no longer be a problem.

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European Corn Borer - *(Rick Foster)* - Early season sweet corn can be seriously injured by first generation European corn borers. So far this season, very few corn borer moths have been caught in our traps (Figure 1). In a "normal" year, this might make us think that corn borers are not going to be much of a problem this year. However, this year it could be that the cool temperatures are slowing down the development of the over-wintering larvae and reducing the flight activity of the adults. Don't become complacent. Keep looking for corn borers and be prepared to take action if necessary. The best time to control corn borers in sweet corn is just before the tassel emerges. The best insecticides for corn borer control over the last 5 to 10 years have been Warrior and Capture. Either of these products will provide excellent control.

Figure 1. European corn borer moth (Picture by B. Hutchison)

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Twilight Meeting - *(Staff)* - There will be a Twilight Meeting on Tuesday, June 24 at 7 PM at the Dexter Bloebaam Farm, located at 8709 S. Decker Road, Decker, IN. For information or directions call the Southwest Purdue Ag Program office at (812) 886-0198. Extension Specialists will be on hand to answer your questions and address your concerns.

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