Growing Healthy Crops and Healthy Profits
December 6-8, 2005
Grand Rapids, Michigan

Great Lakes EXPO
FRUIT, VEGETABLE & FARM MARKET

Snap Beans

Wednesday afternoon 2:00 pm

Moderator: Bruce MacKellar, St. Joseph Co. MSU Extension

2:00 p.m. Weed Control Strategies.

Bernard Zandstra, Horticulture Dept., MSU

2:15 p.m. Seed Treatments, Aphids/Viruses, and Management of Pod Infesting Insects

Richard A. Weinzierl, Crop Sciences Dept., Univ. of Il

2:45 p.m. Soybean Rust: What Happened in 2005

Ray Hammerschmidt, Plant Pathology Dept., MSU

3:15 p.m. Irrigation and Snap Bean Production

Lyndon Lee Kelley, Extension Groundwater Agent, MSU Extension

3:45 p.m. Reducing Deer Feeding on Michigan Snap Bean Fields

Steve Middlemas, Product Manager, Kalsec, Kalamazoo, MI

Weed Control in Snapbeans

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Herbicides Registered for Snapbeans Preemergence

• Eptam	PPI
• Prowl	PPI
• Dual Magnum	PPI & PRE
• Treflan	PPI
• Command	PRE
• Sandea	PRE

POSTEMERGENCE Herbicides Registered for Snapbeans

• Basagran	nutsedge, lambsquarters, other broadleaves
• Sandea	nutsedge, pigweed, ragweed, other broadleaves
• Poast or Assure	grasses
• Reflex	Section 18 emergency label for pigweeds, puncturevine; also other BL

Other Herbicides Registered for Snapbeans

- Gramoxone
- Roundup

Eptam 7E

- Very volatile - incorporate immediately; Use on sandy, dry soils.
- Annual grasses, nutsedge, some broadleaves
- Often tank mixed with Treflan
- 3.5 pt/acre

Treflan

- Incorporate within 2-3 hours
- Annual grasses, lambsquarters, pigweed
- Potential carryover, injury to corn
- Inexpensive
- Use at soil temp above 60 F
- 1-1.5 pt/acre

Prowl 3.3
- Must be incorporated for snapbeans
- Controls annual grasses, lambsquarters, purslane, pigweeds
- May cause stunting at soil temps< 60 F
- 1.2-1.8 qt/acre
- Prowl H_2O new formulation is registered

Dual Magnum 7.6 E
- Incorporate 1-2 inch before planting or PREEMERGENCE after planting
- Annual grasses, nutsedge, nightshade, pigweed
- 1-2 pt/acre
- May cause stunting in cool soil <60 F
- Generic metolachlor is available

Command 3 ME
- PRE after planting; don't incorporate
- Annual grasses and broadleaves, velvetleaf
- 0.4-0.67 pt/acre
- Use in a tank mix

Sandea 75 W
- Preemergence after seeding
- Broadleaves, nutsedge
- 0.5-1 oz/acre
- Tank mix with a grass herbicide preemergence
- Postemergence 0.5-0.67 oz after 2 trifoliate leaves
- Maximum 2 oz/acre PRE & POST

Basagran 4 L
- Postemergence after 1 trifoliate leaf
- Broadleaves, nutsedge, Canada thistle
- Apply with a POST grass herbicide

Reflex 2 E
- Section 18 label for past 4 years
- May have Section 3 label in 2006 or 2007
- Postemergence prior to bloom
- Puncturevine, pigweed, other broadleaves
- One application to soil / 2 years

Potential PRE Weed Control Programs for Snapbeans
- PPI Eptam + Treflan - sandy soil after
- May 15
- PPI Eptam + Sandea
- Prowl or Dual Mag. + Command PRE

Potential POST Weed Control Programs
- Reflex + Poast
- Basagran + Assure, Targa
- Sandea + Poast

Snap Beans: Seed Treatments, Aphids and Viruses, and Managing Pod-Infesting Insects

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Snap beans grown for processing or fresh-market sale are most vulnerable to damage by insects at pre-emergence and seedling stages and again from bloom to harvest. Important early pests include seedcorn maggot, bean leaf beetle, and potato leafhopper, and key pests from bloom to harvest include lygus bugs, bean leaf beetle, European corn borer, and corn earworm. The soybean aphid, an insect that occurred at outbreak levels in Michigan in 2005, does not successfully colonize snap beans, but it does pass through snap bean plantings, it makes feeding probes on plants, and it likely can transmit viruses such as *Cucumber mosaic virus*. Virus infections that begin on seedlings and young plants cause more yield and quality loss than infections that occur near harvest.

Effectiveness of Seed Treatment Insecticides

Insecticides currently labeled for use on snap beans as seed treatments include chlorpyrifos (Lorsban), imidacloprid (Gaucho), and thiamethoxam (Cruiser). Pest insects that are targets for seed treatments include soil pests such as wireworms and seedcorn maggot and foliar pests such as bean leaf beetle, potato leafhopper, and soybean aphid. For seed treatments to control foliar pests, the insecticides must be systemic – they must be translocated from the roots to stems and leaves via the plant's vascular system. Gaucho and Cruiser have been shown to move systemically when used as seed treatments in one or more crops; Lorsban is not considered to have systemic activity.

Recent field trials conducted in the Midwest have helped to define the value of seed treatments in controlling snap bean pests and protecting the crop's yield potential. Hutchison et al. (in press) evaluated Cruiser 5FS, Gaucho 480FS, and Lorsban 50WP for control of seedcorn maggot, bean leaf beetle, and potato leafhopper in Minnesota. Their trials also included a foliar-applied insecticide, lambda-cyhalothrin (Warrior). They found that all of the seed treatments were effective for protecting seeds and seedlings from seedcorn maggot damage and that Cruiser provided better control of bean leaf beetles and potato leafhoppers than did Lorsban or Gaucho; some degree of control lasted up to 6 weeks after planting. Correctly timed foliar sprays of Warrior were more effective than seed treatments for control of bean leaf beetle and potato leafhopper. Table 1 summarizes the findings of Hutchison et al. (in press) on the efficacy of seed treatment and foliar insecticides applied to snap beans. They concluded that (1) where the probability of injury by seedcorn maggot is high, seed treatment is necessary; (2) where the probability of infestations of bean leaf beetle or potato leafhopper on seedlings is high, use of Cruiser is warranted and will improve adjusted gross revenue; foliar sprays may still be needed against these pests as the season progresses; and (3) where the probability of infestations of bean leaf beetle and potato leafhopper is variable (and risk of seedcorn maggot damage is low), regular scouting and well-timed foliar applications of insecticides represent the best option.

Table 1. Effectiveness of seed treatment and foliar insecticides against selected snap bean insects (adapted form Hutchison et al. [in press]).

Insecticide / Target Insect	Cruiser	Gaucho	Lorsban	Foliar Insecticide
Seedcorn maggot	High	High	High	None
Bean leaf beetle	Moderate	Low	Low	High
Potato leafhopper	Moderate	Low	Low	High

The threshold for controlling bean leaf beetles during vegetative growth of snap beans is 1 beetle per foot of row or greater than 50 percent defoliation. Thresholds for potato leafhopper control are (1) on seedlings, 0.5 adults per sweep or 2 nymphs per foot of row, and (2) for third trifoliate to bud stage, 1 adult per sweep or 1 nymph per 10 leaves.

Aphids and Viruses

The soybean aphid, first detected in North America in 2000, is now well established in the northern Midwest and is recognized as a serious pest of soybeans (Ragsdale et al. 2004). Its presence has dramatically increased the number of aphids moving across fields and noncrop areas during its flights to and from its winter host, buckthorn, and during flights between soybean fields during the summer. Soybean aphid populations were extremely high in Wisconsin, Michigan, and northern Indiana in 2005. The North Central Soybean Aphid Suction Trap Network (http://www.ncipmc.org/traps/), managed by David Voegtlin of the Illinois Natural History Survey, includes traps at three sites in Michigan, six in Indiana, nine in Illinois, five in Minnesota, and five in Wisconsin. Traps in Michigan and far northern Indiana captured thousands of aphids per week in late July or early August in 2005. Relatively little has been published on the soybean aphid's status as a vector of plant viruses, but since its introduction to North America it has been reported to carry *Soybean mosaic virus*, *Alfalfa mosaic virus*, and *Potato virus Y* (Hill et al. 2001; Clark and Perry 2002; Davis et al. 2005). Preliminary work by Chris DiFonzo at Michigan State University indicates that it also transmits *Cucumber mosaic virus* in squash. It is thought that the soybean aphid has served as a vector of several viruses that occurred at outbreak levels in snap beans and cucurbits in the upper Midwest in 2003 and 2005.

Seed treatment insecticides have been evaluated on soybeans for control of the soybean aphid. Few of these trials have been published, but findings by Kevin Steffey, Ron Estes, and coworkers in Illinois (personal communication) and others in the region indicate that Cruiser and Gaucho reduce soybean aphid densities in comparison with infestations on untreated plants for up to 6 weeks after planting. Although such data suggest that seed treatments might kill soybean aphids feeding in snap beans as well, numerous studies have found that in-field aphid control does not significantly reduce the incidence of viruses transmitted by aphids in a nonpersistent manner (as are *Cucumber mosaic virus* and *Alfalfa mosaic virus* in snap beans and several key viruses in cucurbits). In nonpersistent transmission by aphids, plants are inoculated with virus particles as soon as the aphids probe a leaf with their feeding stylets, and the aphids lose their ability to transmit the virus after just one or a few probes on uninfected plant tissue. Consequently, by the time an insecticide (systemic or foliar-applied) kills aphids on the susceptible crop, transmission has already occurred and the aphid would not be acting as a vector any longer. So ... seed treatment insecticides are NOT recommended as a tactic for managing virus diseases in snap beans.

Managing Pod-damaging Insects

Lygus bugs, bean leaf beetles, European corn borer, and corn earworm are the insects that most commonly damage snap bean pods. Lygus bugs (including tarnished plant bug) insert a needle-like stylet into pods, leaving a halo-ringed blemish at the feeding site; feeding on buds may cause blossom drop, and feeding on small pods can cause crooking or other distortion in shape. Bean leaf beetles chew holes into pods, leaving pit-like scars on the pod surface. European corn borer and corn earworm larvae tunnel into pods, sometimes becoming contaminants in the harvested and processed crop. Sampling methods and thresholds for these insects are summarized in Table 2.

Table 2. Sampling methods and thresholds for pod-damaging pests of snap beans (adapted from Flood et al. 1995).

Pest	Sampling Methods	Threshold for Control
Lygus bugs	Sweep net or beat cloth	5 nymphs or adults per 25 sweeps or 1 per foot of row. Sample from bud stage until 5 to 7 days before harvest.
Bean leaf beetle	Examine foliage and pods beginning at bloom.	10 percent recent defoliation at bloom or the presence of beetles feeding on pods warrants control.
European corn borer	Ultraviolet light trap; operate from bud stage until 10 - 14 days before harvest	10 corn borer moths per light trap per night for 3 consecutive nights warrants treatment during bud stage to bloom (at 21-24 days before harvest) and again at 10 to 14 days before harvest. If counts exceed 100 moths per trap per night, treat at 5- to 7-day intervals from white bud until 10 to 14 days before harvest
Corn earworm	Large, cone-shaped pheromone trap baited with Hercon zealures (replace at 2-week intervals).	10 earworm moths per pheromone trap per night warrants treatment from bud stage until 7 to 10 days before harvest. Treatment intervals of 5 to 7 days are usually adequate but should be shortened if earworm counts in pheromone traps exceed 100 per night and alternate hosts in an attractive stage are not abundant.

Insecticides that are effective against European corn borer include acephate (Orthene) (14-day PHI) and the pyrethroids bifenthrin (Capture or Discipline) (3-day PHI), zeta-cypermethrin (Mustang Max) (1-day PHI), and lambda cyhalothrin (Warrior) (7-day PHI). Orthene is somewhat less effective against corn earworm, but Capture, Mustang Max, and Warrior are effective, as is esfenvalerate (Asana) (3-day PHI). All of these insecticides give adequate control of lygus bugs and bean leaf beetles. In general, using Orthene early in the bud- or bloom-to-harvest stage is recommended, and as the crop nears harvest, switching to one of the pyrethroids is advised. Sprays can be discontinued at 10 to 14 days before harvest if European corn borer and lygus bugs are the only key pests present. If earworms and bean leaf beetles are present, a final spray may be needed as late as 5 to 7 days before harvest.

References Cited

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Soybean Rust: What Happened in 2005?

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In November 2004, Asian Soybean Rust (ASR), caused by the fungus *Phakopsora pachyrhizi*, was first detected on soybean in the continental US. Because of the threat this disease poses to soybean and many other legumes such as snap and dry beans, a national effort to detect and, if found, manage this disease was put into place. This is a new rust species for the US and is different than the rust commonly found on snap and dry beans (*Uromyces appendiculatus*).

In 2005, sets of small plots, called sentinel plots, were established in the major soybean growing states to serve as early detection sites for soybean rust. These plots proved to be very effective in the detection of the disease before it became a significant problem in the area of detection and provided information on the spread of the disease as well as providing information needed for fungicide recommendations. In addition to these plots, increased resources and training for soybean rust detection were provided to land grant university diagnostics clinics through the National Plant Diagnostic Network that is funded though USDA/CSREES. States were also prepared by having needed emergency registrations for fungicides in place. A USDA sponsored web site (www.sbrusa.net) was established and provided updates on disease occurrence by state and county as well as current information on the overall threat of the disease occurring in an area and disease management recommendations.

Soybean rust was detected only on soybean, kudzu and beggarweed in 2005. The confirmed findings on kudzu, especially in Florida, are significant at this plant species may provide an overwintering host for the pathogen. It is important to note that there is very little risk of the disease overwintering in Michigan and surrounding areas. Throughout most of the 2005 growing season, the disease was only detected in Florida and the Gulf states on only soybeans and kudzu. Only late in the fall was the disease detected as far north as North Carolina and western Kentucky. There have been no reports of disease outbreaks on snap beans or dry beans (even in areas with confirmed soybean rust occurrence).

An overview of the disease progress in 2005, efforts to track the disease the results of field trials on management and what may be in store for next year will be discussed. Information on how this disease may impact legume crops, such as snap beans, will also be discussed.

Snapbeans: Managing Deer Browsing in Vegetable Crops

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Deer reduce vegetable crop potential yields by browsing. Browsing may occur at any and all stages of crop development and maturity. This may necessitate an active deer browsing abatement program at several key times during crop development or all season long, depending on deer browsing habits to the crops being grown. Additional food sources available to the deer will also influence browsing levels and timing to your crops.

BROWSEBAN animal repellent treatment is both a taste and odor aversion deer browsing repellent. It is a natural active ingredient, spray applied, animal repellent proven to effectively and economically reduce animal browsing to labeled crops. While BROWSEBAN has been proven effective under a wide range of numbers of deer present testing has shown the importance of starting treatment early, before browsing has started and maintaining a regular spray treatment program.

BROWSEBAN was field tested on labeled crops, first in large block research plots, followed by full scale commercial field trials. BROWSEBAN can be applied following crop emergence or over the top after transplant up to seven (7) days before harvest. It can be applied alone or in tank mix combinations on most labeled crops. See the BROWSEBAN label for more detailed timing and use instructions.