EM 8906-E • March 2006

Photo by Eddie Dunbar

Managing 12 Spot Beetles in Snap Beans

with fewer chemicals and less risk of crop damage

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Adding value with IPM

Many buyers of processed vegetables are responding to consumer concerns by demanding that producers have an effective environmental stewardship program and reduce pesticide use. Snap bean producers have an opportunity to meet these demands.

The snap bean and 12 spot beetle interaction is relatively simple. Methods for determining risk of damage are well established. By monitoring regional beetle populations, scouting fields with a standard sweep net, and applying conservative action thresholds, a grower can reduce insecticide applications without putting the crop at significant risk.

For vegetable producers, marketing is the most important reason to apply integrated pest management (IPM) practices when controlling 12 spot beetle. Growers who document and communicate their efforts to reduce pesticide use add credibility to their stewardship claims and value to their product.

Pest description and crop damage

The western spotted cucumber beetle is yellowish green, ¼ inch long, with distinct black spots on its wing covers. Mature larvae are white except for the head and last abdominal segment, which are brown. They are about ⅝ inch long.

A close relative, the western striped cucumber beetle, is yellowish and has three black lines on its back.

Cucumber beetle adults eat small holes in the leaves and flowers of many crops. They are especially damaging to snap beans, causing pods to be deformed. They also can damage emerging seedlings. Larvae live in the soil, where they feed on roots and bore into the stem base of corn, peas, and many other crop plants.

Common names: Western spotted cucumber beetle, 12 spot beetle
Order: Coleoptera (beetles)
Family: Chrysomelidae (leaf beetles)
Scientific name: *Diabrotica undecimpunctata undecimpunctata* Mannerheim

Biology and life history

There are two generations of beetles per year. It takes 30 to 60 days to complete a life cycle. You can detect the rise and fall of beetle populations by using yellow sticky traps.

Cucumber beetles overwinter primarily as fertilized females and become active in early spring. Dispersal flights occur during warm periods in April and May (Figure 1, point A).

Adults lay eggs at the base of seedling plants, including sweet corn. Eggs hatch in 7 to 10 days. Larvae feed on roots for about 3 weeks before pupating in the soil.

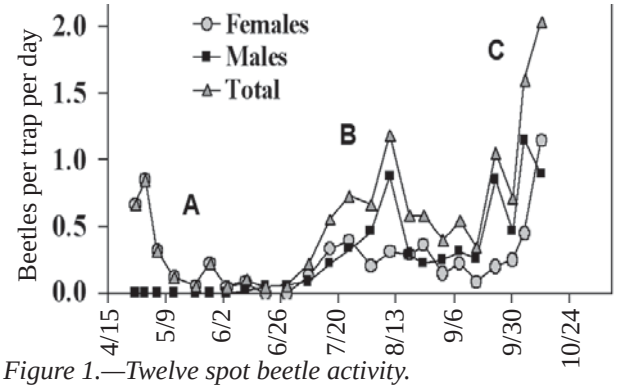

Figure 1.—Twelve spot beetle activity.

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During June, the number of aboveground adult beetles drops significantly. At this point, the beetle population is mostly underground.

Adult beetles emerge in 2 weeks, generally in early July, and begin feeding on pollen, plant foliage, flowers, and pods (Figure 1, point B). At this time, grass seed fields are drying down, and the young beetles move into irrigated vegetables. The emergence is marked by a return to a normal male-to-female ratio in the beetle population. The beetle population rises and eventually peaks in mid-August.

Beetle populations tend to be relatively high from August through October, when the second summer generation emerges from the soil. This population overwinters and reemerges the following spring.

Scouting and thresholds

Seedling stage. The 12 spot beetle damages emerging bean seedlings, especially during the early part of the growing season when little foliage is present. If foliage feeding is intense at bean emergence, some growers apply an insecticide at the seedling stage. Specific treatment thresholds have not been established for foliage feeding in Oregon.*

Pod development. Most beetle damage in snap beans occurs when beetles feed on developing bean pods. In Oregon, a sweep net threshold is used to determine whether treatment is necessary at early bloom and the "pin bean" stage.

If you find an average of 2 to 4 beetles per 10 arcs of the sweep net, treatment is justified (Figure 2). This is a conservative action threshold used by most growers and industry representatives in the Willamette Valley.

Sweep net sampling

Sweep fields with a standard sweep net just prior to first bloom. Take a minimum of four samples from different parts of the field. Regardless of the type or absence of neighboring vegetation, beetles tend to concentrate on field edges.

Be aware of surrounding fields. As grass fields dry down prior to harvest or harvested vegetable crops are disked into the soil, beetles migrate from these areas into irrigated fields, causing a sudden surge in beetle pressure.

Swing the net through the crop canopy with the very top of the net almost at crop height (Figure 3). If the crop is short, sweep close to the ground.

Figure 2. Use a conservative action threshold of 2 beetles per 10 arcs of the sweep net. (Photo by Dan McGrath)

Figure 3. Be consistent in your sweep net sampling technique. (Photo by Dan McGrath)

**University of California–Davis Cooperative Extension recommends treatment of cucumber seedlings if there is an average of one beetle per plant during the seedling-to-4-inch-tall stage.*

- One arc of the sweep net is defined as a 180° pass through the crop canopy.
- Take at least one complete step forward between sweeps so your activity does not influence the catch in your next sweep.
- Each pass of the net through the bean canopy should penetrate the canopy at the same depth. The angle of the net as it passes through the canopy should be consistent with each sweep.
- Be consistent in your sweep net technique; use a consistent stroke and application of force.

Regardless of the sweep net technique you choose, apply the technique consistently. In this way, you can compare beetle population pressure from field to field and over time.

Beetles tend to be found lower in the bean canopy during hot, sunny weather. In this case, you might sweep right over the top of the beetles and get a "false zero."

Beetle counts might be lower in the afternoon than in the morning. Try to sample at a consistent time of day, whether morning or afternoon. Take note of environmental conditions and consider them when analyzing sweep net results.

There are two ways to avoid sweep net sampling errors: (1) use a consistent sweep net technique, and (2) use regional population trends to validate your sweep net samples (see "Regional pest monitoring," below).

Yellow sticky trap sampling

Yellow sticky traps placed just above the crop canopy have been used experimentally to monitor 12 spot beetle populations. Research suggests that if counts exceed two beetles per trap per day, treatment usually is justified to protect developing bean pods.

A minimum action threshold, however, has not been established for yellow sticky traps. If counts fall below two beetles per trap per day, use sweep net sampling and a sweep net action threshold to make a treatment decision.

Regional pest monitoring

Sweep net sampling is labor intensive and costly. When the 12 spot beetle population is high and rising, sampling is frustrating because it leads to an ambiguous "spray-anyway" decision.

To reduce the cost and labor of sweep net sampling, track the 12 spot beetle population using VegNet, the Willamette Valley Regional Pest Monitoring system (http://www.ippc.orst.edu/vegnet/).

The best time for sweep net sampling is when the regional beetle population is low and declining (Figure 1, point A). At this time, sweep net sampling is most likely to pay for itself by leading to a low-risk, no-spray decision. If the regional beetle population trend is low, there are few beetles in surrounding fields and farms, and you do not pick up beetles in your sweep net, you have a doubly safe risk assessment.

Cultural control

There are no effective cultural controls for these pests. Because spotted cucumber beetle larvae also feed on corn, avoiding planting cucurbits next to corn may lower the risk of injury from 12 spot beetles.

In most years, the aboveground adult beetle population drops after egg laying and prior to the emergence of the summer generation. Sometimes, planting can be delayed until after beetles have dispersed and deposited most of their eggs.

Trap and spray crops sometimes draw beetles away from the main crop or intercept incoming beetles at the field edge. Trap cropping is an unproven control method in Oregon.

Biological control

Twelve spot beetles are attacked by a variety of natural enemies, the most important being a parasitic tachinid fly, *Celatoria diabroticae*.

Natural enemies are rarely effective enough, however, to reduce populations below economically damaging levels.

Chemical control

Cucumber beetles are difficult to control. Sprays must be directed at adult beetles. Base your spray decisions on sweep net sampling (see "Scouting and thresholds").

Always follow the instructions on the pesticide label. This Extension publication has no legal status, whereas the pesticide label is a legal document. Read the product label before making any pesticide application.

Chemical controls for 12 spot beetle in snap bean

Product	Rate (ai/acre)	Preharvest interval	Reentry interval	Comments
bifenthrin (Capture)	0.03–0.1 lb	3 days	12 hr	Do not exceed 0.2 lb ai/a per year. Do not apply by ground within 25 ft or by air within 150 ft of aquatic habitat. Toxic to fish.
carbaryl (Sevin)	1–1.5 lb	succulents: 3 days dried: 21 days forage: 14 days hay: 21 days	12 hr	Do not exceed 6 lb ai/a per crop. Toxic in aquatic habitats. Latex-based formulations such as Sevin XLR Plus are less hazardous to bees.
diazinon	0.38 lb	beans: 7 days forage: 4 days	24 hr	EC formulations can be phytotoxic.
endosulfan (Thiodan)	0.5–1 lb	3 days	24 hr	Do not graze or feed threshings. Do not exceed three applications per year. Do not apply within 300 ft of aquatic habitat.
esfenvalerate (Asana)	0.03–0.05 lb	3 days	12 hr	Do not exceed 0.2 lb ai/a per year. Do not allow livestock to graze treated bean fields. Do not harvest treated bean vines for livestock forage, fodder, or hay. Toxic to fish.
lambda-cyhalothrin (Warrior with Zeon)	0.02–0.03 lb	7 days	24 hr	Do not exceed 0.12 lb ai/a per year. Do not apply by ground within 25 ft or by air within 150 ft of aquatic habitat. Toxic to fish.
malathion	1.5 lb	1 day	12 hr	—
methomyl (Lannate)	0.23–0.45 lb	beans: 1 day vines: 3 days hay: 7 days	48 hr	Do not exceed 4.5 lb ai/a per year.
pyrethrins and rotenone (Pyrellin)	See label	0 days	12 hr	Multiple applications at 7-day or shorter intervals are required. WA and OR only. (Uncertain status in Idaho. Check label and registration status in Idaho.)

For more information

PNW Insect Management Handbook. Updated annually. The Extension Services of Oregon State University, Washington State University, and University of Idaho.

Insects and Mites of Economic Importance in the Northwest. Ralph Berry. 1991. Oregon State University Book Store, Corvallis, OR.

Published March 2006.