

Trap Cropping to Control Cucumber Beetles and Squash Bugs in Cucurbit Crops

A Simple, Effective and Affordable Integrated Pest Management Strategy



Spotted cucumber beetle



Striped cucumber beetle



Squash bug

Relevance of cucumber beetles and squash bugs as pests of cucurbit crops

Striped and spotted cucumber beetles and squash bugs are very harmful pests of cucurbit crops. Cucurbits include cucumbers, pumpkins, squash, watermelons and muskmelons. Managing these pests in gardens and small farms can be challenging. Insecticides can be a useful control option; however, be sure to consider harvest interruption due to preharvest intervals and the potential impact on beneficial and pollinator species. Many of these insecticides are also “restricted use.” This means that they require private pesticide applicator training and licensing. This article discusses trap cropping, an Integrated Pest Management (IPM) strategy, that you can use to control cucumber beetles and squash bugs with little or no insecticides applied to the cash crop.

What is trap cropping?

As with most animals, insects prefer certain food types. Insects will select their preferred

plants. But if they have no option, they will be happy to feed on whatever plants are present. Trap cropping means selecting plants highly attractive to the target insect pest. A limited number of these plants are then grown at the perimeter of the garden or cucurbit field. These attractive plants pull the pests away from the cash crop. Then, the insects gathering on the trap crop can be killed with a limited application of insecticides or by other means of removal.

Research conducted by the Lincoln University (LU) IPM Program since 2011 has shown that ‘Blue Hubbard’ squash is a very attractive plant to cucumber beetles and squash bugs. This is due to this variety’s high levels of the biochemical compound cucurbitacin. ‘Blue Hubbard’ is an excellent trap crop because it can produce high amounts of this compound as early as two weeks of age. As ‘Blue Hubbard’ squash grow in size, the attractiveness of the cucurbitacins is enhanced by the presence of flowers, which are also very attractive to cucumber beetles.



Dr. Jaime C. Piñero
State Extension Specialist
- Integrated Pest Management

900 Chestnut Street, Allen Hall
Jefferson City, MO 65101
(573) 681-5543

LUCE GS#18-G-2017
12/21/2017

What are the benefits of trap cropping?

Research conducted by the LU IPM Program has shown that 'Blue Hubbard' squash can be much more attractive than zucchini, cucumber or summer squash. For example, it is 55 times more attractive to spotted cucumber beetles, 25 times more attractive to striped cucumber beetles and 20 times more attractive to squash bugs than zucchini!

By using trap cropping, farmers have reduced inputs such as fuel, labor, time and insecticides. They have also increased income while protecting pollinators and other beneficial insects. As an example, one producer from St. Peters, Missouri, has not sprayed any insecticides on his cucurbit cash crop since 2011. He only applies a small amount of insecticide to the 'Blue Hubbard' seedlings just before transplanting them to the corners of his fields. He now sells his cucurbit produce as insecticide-free.

How can I implement trap cropping on my garden or farm?

With some planning, using trap crops is easy and low in cost. In Central Missouri, mid-April is the time to start growing 'Blue Hubbard' squash transplants. The key is to transplant two-week old 'Blue Hubbard' seedlings (trap crop) to the field at the same time you sow the seeds of your cucurbit cash crop. If you grow your cash crop from transplants, then you will need to transplant the 'Blue Hubbard' seedlings at least two weeks before your cash crop. Having one or two cucumber beetles or squash bugs on

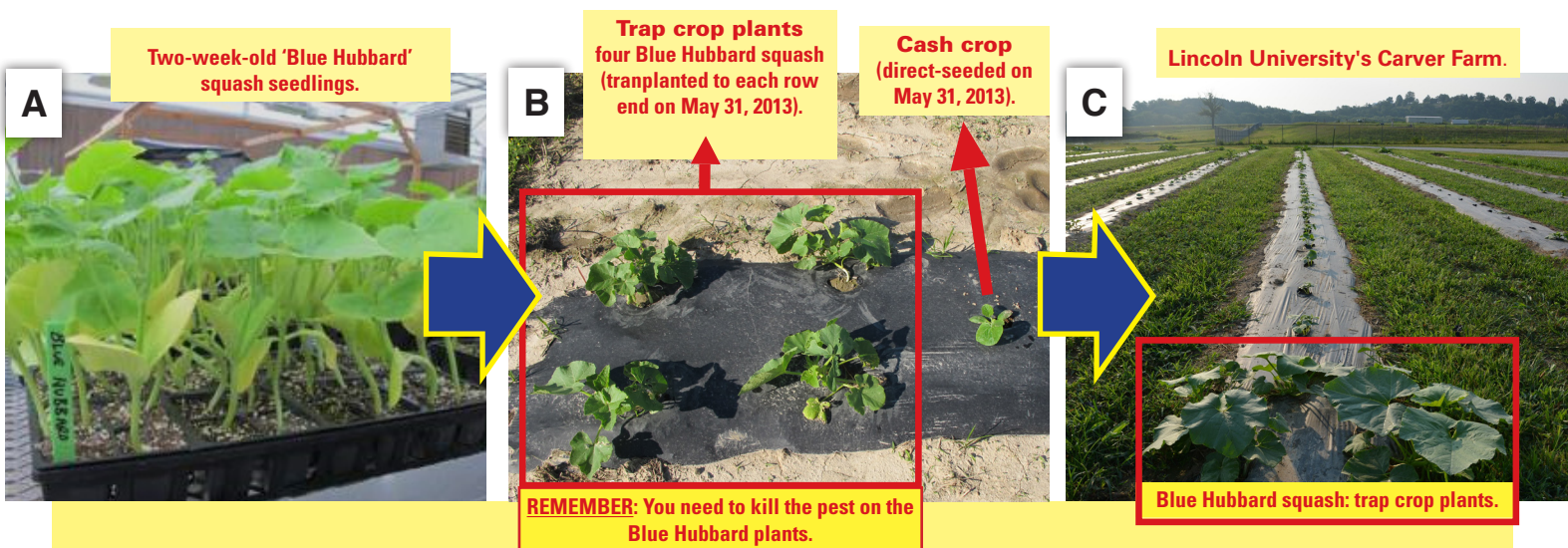
your cash crop does not mean that you need to spray the entire field. Instead, by targeting the trap crops for insect termination, it may be possible to remain below the economic threshold (the point beyond which the number of beetles will lead to economic loss).

Research by the LU IPM Program has found that for a small garden of 100 or so cucurbit plants, cucumber beetles and squash bugs can be controlled using six to eight 'Blue Hubbard' squash plants. The trap crop should be planted at the garden corners, about 3-8 feet from the cash crop.

On a commercial farm, for cucurbits grown using plastic mulch and drip irrigation, it is recommended to transplant two to four 'Blue Hubbard' squash seedlings at both ends of each row (see photos below).

How can I remove or kill cucumber beetles and squash bugs congregating on trap crops?

Insect pests massing on the trap crop should be killed. Otherwise, they are likely to reproduce on those plants. Then, they can move to the cash crop. Below are some insecticide recommendations. Non-insecticidal options include vacuuming using a reverse leaf blower, a practice conducted by some Massachusetts farmers. Hand-picking bugs or flaming (if this will not destroy the plastic mulch) can also be used. If insect removal means that trap crops will be sacrificed, it is a good idea to have 'Blue Hubbard' squash seedlings on hand as replacements.



(A) Two-week-old 'Blue Hubbard' squash seedlings ready to be transplanted to the field. (B) For the IPM studies, four 'Blue Hubbard' squash seedlings transplanted at the ends of each row, when the cash crop seeds are sowed, have produced excellent results. (C) Field view of 'Blue Hubbard' squash plants (larger plants inside the red box) used as trap crops planted at both ends of each row at Lincoln University's George Washington Carver Farm.

Conventional insecticides: Foliar (leaf) applications of the insecticides listed in the Midwest Vegetable Production Guide for Commercial Growers for use in cucurbit crops effectively control cucumber beetles and squash bugs. Some producers have opted to use small amounts of systemic insecticides, such as Admire® Pro or Alias® 2F, applied to the trap crop only. When applied to the roots, systemic insecticides are absorbed by the plant tissue, making the plants toxic to any insects feeding on them. Imidacloprid-treated plants will continue to kill insect pests for about three to four weeks.

Organic insecticides: Spinosad-containing insecticides are effective at killing cucumber beetles. However, they are ineffective at controlling squash bugs. Pyrethrin-containing insecticides, such as Azera® and Pyganic®, are fair options to kill cucurbit pests but the highest rate may be needed and they may need to be re-applied frequently.



View of squash bugs and cucumber beetles killed by systemic insecticide applied to the roots of 'Blue Hubbard' squash (trap crop).



'Blue Hubbard' squash can also be grown in large pots. Some farmers have implemented trap cropping by placing potted 'Blue Hubbard' plants outside high tunnels. Treating the potted plants with a systemic insecticide has given good control. If temperatures at night are expected to drop, potentially injuring the 'Blue Hubbard' squash seedlings, the pots can be moved indoors temporarily.

Always follow the label instructions and safety procedures. Also, check to be sure the chemical you are using is registered for use on your crop. Mention of trade names or commercial products does not constitute endorsement or recommendation for use. If you are an organic certified producer, make sure that the substance, including its brand name and formulation, is listed in your organic system plan and that it is reviewed and approved by your USDA-accredited certification agency.

One way to determine the success of trap cropping is by scouting both the trap crops and the cash crop at least once per week. If the number of cucumber beetles on cucumbers or muskmelon (cash crops) averages less than one per plant, the pest density is unlikely to cause economic damage. Therefore, no insecticide sprays are needed. However, if the average number of cucumber beetles is more than one per cash crop plant, then applying insecticide is advised. For zucchini, squash and other bacterial wilt-resistant crops, an average of five beetles per plant is acceptable.

For squash bugs, apply insecticide to the cash crop if the following conditions are met: (1) plants are in the seedling stage, (2) squash bugs are present, and (3) some wilting is seen. At the early flowering stage, the cash crop can tolerate an average of one egg mass per plant.



View of a zucchini field protected by 'Blue Hubbard' squash (larger plants at the end of rows). Buckwheat (blooming on the left) was planted to enhance crop pollination and to bring beneficial insects. By not spraying insecticides to the cash crop, pollinators and the pests' natural enemies are protected.

What should I do if trap cropping does not work?

Besides the above recommendations, 'Blue Hubbard' squash must be properly watered and fertilized, just like the cash crop, for trap cropping to work well. Stressed or diseased plants will not perform as well as healthy plants. One suggestion to increase the chance of success is to plant an additional 'Blue Hubbard' seed in the same location once trap crop plants start blooming. Remember, insect pests on trap crop plants need to be killed; otherwise, the pest will reproduce and kill the trap crop plants. Next, they will likely move to the cash crop. If trap cropping is used and the density of pests on the cash crop is higher than the thresholds listed above, an insecticide spray is needed.

As a result of research and outreach conducted since 2011, some

Considerations for successful implementation of trap cropping:

- (1) Grow 'Blue Hubbard' squash seedlings before the cash crop. Transplant two-week-old 'Blue Hubbard' squash plants to the field at the same time you sow the seeds of the cash crop or two weeks before you transplant your cash crop.
- (2) Cucumber beetles and squash bugs have few natural enemies. Thus, insect pests congregating on trap crop plants need to be removed by either spraying an insecticide or by other means (e.g., vacuuming, by hand).

Missouri farmers who have adopted trap cropping have increased production of high-quality vegetable crops using more sustainable IPM methods. This has led, for some producers, to increased profits and less negative impact on pollinators and other beneficial insects, while decreasing pesticide use, labor and other farm inputs.

Bibliography

Capinera, J. L., 2001. *Handbook of Vegetables Pests*. New York: Academic Press.

Egel, D. S., Foster, R., Maynard, E., Weller, S., Babadoost, M., Nair, A., Rivard, C., et al. *Midwest Vegetable Production Guide for Commercial Growers 2017*. Last modified March 13, 2017. <https://ag.purdue.edu/btny/midwest-vegetable-guide/Pages/default.aspx>.

Foster, R. E. "Vegetable Insects: Cucurbit Insect Management." Purdue University Extension publication E-30-W. Last modified March 2016. <https://extension.entm.purdue.edu/publications/E-30.pdf>.

Lam, F., and R. E. Foster. "Vegetable Insects: Monitoring and Decision Making for Cucumber Beetles on Muskmelon." Purdue University Extension publication E-101-W. Last modified May 2010. <https://extension.entm.purdue.edu/publications/E-101.pdf>.

Pair, S. D. 1997. "Evaluation of Systemically Treated Squash Trap Plants and Attracticidal Baits for Early-season Control of Striped and Spotted Cucumber Beetles (Coleoptera: Chrysomelidae) and Squash Bug (Hemiptera: Coreidae) in Cucurbit Crops." *Journal of Economic Entomology* 90: 1307-1314. ■