

Alternative Pest Control Methods for the Invasive Pest, *Bagrada hilaris*

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ABSTRACT

The goal of this project is to examine vacuuming as a feasible organic method of control for the Bagrada bug, *Bagrada hilaris*. Vacuumed samples of the insect were collected from a treatment condition and a control condition across five days off of a crop of turnips, *Brassica rapa* var. *rapa*, at Cal Poly Pomona's Spadra farm. Preliminary results seem to indicate that vacuuming may reduce Bagrada bug populations in the field but not enough to stay within tolerable economic thresholds of crop loss.

INTRODUCTION

- ✓ Bagrada bug, *Bagrada hilaris*, is an invasive insect pest originally from Africa that is now found throughout Southern California, the Southwest U.S., and as far north as Yolo County.
- ✓ It causes significant damage to Cole crops (e.g. broccoli, cabbage, kale) and has been seen feeding on a host of other crop families, from papaya to potatoes.
- ✓ Bagrada bugs have caused 10% crop loss in broccoli, 20% crop loss in cauliflower, and 35% yield loss in cabbage.
- ✓ Yearly production of broccoli, cauliflower, and cabbage in California are worth \$806.6 million, \$309 million, and \$177.7 million, respectively.
- ✓ Despite its significant impact on California agriculture, only preliminary research on the insect's biology has been conducted.
- ✓ Very few effective control measures are available:
 - ✦ Applications of insecticides such as bifenthrin, methomyl, or chlorpyrifos every three days during certain crop growth stages,
 - ✦ Or dinotefuran, a neonicotinoid, every five days.
- ✓ Purpose:
 - ✦ Develop an alternative control method that is practical for small organic crop producers, who have been especially impacted by the Bagrada bug.
 - ✦ Investigate if vacuuming, which has proven successful in other crops, is a potential method of control for Bagrada bug.



Figure 1: Life Stages of *Bagrada hilaris* (<http://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=17517>)



Figure 2: Typical Damage Caused by *Bagrada hilaris*



Figure 3: Infestations are Extensive if Left Untreated

METHODS

(NOTE: The original approach of this project, to investigate vacuuming on Bagrada bug populations during the spring, summer, and fall of 2017, was hampered by the fact that Bagrada bugs were not present in farm fields throughout California for the first nine months of the year. Bagrada bug did finally appear in October. It remains a mystery as to why this occurred).

- ✓ A row crop of turnips, *Brassica rapa* var. *rapa*, at Cal Poly Pomona's Spadra farm, was used.
- ✓ Bagrada bugs were collected via vacuum sampling from Treatment and Control plots for five days.
- ✓ All treatment plots were vacuumed with a modified leaf blower on the first day of the experiment.
- ✓ On the subsequent four days, three Treatment plots were randomly selected and insects were collected with the vacuum.
- ✓ Each day, three Control plots that had never been previously vacuumed were sampled with the vacuum.
- ✓ All insect samples were brought back to the lab and kept in the laboratory freezer until they were inspected for Bagrada bug and other key insect groups.



Figure 4 & 5: A Modified Leaf Blower is Used to Collect Samples of *Bagrada hilaris*



Figure 6: A Crop of Turnips, Divided Into Treatment and Control, is Flagged for Vacuum Sampling

RESULTS

- ✓ Nymph populations are near identical between treatment and control plots.
- ✓ Adult populations were reduced by approximately 40% between days 1 and 2 (from 25 to 15, respectively).
- ✓ Adult populations in treatment plot recovered to same levels as control plot within the following three days.

IMPLICATIONS & FUTURE WORK

- ✓ Vacuuming may reduce Bagrada bug populations in the field, but it does not seem to be an effective control method once outbreaks occur.
- ✓ It remains to be seen if vacuuming can prevent outbreaks from happening, a goal of future research.
- ✓ Vacuuming may be destructive to the crop itself and this needs to be factored into the feasibility of this pest control method.
- ✓ Bagrada bug's absence from California crop fields during most of the year raises many questions about the biology of this invasive insect.
- ✓ Organic Farming:
 - ✦ California has more organic farms than any other state.
 - ✦ Bagrada bug causes losses in multi-million dollar crops such as organic broccoli (\$30 million dollars in sales per year in California) and organic cauliflower (\$17 million dollars in sales per year in California).
- ✓ Urban Farming:
 - ✦ Urban agriculture has become a priority for non-profit organizations, city planners, and government agencies because of its associated benefits combating poverty and enhancing public health.
 - ✦ In light of these benefits, the California legislature passed the Urban Agriculture Incentive Zones (AB 551) program in 2014, allowing California municipalities to offer tax credits to urban farmers.
- ✓ Extension of Growing Season:
 - ✦ Best method organic growers can implement is to not grow cole crops (cabbage, broccoli, kale, etc.) during the warmer months. This means that Southern California organic farmers are not producing numerous lucrative crops four to six months out of the year.
 - ✦ Continued research in alternative control methods and the development of a state-wide control program may provide relief for urban and organic farmers, increasing the growing season of cole crops by four to six months and enhancing farm revenue.

Acknowledgements

This project was supported by the California State University Agricultural Research Institute Grant number 17-04-235 and the Kellogg Honors College.

*References available upon request.