Western IPM Center

Project Report Form

How to submit: Please submit this completed form electronically, as an attached Microsoft Word file, to Frank Zalom at fgzalom@ucdavis.edu. **Content:** Complete each section below, and include responses to as many of the questions listed in Attachment A as are relevant to your project. *These are guidelines.* Provide your readers with enough detail that someone who is not familiar with your project can understand what you were trying to achieve, how you went about it, and what you accomplished, but please keep it concise.

A. Report Data

Date: 31 Oct 2009
Reporting Period: 01 AUG 2008 TO 31 JUL 2009
Report Type (please check one):
☒ Progress Report ☐ Final Report

B. Grant Data

- Grant Agreement #: 2008-34103-19414
- Title: USING INTERCROPS AND ALTERNATIVE PREY TO BOOST PREDATORY FLIES IN LETTUCE
- Grant Type: SPECIAL GRANT
- Lead investigator:
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- Team members (name, title, institution): Nick Mills, Professor, U.C. Berkeley, Dept. of ESPM. (2) Erik Nelson, Asst. Specialist, U.C. Berkeley, Dept. of ESPM
- State(s) involved: California

C. Nontechnical Summary. An overview of the project, briefly outlining the problem(s), how your project addresses them, and your results, *written to a lay audience.* (500 words)

Aphids are major pests of lettuce. They feed in the plant interior and damage crops primarily through contamination. Because it is difficult to achieve direct contact with insecticides, conventional lettuce production routinely employs systemic pesticides. Organic lettuce production is unable to use these synthetic compounds and instead relies on biological control. The most important biological control agents are naturally-occurring syrphid flies. One strategy for enhancing the local syrphid fly population is to plant intercrops that will host non-pest aphids. The non-pest aphids in the intercrop would serve as alternative prey for syrphid flies and would support their development prior to the appearance of the pest aphids. The long-range goal of this project is to assess the feasibility of using intercrops and alternative prey to enhance in-field syrphid populations and suppress pest aphids. Previous research screened nine potential intercrops for their ability to provide food for syrphid larvae. In two phases, the current research project is further testing the three most promising intercrops in large scale field experiments. First, we are determining which intercrop has the most potential for reducing pest aphid densities and improving crop quality. Second, we are attempting to integrate the use of host plants for alternative aphids with the existing grower practice of planting flowers to provide nectar and pollen. In both phases we will check that intercrops do not exacerbate any existing pest problems. This project will develop a pest control tactic that relies on naturally-occurring predators rather than chemical sprays. If intercropping for alternative aphids proves to boost syrphid numbers and suppress pest aphids in lettuce, this strategy could be adopted by lettuce growers practicing sustainable agriculture.

D. Objectives and Progress. List your objectives and describe your progress for each objective.

Objective 1: Test the ability of intercrops bearing non-pest aphids to increase syrphid populations and reduce aphid populations in lettuce fields. Progress: In summer of 2008 we compared three potential intercrops—barley, bell beans, and vetch—and learned that barley hosts non-pest aphids the most reliably and in the greatest numbers. However, none of the intercrops reduced the densities of pest aphids in the immediately adjacent lettuce. Syrphids are highly mobile, and their range exceeds the size of our experimental plots (40 m). Thus, intercrops with resources for syrphid flies may influence syrphid and pest populations over hundreds of meters, and these effects may be difficult to observe. However, our periodic sampling program showed that high numbers of syrphid larvae at one sample date were correlated with low numbers of pest aphids two weeks later. This result is evidence that syrphid larvae do indeed suppress pest aphids.

Objective 2. Integrate an intercrop bearing non-pest aphids with existing grower practices. Progress: We will conduct two trials of a field experiment to compare barley (a source of alternative prey) with flowers (a source of nectar and pollen). The fall trial was completed in fall of 2009; the spring trial will be run in spring of 2010.

Objective 3. Test for negative effects of intercrops on pest management. Progress: In the 2008 trial, none of the three intercrops hosted aphid species that are pests of lettuce. At certain times of year, some of the intercrops were associated with higher densities of thrips, which can damage lettuce directly and vector certain pathogens.

E. Outputs. List your project's outputs, which might include publications, information, data, meetings held, attendance at meetings held, etc.

The results of our 2008 experiment were presented to the annual meeting of the California Lettuce Research Board in March, 2009. The fall 2009 experiment was presented to a group of approximately 20 growers and resource managers in a field day event at the site of the experiment.

F. Impacts and Potential Impacts. The "impacts" and "potential impacts" sections of your report will help the Western IPM Center highlight the value of IPM research and education by detailing the

real-world impacts of Center-funded projects. We will use the information in news articles, reports, and informational brochures to showcase the impacts of projects that our program supports. *See Attachment A at end of form for questions to assist you in describing the impacts of your project.*

1. Impacts. Describe any impacts of your work. ***Impacts*** are specific changes in condition for those affected by your work. Impacts include adoption of technology, creation of jobs, reduced cost to the consumer, less pesticide exposure to farmers, access to more nutritious food, and a cleaner environment and healthier communities.

Concrete impacts are beyond the scope of this research project.

2. Potential impacts. Describe your project's potential impacts. ***Potential impacts*** are the ways that your project's outputs could directly lead to changes in condition that will unfold in the future.

The final phase of our research will conclude in spring of 2010. We expect to demonstrate that barley is a useful intercrop in organic lettuce fields, or that it is not. If the alternative aphids that appear on barley help sustain syrphid flies and improve control of pest aphids, our research may lay the foundation for growers to test this practice in their own farm operations. If our research deems this tactic ineffective, it will provide growers with an evaluation of a frequently-suggested IPM tactic and it will allow them to allocate their R&D resources to other projects.

G. Appendices

1. With your report, please attach ***at least two (2) photographs*** that illustrate your project. Please describe the photo and indicate the name and institution of the person who took the photo. (If you submit more than two photographs, please include those additional descriptions and photo credits under "H. Additional Information," below.)

Photo #1 description:

(Daane1…) Organic romaine lettuce adjacent to experimental intercrops of barley, alyssum, bell beans, and vetch. 2008.

Photo #1 credit (photographer's name and institution):

Erik H. Nelson, U. C. Berkeley

Photo #2 description:

(Daane2…) Experimental intercrops of barley, alyssum, bell beans, and vetch in a field of romaine lettuce. 2008.

Photo #2 credit (photographer's name and institution):

Erik H. Nelson, U. C. Berkeley

2. Also attach any printed fact sheets or other publications resulting from your work that will enhance our understanding of your project and its impacts. Please provide a description of each attached publication below.

Document #1 description:

Document #2 description:

Document #3 description:

H. Additional Information

Photo "Daane3": Researcher Erik Nelson examines an experimental intercrop of bell beans for alternative, non-pest aphids. 2008. Photo credit: Marcos Botton.

Credit: *Some of the language about impacts and potential impacts was adapted from a PowerPoint presentation by H. Michael Harrington, Executive Director, Western Association of Agricultural Experiment Station Directors, Colorado State University.*

Attachment A

Questions to Help in Reporting Impacts and Potential Impacts

Below are some questions that will guide you in assessing and then describing the impacts and potential impacts of your project. The relevance of each question may vary depending on whether yours is a research or extension project. Please answer as many as you can to the best of your ability, and feel free to describe any additional types of impacts not mentioned below. Remember to identify any potential impacts.

1. ***Innovations in IPM:***
   Are there new IPM practices that have been (impacts) or could be (potential impacts) adopted as a direct result of your project? What is the total number of acres (or homes, schools, greenhouses, nurseries) on which these practices could realistically be implemented?
2. ***Safeguarding human health and the environment:***
   a. Has the project reduced risk (or could it potentially do so) by changing the use of pesticides on farms, in homes, in schools, etc.? For example, could it result in fewer sprays per season or a switch to lower-risk pesticides? If possible, quantify the changes in condition. (Since there is no unanimous definition of *high* and *low risk,* investigators selecting this indicator are asked to categorize the pesticides they are reporting on as *high* or *low risk* according to the particular situation [e.g., lower risk to natural enemies]).
   b. Are there any other impacts or potential impacts on human health or the environment as a result of your project?
3. ***Economic benefits:***
   a. What is (or could be) the economic benefit (e.g., dollars saved) for clientele who adopt IPM strategies and systems you studied? Do you envision potential commercialization or mass production of these systems?
   b. How many clients are satisfied with IPM results (such as improved yield, improved quality of yield, reduced pest populations, more effective pest control, greater preservation of nonpest species)?
   c. Are there other financial benefits that might be realized (potential impact) as a result of your project?
4. ***Implementation of IPM:***
   a. How many IPM strategies and systems have been validated through this project (e.g., through on-farm trials, large plot tests, or other methods used to confirm efficacy)?
   b. How many educational materials were delivered? To whom? And what are the impacts or potential impacts?
   c. What is the number of growers/personnel trained? And what are the impacts or potential impacts?
   d. For a Web site, what volume of traffic and type of use has the site experienced? (For example, number of visitors per day or month; number of page views; number of unique user sessions; change in volume during growing season; average viewing time.) And what are the impacts or potential impacts?
   e. How many more people adopted IPM practices as a direct result of your project, or how many people adopted new IPM practices?
   f. Are there other ways in which your work will result in improved use or increased implementation of IPM strategies in your region or across the West?
5. Has your project or study increased collaboration among stakeholders interested in the development and implementation of improved IPM strategies and systems?