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: 10/27/09
Reporting Period:
Report Type (please check one):
☒ Progress Report ☐ Final Report

B. Grant Data

- Grant Agreement #: NM-112816
- Title: Seasonal Phenology of the Beet Leafhopper in Relation to its
- Weed Hosts and Beet Curly Top Virus Infection
- Grant Type: Western Region IPM Grant
- Lead investigator:
  - Name: Rebecca Creamer
  - Title: Associate Professor
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- Team members (name, title, institution): C. Scott Bundy, Associate Professor, NMSU
- Jill Schroeder, Professor, NMSU
- Leigh Murray, Professor, Kansas State University
- State(s) involved: New Mexico and Kansas

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)

Curly top virus (BCTV), which is transmitted by the beet leafhopper, Circulifer tenellus (Baker) [Hemiptera: Cicadellidae], has caused significant problems to irrigated agriculture in the western US since 1899. In New Mexico, curly top disease causes substantial (over 50% in some years) losses to chiles. Since the crop is often grown with a small profit margin, growers are not able to grow chile profitably with that level of loss. Growers often attempt to control the problem by insecticide application, but the vector can transmit the virus more rapidly than an insecticide can be effective. As such, insecticide use for control of curly top is not sustainable from an IPM, environmental, or economic perspective. Little is known about the seasonal development of the beet leafhopper in New Mexico. A better understanding of the phenology of this insect (number of generations, timing of nymphal and adult development, etc.) and its interaction with weed hosts and chile are critical for proper timing and implementation of management strategies. Thus, a better understanding of how the beet leafhopper interacts with important weeds, such as London rocket, will allow commercial growers and gardeners in the general public not only the advance warning of likely high disease pressure, but also a necessary tool to implement effective disease management.

Beet leafhopper populations have been evaluated each week in southern New Mexico at multiple locations since January 2008. Sampling consisted of weekly sweep and bucket samples and plant stem/leaf samples to determine adult/nymph and egg populations, respectively. Based on field research consisting of weekly samples over nearly two years, we find that the beet leafhopper completes 1 (possibly 2) generations on weedy hosts in southern New Mexico; this is considerably fewer generations than previously speculated in the literature. The insect will complete its development on the weeds London rocket and kochia, showing that these weeds are important hosts of the leafhopper. Based on the developmental phenology of the insect and weed hosts, we will be able to adjust management strategies to better manage for this pest and the virus.

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

The overall objective of the proposed research is to determine the seasonal phenology of the beet leafhopper in southern New Mexico and its relationship to weed host phenology and habitat. These data will be used to better implement management strategies, including when and where the weed hosts should be removed for optimum disease control. Specific objectives include:

1. Establish the seasonal phenology of the beet leafhopper in southern New Mexico, using London rocket and Kochia scoparia as key winter and summer hosts, respectively and assess the effect of habitat of London rocket and Kochia on suitability for beet leafhoppers.

PROGRESS: Beet leafhopper populations have been evaluated each week in southern New Mexico at multiple locations since January 2008. Sampling consisted of weekly sweep and bucket samples and plant stem/leaf samples to determine adult/nymph and egg populations, respectively. Based on field research consisting of weekly samples over nearly two years, we find that the beet leafhopper completes 1 (possibly 2) generations on weedy hosts in southern New Mexico; this is considerably fewer generations than previously speculated in the literature. Data collection will continue through the end of 2009 and possibly into early 2010. This will allow for clarification of field data. Dissection of adult female leafhoppers continues and gives us additional information on phenology. We have shown that the beet leafhopper will complete its development on the weeds London rocket and kochia, showing that these weeds are important hosts of the leafhopper.

2. Determine the natural incidence of curly top on London rocket in different months of the year.

PROGRESS: Weekly or bi-weekly plant samples have been preserved since early 2008 and will be processed and virus extracted in the near future. This will show levels of curly top virus in relationship to beet leafhopper populations.

3. Refine management recommendations for curly top based on the results obtained.

PROGRESS: Our developing picture of leafhopper development timing in relationship to plant phenology and host suitability should allow us to improve management strategies. Results will soon be forthcoming.

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

Davis, G. and Scott Bundy. 2009. Seasonal phenology of the beet leafhopper, Neoaliturus tenellus (Baker) (Hemiptera: Cicadellidae), in southern New Mexico. poster presentation, ESA National Meeting, Indianapolis, IN (Dec. 13-16).

Davis, G. and C. Scott Bundy. 2009. Phenology of the Beet Leafhopper in the Mesilla Valley of Southern NM. invited talk, Curly Top Regional Working Group Meeting, Tucson, AZ, (Aug. 20, 2009).

Davis, G. and Scott Bundy. 2009. Seasonal development of the beet leafhopper, Neoaliturus tenellus (Baker) (Hemiptera: Cicadellidae), in southern New Mexico. oral presentation, Rocky Mountain Conference of Entomologists, Silverton, CO (Aug. 3-4).

Davis, G. and C. Scott Bundy. 2009. Seasonal phenology of the beet leafhopper, Neoaliturus tenellus (Baker) (Hemiptera: Cicadellidae), in southern New Mexico. poster presentation, Annual Meeting of the Southwestern Branch of the ESA, Stillwater, OK (Feb. 23-26).

Davis, G. and Scott Bundy. 2008. Seasonal phenology of the beet leafhopper, Neoaliturus tenellus (Baker) (Hemiptera: Cicadellidae), in southern New Mexico. poster presentation, ESA National Meeting, Reno, NV (Nov. 16-19, 2008).

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.

The results of this research, when completed, will provide New Mexico growers with critical information on the associations among the beet leafhopper, beet curly top virus, and key weed populations and the seasonal timing of these associations, providing management tools to better deal with this pest complex.

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.

ECONOMIC BENEFITS -

Better management strategies developed due to an increased understanding of the seasonal relationships of the beet leafhopper, weed hosts, and beet curly top virus should result in better yields and increased profits.

ENVIRONMENTAL BENEFITS -

Our data should offer the potential to reduce insecticide applications (and resulting environmental exposure) due to a better understanding of the timing of the seasonal development of the beet leafhopper.

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:

Master's student Graeme Davis busy at work pinning beet leafhopper specimens in the laboratory

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

Scott Bundy, New Mexico State University

Photo #2 description:

Beet leafhopper habitat in southern New Mexio, showing London rocket growing at the margin of a field

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

Scott Bundy, New Mexico State University

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

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?