Efficacy of Bifenthrin against Seedcorn Maggots on Dry Bulb Onion

Project No. P13485
Date: 02/2023

PROJECT TITLE:

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PROJECT JUSTIFICATION AND OBJECTIVES:

Seedcorn maggot (SCM) is a major pest of many agricultural crops because it attacks germinating seeds and seedlings, often a problem in the spring when soil temperatures are cool and soil moisture is high. This pest can devastate crops resulting in complete plant stand loss. Because SCM is a ubiquitous pest on most farms, it is considered a very common annual pest. For dry bulb onion, SCM damage may stunt plant growth, which may reduce yield. Due to the loss of chlorpyrifos and lack of effective alternative resolutions, onion growers may benefit from the addition of bifenthrin, an active ingredient known to be effective on soil-borne pests, to their pest management toolbox.

The goal of this study is to generate efficacy and phytotoxicity data to support the registration of bifenthrin to control SCM infestations in dry bulb onion.

Adherence to Good Laboratory Practices (GLPs) is NOT required for trials conducted under this research plan.

IR-4 RESEARCH COORDINATOR:

Consult with the Research Coordinator listed below regarding desired changes in this research plan prior to occurrence.

Dr. Alice Axtell, Principal Entomologist
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Signature of IR-4 Research Coordinator

2/16/2023
Date

MATERIALS & METHODS:

Host plant: Dry bulb onion (*Allium cepa* spp.)

Host Plant Management: Follow local agricultural practices for the production of dry bulb onion including fertilization, irrigation, weed and fungal disease management that ensure good crop production.

Insect Pest: Seedcorn maggots (SCM) (*Delia platura*)

Artificial Pest Infestation: If a low natural pest pressure is expected, it is recommended to apply a combination of bone and meat meal or dog food in a narrow band over the row immediately after seeds are planted, to increase the attractiveness of the plot to the pest.

Test Site: Conduct a trial under field conditions.

Treatments: View Table 1 for the full list of treatments. Read product label and follow use directions prior to applying any insecticide. The IR-4 Research Coordinator will request and arrange the shipment of the test substances (all treatments except the adjuvant) prior to trial initiation. Upon receipt, document the lot/batch number. Store the test substance in a secure, clean, dry area at temperature ranges noted in the product label. Avoid treating plants under unusually extreme environmental conditions.

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Table 1: List or treatments

Treatment	EPA Reg. #	Active Ingredient	MFG	Application Method	Product Rate	GPA
Untreated check	N/A					
Diazinon AG500[1] [COMMERCIAL STANDARD]	66222-9	Diazinon	Adama	Broadcast just before planting and immediately incorporate into the top 3-4 inches of soil. REI: 3 days	4 qts/A	20-50 gal/acre
Capture LFR[2]	279-3302	Bifenthrin	FMC	T-band application or banded application at planting after the furrow is closed followed by 0.375 inch of irrigation	252.3 ml/A	
				Banded application approximately 10 days after seeding followed by 0.375 inch of irrigation		

[1] **Sample calculation for broadcast applications:** Treated area = swath width × row length × number of passes, where swath width is the number of nozzles × nozzle spacing

[2] **Sample calculation for banded applications:** Treated area = swath width × number of rows × row length, where swath width is measured at the target surface since the height of the nozzle influences the width.

Adjuvants: All applications shall include an adjuvant at a rate recommended by the adjuvant label.

Application Equipment: Flat fan nozzles are recommended for this study as they are designed to overlap. Alternatively, use application equipment that will provide uniform application of the treatments and simulates the intended commercial application technique. To ensure accurate delivery, calibrate the equipment prior to application of the test substance(s).

Experimental Design: Each treatment should be replicated at least **6** times. Each replicate should consist of 4 rows spaced 3.5 inches apart from each other and at least 20 ft long. Treatments should be arranged in an appropriate experimental design that minimizes the bias deriving from environmental differences across the testing site. A completely randomized block design is usually recommended for field and large scale greenhouse trials. If feasible, maintain an untreated buffer of 5-6 ft around each experimental unit.

Supplemental Crop treatments: The integrity of the study should be protected by managing pests causing significant damage to the crop other than the test target pest. Only EPA-registered maintenance pesticides should be used at labeled rates and applied to replicates. Document all supplemental crop treatments.

DATA COLLECTION:

Efficacy: Conduct 3-4 stand counts of all the plants emerged within a randomly selected 10 square foot section from each experimental plot starting at plant establishment and continuing on a weekly basis. At each sampling date, excavate some plants to confirm the presence of SCM.

Plant Vigor: For each treatment, find the most vigorous replicate and record that value as 100%. Then compare the other replicates to the most vigorous one using a scale from 0 (= dead plot) to 100 (most vigorous). Alternatively, find the most vigorous plot in the whole trial and then compare the rest of the plots to it.

Yield: At harvest, select a random 10 square foot section from each experimental plot and collect all the onions grown within that space. Measure their diameter and classify the harvested onions based on the following commercial sizes: pre-pack (<2.25”), medium (2.25-3”), jumbo (3-4”), colossal (>4”), and cull (onion that fails to meet the requirements of either of the foregoing grades and topping requirements). For each bulb category, measure the weights with a free-standing scale and calculate the proportional weight in tons per acre.

Crop Injury: Use the rating scale below to conduct 3-4 weekly assessments of potential insecticide-induced damage to plants. Assessments should be conducted on the untreated control plants at the same time when assessments are conducted on treated plants. If phytotoxicity is observed on treated plants, provide a description of the symptoms observed and take pictures comparing treated and untreated plant material.

- 0 = no damage seen in the experimental plot
- 1 = damage seen in ≤10% of the experimental plot
- 2 = damage seen in 11-25% of the experimental plot
- 3 = damage seen in 26-50% of the experimental plot
- 4 = damage seen in >50% of the experimental plot

STATISTICAL ANALYSIS:

Conduct appropriate statistical analysis to determine if significant differences exist between treatments. Statistical analysis from commonly used agricultural data programs, such as but not limited to Agricultural Research Manager (ARM), SAS, Minitab, etc. is acceptable.

DATA REPORTING:

At trial completion, please submit a final report and the raw data in two separate files to the IR-4 Research Coordinator and the appropriate Regional Field Coordinator (RFC) listed below.

For the sake of consistency and to avoid missing information, IR-4 encourages collaborators to adopt and fill out the Final Report Research Template provided by the Research Coordinator prior to trial conclusion.

The final report should be submitted to IR-4 within 60 days of last data collection.

For non-confidential test substances, IR-4 encourages researchers to publish the results obtained from the study. Any publications should acknowledge support by IR-4.

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TRIAL SITE INFORMATION

Researcher	Field ID No.	RFC
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RESEARCH FIELD COORDINATORS (RFC)

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