Efficacy and Crop Safety of Cyazofamid for the Control of Club Root in Turnip

Project No. P13015
Date: 09/2022

PROJECT TITLE:

Efficacy and Crop Safety of Cyazofamid for the Control of Club Root in Turnip.

PROJECT JUSTIFICATION AND OBJECTIVES:

IR-4 received a request for the use of cyazofamid for control of club root (*Plasmodiophora brassicae*) in turnip. The purpose of this research is to collect efficacy and crop safety data to support registration of cyazofamid for use on this specialty crop.

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 and Plant Pathologist,
IR-4 Project Headquarters
1730 Varsity Drive, Venture IV Suite 210, Raleigh, NC 27606
Office: (919) 515-3055;
E-mail: aaxtell@ncsu.edu

9/2/2022

Signature of IR-4 Research Coordinator
Alice Axtell

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MATERIALS & METHODS:

Host plant: Turnip (*Brassica rapa* spp.) - Use locally grown commercial varieties that are susceptible to the test pathogen.

Pathogen: Club root (*Plasmodiophora brassicae*)

Test site: Greenhouse

No. of trials: 2

Treatments: See tables below. Treatments differs slightly between Trial 1 and 2.

Seeding Directions: Sow two turnip seeds per pot within 1 day from treatment application, thinning to one seedling 7 to 10 days later.

Pathogen Inoculation Timing: Pathogen inoculation should occur 1 week after sowing.

Test Substances Manipulation: Read product use directions prior to manipulation and application. Applicators and handlers must wear the personal protective equipment listed on the product label. Do not use old/expired products for trials conducted under this research plan. The IR-4 Research Coordinator will arrange for new test substance to be delivered.

Upon receipt of the test substance(s), document the corresponding lot/batch number. Store the test substance in a secure, clean, dry area at temperature ranges noted in the product label. Use application equipment that will provide uniform application of the test substance and simulates the intended commercial application technique. To ensure accurate delivery, calibrate test application equipment prior to application of the test substance(s).

Experimental Design: Each test site should conduct four replicates of each treatment. Arrange plots in a randomized complete block design or other appropriate statistical design. The individual plots should be large enough to permit accurate application of the test substance in a manner that represents the major application technique that will be used commercially.

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 all experimental units. Document all supplemental crop treatments.

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.

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List of Treatments for Trial 1

Treatment	MFG	EPA Reg. #	AI	Rate	Directions	GPA
Untreated (non-inoculated soil)	N/A	N/A	N/A	N/A	N/A	>50 gal/A
Untreated (inoculated soil)	N/A	N/A	N/A	N/A	N/A	
Omega 500F[1]	ISK	71512-1	Fluazinam	41.6 fl oz/A	Conduct 1 soil drench application immediately after seeding	
Ranman 400 SC	ISK	71512-3	Cyazofamid	19.5 fl oz/A	Conduct 1 soil drench application immediately after seeding	

[1]**Commercial Standard**. May delay the start of harvest up to 8 days, cause some plant stunting, and shorten harvest period without adverse effects on the final yield.

List of Treatments for Trial 2

Treatment	MFG	EPA Reg. #	AI	Rate	Directions	GPA
Untreated (non-inoculated soil)	N/A	N/A	N/A	N/A	N/A	100 gal/A
Untreated (inoculated soil)	N/A	N/A	N/A	N/A	N/A	
Omega 500F[1]	ISK	71512-1	Fluazinam	41.6 fl oz/A	Conduct 1 soil drench application before seeding	
Ranman 400 SC[2]	ISK	7151 2-3	Cyazofa mid	20.0 fl oz/A	Pre-plant soil incorporation followed by mechanical incorporation 6 to 8 inches into the soil	

[1]**Commercial Standard**. May delay the start of harvest up to 8 days, cause some plant stunting, and shorten harvest period without adverse effects on the final yield.

[2]**Ranman 400 SC - To match the concurrent GLP field studies, calculate the volume of solution to apply to each pot in the following manner:**

Assuming the most common row spacing for turnip is 36" and considering an acre is equal to an area of 208.71' width by 208.71' length we can make the following calculations:

Using 36" row, (208.71'/3'=69.57), one would have 69.57 rows that are 208.71 ft. long in an acre.

Since a 9" band is sprayed, the treated area would be 69.57' x 208.71' x ¾' = 10,890 sq. ft. treated.

20 fl. oz. / 10,890 sq. ft. = 0.001837 fl. oz. / sq. ft. (or per pot with 1 sq. ft. of area)

Assuming a spray volume of 100 gal/A, then 100 gal/10,890 sq. ft. = 0.00918 gal/sq ft = 1.411 fl. oz./sq. ft. or 41.73 ml/sq. ft.

0.001837 fl. oz. of product/ sq. ft. + 1.411 fl. oz. of water/sq. ft. = 1.413 fl. oz./sq. ft. mixture = 41.78 ml/sq. ft.

If the most common row width for turnip is NOT 36'', please update the calculations accordingly.

DATA COLLECTION:

Efficacy:

Club root incidence and severity should be rated within approximately 6 to 8 weeks after the application. Evaluations should be conducted when conditions are most favorable for club root. For incidence, evaluate turnip plants in each replicate and calculate the number of infected plants (% of infection). For severity, evaluate each turnip root plant in each replicate and use the following scale: Symptomless (1) = Healthy; Symptomatic (2) = Infected roots are enlarged, galls develop on the taproot or secondary roots, top growth is stunted and lower leaves are yellowing and dropping off. Affected plants may wilt during the day and recover at night; Dead (3) = Roots are rotting and/or contain many galls; top growth is severely wilted or dead. Additionally determine the number of plants that produce marketable-sized roots.

Crop Injury:

Crop health should be evaluated on all plots 10-14 days after the application (foliage) and at commercial maturity (roots and foliage). If injury occurs then additional evaluations should be considered. Evaluate the impact on disease development. Assess four randomly selected areas within each treatment. Use visual ratings on a 0 to 5 scale:

- For roots: 0 = no adverse effect on root; 3 = moderate stunting; 5 = severe stunting
- For foliage: 0 = no adverse effect on foliage; 3 = moderate foliage damage; 5 = severe foliage damage including defoliation and numerous spotting

Specify the type of injury (stunting, stand loss, leaf burn, leaf cupping or twisting, chlorosis, etc.). Record if any delay in maturity occurred and provide an overall assessment (if the level of phytotoxicity would be acceptable in commercial production).

Yield (OPTIONAL):

Determine yield at the conclusion of the study

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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 and the raw data 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.

TRIAL SITE INFORMATION

Researcher	Field ID NO.	RFC
Dr. Cynthia Ocamb, OSU, Botany & Plant Pathology, 2082 Cordley Hall, Corvallis, OR 97331-2902 Phone: 541-737-4020; Email: cynthia.ocambc@oregonstate.edu	P13015.22-ORP13 P13015.22-ORP14	WSR

RESEARCH FIELD COORDINATORS

WSR: Dr. Michael Horak, Western Region IR-4 Project, 4218 Meyer Hall, University of California-Davis, Davis, CA 95616; Tel: (530) 752-7634, FAX# 530-752-2866; e-mail: mjhorak@ucdavis.edu