IR-4 NATIONAL PESTICIDE CLEARANCE
EFFICACY AND PERFORMANCE PROTOCOL

PR. NO.: B00102
DATE: 1/24/19

1. PROJECT TITLE:
Weed Management Herbicide Screening

2. JUSTIFICATION AND OBJECTIVES:
IR-4 has received a request for the screening of minor use of herbicides to control weeds. The purpose of this research is to collect safety data to support pesticide registration according to parameters outlined in the request.

3. **IR-4 RESEARCH COORDINATOR:**

Michael Braverman 1/11/19

Michael Braverman IR-4 Project Headquarters, 500 College Road East, Suite 201 W, Princeton, NJ 08540, (732) 932-9575 4610, FAX# (609) 514-2612, E-mail: mbrave@njaes.rutgers.edu

4. **TEST SYSTEM/CROP:**
Use a commercial organic variety of sweet corn, grain sorghum, and rice. Report: variety/source, lot number, etc. Field trials will be conducted at the appropriate sites to determine herbicide performance. Other monocot crops may be added if available for your location.

5. **TEST/CONTROL SUBSTANCE:**
IR-4 Personnel will arrange procurement of the test substance. 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.

6. **TEST SYSTEM DESIGN and STATISTICAL METHOD:**
Each test site will consist of four replicates. The individual plots will be large enough to permit accurate application of the test substance Conduct appropriate statistical analysis to determine if significant differences exist between treatments.

7. TEST SITE PREPARATION:
Prepare test site following good local agricultural practices for the production of crops including fertilization, irrigation, if necessary and available, and other practices that ensure good crop production. The soils should be dominated by broadleaf weeds, preferably Abutilon, *Amaranthus*, *Chenopodium*, Cirsium and/or *Galinsoga*. It is optional to seed strips of these weeds into the plots if available. Till prior to planting crops or weeds.

8. TEST SUBSTANCE APPLICATION:

Use application equipment that will provide uniform application of the test substance and simulates the intended commercial application technique as specified below. To ensure accurate delivery, calibrate test application equipment just prior to application of the test substance.

4. APPLICATION TREATMENTS AND TIMING:

	Type of Application	Treatments	Rate and timing
1	-	Untreated control	-
2	Delayed Pre	Avenger Ag Optima	Mix at a ratio of 1 quart product to 16 quarts of water. Apply to emerged weeds just before emergence of the first crop.
3	Delayed Pre	Avenger Ag Optima	Mix at a ratio of 1 quart product to 16 quarts of water. Apply to emerged weeds just before emergence of the first crop.
	Post	MBI-014 WDG + Brandt Ultra 90	MBI-014 WDG at 3 Pounds/A in a 30 gallon per acre spray volume. Mix with Brandt Ultra 90 at 1 fl.oz. per gallon of finished spray solution. Apply at 2 weeks after planting.
4	Delayed Pre	Avenger Ag Optima	Mix at a ratio of 1 quart product to 16 quarts of water. Apply to emerged weeds just before emergence of the first crop.
	Post	MBI-014 WDG + Brandt Ultra 90	MBI-014 WDG at 5 Pounds/A in a 30 gallon per acre spray volume. Mix with Brandt Ultra 90 at 1 fl.oz. per gallon of finished spray solution. Apply at 2 weeks after planting
5	Delayed Pre	Avenger Ag Optima	Mix at a ratio of 1 quart product to 16 quarts of water. Apply to emerged weeds just before emergence of the first crop.
	Post	MBI-014 WDG + Brandt Ultra 90	MBI-014 WDG at 3 Pounds/A in a 30 gallon per acre spray volume. Mix with Brandt Ultra 90 at 1 fl.oz. per gallon of finished spray solution Apply at 3 weeks after planting
6	Delayed Pre	Avenger Ag Optima	Mix at a ratio of 1 quart product to 16 quarts of water. Apply to emerged weeds just before emergence of the first crop.
	Post	MBI-014 WDG + Brandt Ultra 90	MBI-014 WDG at 5 Pounds/A in a 30 gallon per acre spray volume. Mix with Brandt Ultra 90 at 1 fl.oz. per gallon of finished spray solution . Apply at 3 weeks after planting.
7	Delayed Pre	Avenger Ag Optima	Mix at a ratio of 1 quart product to 16 quarts of water. Apply to emerged weeds just before emergence of the first crop.
	Post	MBI-014 WDG + Brandt Ultra 90	MBI-014 WDG at 3 Pounds/A in a 30 gallon per acre spray volume. Mix with Brandt Ultra 90 at 1 fl.oz. per gallon of finished spray solution . Apply at 2 and 3 weeks after planting.

8	Delayed Pre	Avenger Ag Optima	Mix at a ratio of 1 quart product to 16 quarts of water. Apply to emerged weeds just before emergence of the first crop.
	Post	MBl-014 WDG + Brandt Ultra 90	MBl-014 WDG at 5 Pounds/A in a 30 gallon per acre spray volume . Mix with Brandt Ultra 90 at 1 fl.oz. per gallon of finished spray solution Apply at 2 and 3 weeks after plantinQ.
9	Post only	MBl-014 WDG + Brandt Ultra 90	MBl-014 WDG at 3 Pounds/A in a 30 gallon per acre spray volume. Mix with Brandt Ultra 90 at 1 fl.oz. per gallon of finished spray solution . Apply at 2 weeks after planting.
10	Post only	MBl-014 WDG + Brandt Ultra 90	MBl-014 WDG at 5 Pounds/A in a 30 gallon per acre spray volume. Mix with Brandt Ultra 90 at 1 fl.oz. per gallon of finished spray solution Apply at 2 weeks after planting.
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14	Post only	MBl-014 WDG + Brandt Ultra 90	MBl-014 WDG at 5 Pounds/A in a 30 gallon per acre spray volume. Mix with Brandt Ultra 90 at 1 fl.oz. per gallon of finished spray solution Apply at 2 and 3 weeks after planting.

5. CROP INJURY AND WEED CONTROL EVALUATIONS

Record crop height and leaf stage and status just prior to the first and all subsequent postemergence treatments. Make weed control and crop vigor or injury evaluations 3 days 1, 2, 3 weeks after each treatment. Take weed and crop height, fresh and dry weight at 42 days after planting.

A suggested evaluation scale is below. Numbers may be recorded as percentages or as the abbreviated scale listed below.

Description of the scale used for visual evaluations of plant injury.

Value	Plant Symptoms

0	No visual injury present. Plants are equivalent to the non-treated plants.
1-2	Minimal injury. Less than 10% of the plant leaf surface area showing chlorosis, necrosis or other symptoms. Or 10 to 20% reduction in growth.
3-4	Greater than 20% discoloration or necrosis; generally associated with some stunting. Or 30 to 40% reduction in above-ground biomass.
5	About 50% reduction in above-ground biomass; may also have chlorotic or necrotic foliage or growing points, or a combination thereof.
6 to 9	A majority of the plant is necrotic or otherwise visibly damaged.
10	Plant appears dead. No signs of regrowth.

Investigator should record other data as deemed appropriate to describe symptoms observed. Examples may include: percent of leaves with symptoms; percent of growing points necrotic ((number necrotic/total number)*100). At termination plant height, width or above-ground biomass should be measured (exact measure will depend upon the growth habit of the species tested).

11 SUPPLEMENTAL CROP TREATMENTS:

The integrity of the study should be protected by managing pests causing significant damage to the test crop. Only EPA-registered maintenance pesticides should be used at labeled rates. Document all supplemental crop treatments.

12 FIELD DOCUMENTATION AND RECORD KEEPING:

All operations, data and observations, appropriate to this study should be recorded directly and promptly. At a minimum, collect and maintain the following raw data:

- Test site information
- Plot maps
- Information regarding calibration, and use of application equipment
- Treatment application data
- Crop maintenance pesticides and cultural practices
- Meteorological/Irrigation records – Daily
- Other data requested in the which is appropriate

NOTE:

Please take phytotoxicity ratings on all plots during study conduct and at its conclusion. Specify the type of injury (stunting, stand loss, leaf burn, leaf cupping or twisting, chlorosis, etc.). Record if any delay in maturity occurred. With the last rating evaluate if the crop is stunted and provide an overall assessment (if the level of phytotoxicity would be acceptable in commercial production).

13. PROTOCOL/MODIFICATIONS:

Consult with the IR-4 Regional/ARS Field Research Coordinator and IR-4 HQ Research Coordinator regarding desired changes in this protocol prior to occurrence.

14. **FIELD RESEARCH REPORT/ARCHIVING:**
A short summary of one to two pages should be submitted. Statistical analysis of the data is required. Copies of the data from each evaluation are requested. The Field Research Director should send the report and evaluation data to Dr. Michael Braverman, Biopesticide Manager and a copy to your IR-4 Regional Field Coordinator. We encourage you to publish the results. Any publications should acknowledge support by IR-4.

15. **FIELD PERSONNEL:**

Trial ID#	FRD	Address	Phone	Email
B00102-19-OR01	Ed Peachey	Oregon State University Horticulture Department ALS 4045 Corvallis OR 97331	541-740-6712	ed.peachey@ oregonstate.edu
B00102-19-NC01	Roger Batts	North Carolina State University NCSU IR-4 Field Research Center NCSU Campus Box 7654	919-515-1668	rbbatts@ncsu.edu
B00102-19-DE01	Mark VanGessel	University of Delaware Research and Education Center 16483 County Seat Highway Georgetown, DE 19947	302/856-7303 (x 510)	mjv@udel.edu
B00102-19-OH01	Doug Doohan	205 Gourley Hall 1680 Madison Ave Wooster, OH 44691	(330) 202-3593	doohan.1@osu.edu

Sources for Products:

Product	Contact	Phone and E-mail
Avenger Ag Optima	Cutting Edge Formulations, Inc. *Keenon Grant* Avenger Products, LLC Customer Service Representative KeenonG@ceformulations.com P: 678.546.5009 Joseph Jankauskas jaj@ceformulations.com	866-906-WEED jaj@ceformulations.com
MBI-014 Brandt Ultra 90	Tim Johnson, Marrone Bio Innovations, Inc.	570-441-8775 tjohnson@marronebio.com