PERFORMANCE OF GLUFOSINATE ON CUCURBIT VEGETABLES
IR-4 Project: P12018 (3rd year)

Date: 04/19

PROJECT TITLE, JUSTIFICATION AND OBJECTIVES:
Performance of GLUFOSINATE on CUCURBIT VEGETABLES. The purpose of this research is to collect performance data on cantaloupe, cucumber, and summer squash to support registration of glufosinate on Cucurbit vegetables. Adherence to Good Laboratory Practices (GLPs) is not required for trials conducted under this research plan.

IR-4 PRODUCT PERFORMANCE RESEARCH COORDINATOR:
Consult with the Research Coordinator listed below regarding desired changes in this research plan prior to occurrence.

Roger B. Batts, 6572-A Jaycross Rd., Fremont, NC 27830, 252.281.1612, e-mail: rbbatts@ncsu.edu

TEST SITE, TEST SUBSTANCES AND STATISTICAL ANALYSIS:
Field trials should be conducted at appropriate sites to determine the performance of glufosinate when applied to cantaloupe, cucumber, and summer squash. Evaluate the test materials listed below. Do not use old products for trial conducted under this research plan. If needed, the IR-4 Research Coordinator will arrange for fresh test substances to be delivered. If unsure, contact the IR-4 Research Coordinator for guidance.

Follow local agricultural practices for cantaloupe, cucumber and summer squash production including fertilization, irrigation, if necessary and available, and other practices that ensure good crop production. Use a locally-grown, commercial variety of cantaloupe.

Each test site will include at least three replicates of each treatment, arranged in an appropriate statistical design. The individual plots should be large enough to permit accurate application of the test substances in a manner that represents the major application technique that will be used commercially. Conduct appropriate statistical analysis to determine if significant differences exist between treatments. Statistical analysis from commonly used agricultural data programs, such as Agricultural Research Manager (ARM), is acceptable.

TREATMENTS AND TIMING:
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 prior to application of the test substance(s).

The use patterns that are to be evaluated will vary with the production system (Environment) listed below. Each researcher will choose a treatment list based on the production system in his/her area.

Environment 1. Treatment list for transplanted cantaloupe, cucumber, and summer squash in bare ground culture

<table>
<thead>
<tr>
<th>Trt#</th>
<th>Product(s)</th>
<th>Active ingredient(s)</th>
<th>Rate of formulated product(s)</th>
<th>Rate of active ingredient(s)</th>
<th>Application Placement &amp; Timing</th>
<th>Spray Volume Range(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Untreated – Weed free*</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>02</td>
<td>Rely + AMS(^2)</td>
<td>glufosinate</td>
<td>24 oz/a</td>
<td>0.44 lb ai/a</td>
<td>Pre-transplant soil broadcast(^3)</td>
<td>&gt;15 GPA</td>
</tr>
<tr>
<td>03</td>
<td>Rely + AMS(^2)</td>
<td>glufosinate</td>
<td>48 oz/a</td>
<td>0.88 lb ai/a</td>
<td>Pre-transplant soil broadcast(^3)</td>
<td>&gt;15 GPA</td>
</tr>
<tr>
<td>04</td>
<td>Rely + AMS(^2)</td>
<td>glufosinate</td>
<td>32 oz/a</td>
<td>0.59 lb ai/a</td>
<td>Hooded/shielded band to row middle(^4)</td>
<td>&gt;15 GPA</td>
</tr>
<tr>
<td>05</td>
<td>Rely + AMS(^2)</td>
<td>glufosinate</td>
<td>64 oz/a</td>
<td>1.17 lb ai/a</td>
<td>Hooded/shielded band to row middle(^4)</td>
<td>&gt;15 GPA</td>
</tr>
</tbody>
</table>
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*Maintain untreated plots as weed-free for comparison to Rely-treated plots. If maintenance herbicides are used, they must not compromise the crop response evaluations targeted by this protocol.

1GPA=gallons per acre

2Use Rely 280 (2.34 lb ai/gal). Rely treatments will include a fine feed grade or spray grade ammonium sulfate (AMS) at 3 lb/acre.

3Due to concerns of transplant foliage contacting glufosinate remaining on the soil surface, it is strongly suggested that after the preplant application has dried for at least 48 hours on weed foliage and prior to transplanting, at least 0.25" of irrigation be applied to move the glufosinate into the soil. Document time, date, and amount of irrigation in the final report.

4Do not concentrate test substance in the treated area. The rate specified is for the treated area.

Application Description:
TRT 02, and 3: Make one broadcast application to preformed beds at least 3 days before transplanting. It is strongly suggested that after the pre-plant application has dried for at least 48 hours on weed foliage and prior to transplanting, at least 0.25" of irrigation be applied to move the glufosinate into the soil.

TRT 04, and 05: Make two applications, 10-14 days apart, with the first being applied when weeds in the row middles are 3-4 inches tall. In the absence of weeds, the first application shall be made at approximately 2 weeks after transplanting. Do not allow spray solution to contact crop.

DATA COLLECTION:
Crop Injury: YES X NO OPTIONAL
Crop injury data will be collected at 14 and 28 days after transplanting and 14 and 28 days after each row middle application. Specify the type of injury (stunting, stand loss, leaf burn, leaf cupping or twisting, chlorosis, etc.) and assess if this level of injury is commercially acceptable. Photo images of significant injury should be collected and included in the final report.

Weed Control: YES X NO OPTIONAL
Weed control data is not required.

Crop yield: YES X NO OPTIONAL
Yield data will be collected and will include yield/acre and, if appropriate, grades (quality and/or size) of harvested products according to official standards. An explanation of the standards should be included in the final report.

Environment 2. Treatment list for seeded cantaloupe, cucumber, and summer squash in bare ground culture

<table>
<thead>
<tr>
<th>Trt#</th>
<th>Product(s)</th>
<th>Active ingredient(s)</th>
<th>Rate of formulated product(s)</th>
<th>Rate of active ingredient(s)</th>
<th>Application Placement &amp; Timing</th>
<th>Spray Volume Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Untreated – Weed free*</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>02</td>
<td>Rely + AMS²</td>
<td>glufosinate</td>
<td>24 oz/a</td>
<td>0.44 lb ai/a</td>
<td>Preplant³ and preemergence soil broadcast</td>
<td>&gt;15 GPA</td>
</tr>
<tr>
<td>03</td>
<td>Rely + AMS²</td>
<td>glufosinate</td>
<td>48 oz/a</td>
<td>0.88 lb ai/a</td>
<td>Preplant³ and preemergence soil broadcast</td>
<td>&gt;15 GPA</td>
</tr>
<tr>
<td>04</td>
<td>Rely + AMS²</td>
<td>glufosinate</td>
<td>32 oz/a</td>
<td>0.59 lb ai/a</td>
<td>Hooded/shielded band to row middle⁴</td>
<td>&gt;15 GPA</td>
</tr>
<tr>
<td>05</td>
<td>Rely + AMS²</td>
<td>glufosinate</td>
<td>64 oz/a</td>
<td>1.17 lb ai/a</td>
<td>Hooded/shielded band to row middle⁴</td>
<td>&gt;15 GPA</td>
</tr>
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*Maintain untreated plots as weed-free for comparison to Rely-treated plots. If maintenance herbicides are used, they must not compromise the crop response evaluations targeted by this protocol.

1GPA=gallons per acre

2Use Rely 280 (2.34 lb ai/gal). Rely treatments will include a fine feed grade or spray grade ammonium sulfate (AMS) at 3 lb/acre.

3It is strongly suggested that after the PRE application has dried for at least 48 hours on weed foliage, at least 0.25" of irrigation be applied to move the glufosinate into the soil. Irrigation is not required following the preplant application. Document time, date and amount of irrigation in the final report.

4Do not concentrate test substance in the treated area. The rate specified is for the treated area.

Application Description
TRT 02 and 03: Make two broadcast applications to preformed beds. The first will occur 7 to 14 days before planting and the second will be made at least 3 days prior to emergence of the seeded crop. It is strongly suggested that after the PRE application has dried for at least 48 hours on weed foliage, at least 0.25" of irrigation be applied to move the glufosinate into the soil. Irrigation is not required following the preplant application. Application to emerged crop will cause severe injury. Emergence date of crop should be recorded in final report.

TRT 04 and 05: Make two applications, 10-14 days apart, with the first being applied when weeds in the row middles are 3-4 inches tall. In the absence of weeds, the first application shall be made at approximately 2 weeks after crop emergence. Do not allow spray solution to contact crop.

DATA COLLECTION:
Crop Injury: YES X NO___ OPTIONAL____
Crop injury data will be collected at 14 and 28 days after planting and 14 and 28 days after each row middle application. Specify the type of injury (stunting, stand loss, leaf burn, leaf cupping or twisting, chlorosis, etc.) and assess if this level of injury is commercially acceptable. Photo images of significant injury should be collected and included in the final report.

Weed Control: YES_____ NO X____ OPTIONAL____
Weed control data is not required.

Crop yield: YES _X____ NO_____ OPTIONAL____
Yield data will be collected and will include yield/acre and, if appropriate, grades (quality and/or size) of harvested products according to official standards. An explanation of the standards should be included in the final report.

Environment 3. Treatment list for transplanted cantaloupe, cucumber, and summer squash in plastic mulch culture

<table>
<thead>
<tr>
<th>Trt#</th>
<th>Product(s)</th>
<th>Active ingredient(s)</th>
<th>Rate of formulated product(s)</th>
<th>Rate of active ingredient(s)</th>
<th>Application Placement &amp; Timing</th>
<th>Spray Volume Range¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Untreated – Weed free*</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>02</td>
<td>Rely + AMS²</td>
<td>glufosinate</td>
<td>24 oz/a</td>
<td>0.44 lb ai/a</td>
<td>Pre-transplant broadcast over mulch³</td>
<td>&gt;15 GPA</td>
</tr>
<tr>
<td>03</td>
<td>Rely + AMS²</td>
<td>glufosinate</td>
<td>48 oz/a</td>
<td>0.88 lb ai/a</td>
<td>Pre-transplant broadcast over mulch³</td>
<td>&gt;15 GPA</td>
</tr>
<tr>
<td>04</td>
<td>Rely + AMS²</td>
<td>glufosinate</td>
<td>32 oz/a</td>
<td>0.59 lb ai/a</td>
<td>Hooded/shielded band to row middle⁴</td>
<td>&gt;15 GPA</td>
</tr>
<tr>
<td>05</td>
<td>Rely + AMS²</td>
<td>glufosinate</td>
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*Maintain untreated plots as weed-free for comparison to Rely-treated plots. If maintenance herbicides are used, they must not compromise the crop response evaluations targeted by this protocol.

1GPA=gallons per acre
2Use Rely 280 (2.34 lb ai/gal). Rely treatments will include a fine feed grade or spray grade ammonium sulfate (AMS) at 3 lb/acre.
3Make one broadcast application over plastic mulch bed at least 3 days prior to transplanting. After the application has dried on weed foliage for at least 48 hours and prior to punching holes for transplants, at least 0.25" of overhead irrigation must be applied to remove glufosinate residue from mulch surface. Do not transplant until irrigation water has completely evaporated from the mulch surface. Document time, date and amount of irrigation in the final report.
4Do not concentrate test substance in the treated area. The rate specified is for the treated area.

Application Description:

TRT 02 and 03: Make one broadcast application over plastic mulch bed at least 3 days prior to transplanting. After the application has dried on weed foliage for at least 48 hours and prior to punching holes for transplants, at least 0.25" of overhead irrigation must be applied to remove glufosinate residue from mulch surface. Do not transplant until irrigation water has completely evaporated from the mulch surface.

TRT 04 and 05: Make two applications, 10-14 days apart, with the first being applied when weeds in the row middles are 3-4 inches tall. In the absence of weeds, the first application shall be made at approximately 2 weeks after transplanting. Do not allow spray solution to contact crop.

Environment 4. Treatment list for seeded cantaloupe, cucumber, and summer squash in plastic mulch culture

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<tr>
<th>Trt#</th>
<th>Product(s)</th>
<th>Active ingredient(s)</th>
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<th>Spray Volume Range</th>
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</thead>
<tbody>
<tr>
<td>01</td>
<td>Untreated – Weed free*</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>02</td>
<td>Rely + AMS²</td>
<td>glufosinate</td>
<td>24 oz/a</td>
<td>0.44 lb ai/a</td>
<td>Preplant broadcast over mulch³</td>
<td>&gt;15 GPA</td>
</tr>
<tr>
<td>03</td>
<td>Rely + AMS²</td>
<td>glufosinate</td>
<td>48 oz/a</td>
<td>0.88 lb ai/a</td>
<td>Preplant broadcast over mulch³</td>
<td>&gt;15 GPA</td>
</tr>
<tr>
<td>04</td>
<td>Rely + AMS²</td>
<td>glufosinate</td>
<td>32 oz/a</td>
<td>0.59 lb ai/a</td>
<td>Hooded/shielded band to row middle⁴</td>
<td>&gt;15 GPA</td>
</tr>
<tr>
<td>05</td>
<td>Rely + AMS²</td>
<td>glufosinate fb glufosinate</td>
<td>64 oz/a</td>
<td>1.17 lb ai/a</td>
<td>Hooded/shielded band to row middle⁴</td>
<td>&gt;15 GPA</td>
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*Maintain untreated plots as weed-free for comparison to Rely-treated plots. If maintenance herbicides are used, they must not compromise the crop response evaluations targeted by this protocol.

1GPA=gallons per acre
2Use Rely 280 (2.34 lb ai/gal)
3After application has dried on weed foliage for at least 48 hours and prior to punching holes for seeding, at least 0.25" of overhead irrigation must be applied to remove glufosinate residues from mulch surface. Do not plant until irrigation water has completely evaporated from the mulch surface. Document time, date and amount of irrigation in the final report.
4Do not concentrate test substance in the treated area. The rate specified is for the treated area.

Application Description

TRT 02 and 03: Make one broadcast application over plastic mulch, at least 3 days prior to seeding. After application has dried on weed foliage for at least 48 hours and prior to punching holes for seeding, at least 0.25" of overhead irrigation must be applied to remove glufosinate residues from...
mulch surface. Do not plant until irrigation water has completely evaporated from the mulch surface. Emergence date of crop should be recorded in final report.

TRT 04 and 05: Make two applications, 10-14 days apart, with the first being applied when weeds in the row middles are 3-4 inches tall. In the absence of weeds, the first application shall be made at approximately 2 weeks after crop emergence. Do not allow spray solution to contact crop.

DATA COLLECTION:
- **Crop Injury:** YES X  NO  OPTIONAL
  Crop injury data will be collected at 14 and 28 days after planting and 14 and 28 days after each row middle application. Specify the type of injury (stunting, stand loss, leaf burn, leaf cupping or twisting, chlorosis, etc.) and assess if this level of injury is commercially acceptable. Photo images of significant injury should be collected and included in the final report.

- **Weed Control:** YES X  NO  OPTIONAL
  Weed control data is not required.

- **Crop yield:** YES X  NO  OPTIONAL
  Yield data will be collected and will include yield/acre and, if appropriate, grades (quality and/or size) of harvested products according to official standards. An explanation of the standards should be included in the final report.

FINAL REPORT:
At trial completion, please submit a final report to the Research Coordinator and the appropriate ARS/Regional Field Coordinator listed below within 60 days of last data collection. This shall include but not be limited to:
- Data requirements listed above
- Soil temperature at each application must be recorded and included in the final report. Detailed irrigation records during the trial period are also required.
- Test site and application information; including soil characteristics, crop maintenance pesticides and cultural practices, description of the application equipment, environmental conditions at application(s), meteorological and irrigation records, and other pertinent information, such as photos of significant crop injury.

The final report will also include a thorough narrative that analyzes the results and evaluates the potential of the tested products for use in the tested crop(s). The final report may be in paper or electronic format.

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**TRIAL SITE INFORMATION**

<table>
<thead>
<tr>
<th>Researcher</th>
<th>Field ID NO.</th>
<th>RFC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brad Hanson, University of California, Davis, Department of Plant Sciences, MS-4, 290A Robbins Hall, Davis CA 95616; ph: 530-752-8115; fax: 530-752-4604; cell: 530-304-9528; e-mail: <a href="mailto:bhanson@ucdavis.edu">bhanson@ucdavis.edu</a></td>
<td>P12018.19-CAP07</td>
<td>WSR</td>
</tr>
</tbody>
</table>
RFC = Regional/ARS Field Coordinator
Location:

WSR: Dr. Michael Horak, Regional Field Coordinator, Western Region IR-4 Project, 4218 Meyer Hall, University of California-Davis, Davis, CA 95616 (530) 752-7634; Cell# 530-219-8466; e-mail: mjhorak@ucdavis.edu

Signature of IR-4 Product Performance Research Coordinator
Roger B. Batts

Date: 04/19