PERFORMANCE OF SELECTED HERBICIDES ON QUINOA
IR-4 Project: IS00426

Date: 5/23

PROJECT TITLE, JUSTIFICATION AND OBJECTIVES:

Performance of Selected Herbicides on Quinoa. The purpose of this research is to collect crop safety data to support registration of selected herbicides in quinoa. 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, IR-4 Project Headquarters, 1730 Varsity Dr., Venture IV, Suite 210, Raleigh, NC 27606, (919) 515-3054, 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 herbicides when applied to quinoa. 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 the production of quinoa including fertilization, irrigation, if necessary and available, and other practices that ensure good crop production. Use a locally-grown, commercial variety of quinoa.

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 and shall also be large enough to allow meaningful scientific evaluation. 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).

Preplant Burndown Herbicides[1]:
IS00426.23-ID01

Trt#	Product	Active ingredient	Rate of formulated product/a	Rate of active ingredient	Application Placement & Timing	Spray Volume Range (GPA) *
01	Weed Free[2]	N/A	N/A	N/A	N/A	N/A
02	Weedy[3]	N/A	N/A	N/A	N/A	N/A
03	Roundup WeatherMax	glyphosate	44 fl oz	1.55 lb ae/a	Broadcast Preplant 14 DBP	16-40
04	Roundup WeatherMax	glyphosate	44 fl oz	1.55 lb ae/a	Broadcast Preplant 7 DBP	16-40
05	Rely 280 + AMS	glufosinate	43 fl oz	0.79 lb ai/a	Broadcast Preplant 14 DBP	≥10
06	Rely 280 + AMS	glufosinate	43 fl oz	0.79 lb ai/a	Broadcast Preplant 7 DBP	≥10
07	Rely 280 + AMS	glufosinate	87 fl oz	1.59 lb ai/a	Broadcast Preplant 14 DBP	≥10
08	Rely 280 + AMS	glufosinate	87 fl oz	1.59 lb ai/a	Broadcast Preplant 7 DBP	≥10
09* **	GF-3206	florpyrauxifen	16 fl oz	0.026 lb ai/a	Broadcast Preplant 14 DBP	>10

10* **	GF-3206	florpyrauxifen	32 fl oz	0.053 lb ai/a	Broadcast Preplant 14 DBP	>10
11* **	Embed Extra	2,4-D choline	3 pt/a	1.43 lb ae/a	Broadcast Preplant 14 DBP	≥10
12* **	Embed Extra	2,4-D choline	6 pt/a	2.85 lb ae/a	Broadcast Preplant 14 DBP	≥10

*GPA=gallons per acre
**PRE=after crop is seeded but prior to crop and weed emergence.
***Optional treatments. If included, a postemergence graminicide will be needed. Graminicide will not be tank-mixed with these treatments. Graminicide trade name, active ingredient, application date and application rate will be included in the final report.
[1]Hand-weeding and/or mechanical weed control is allowed for each treatment after the last weed control evaluation, if needed.
[2]TRT 01 should be kept as weed-free as possible through the use of registered herbicides and/or mechanical and hand weeding. Trade name, active ingredient name, application date(s) and rate(s) of maintenance herbicides will be included in the final report.
[3]Hand-weeding and/or mechanical weed control is allowed for TRT 02 and other herbicide treatments after the last weed control evaluation in the trial, if needed.

Application description: Make one or two broadcast applications to the soil at specified timings listed above. If necessary, 14 DBP treatments may be applied prior to soil preparation for seeding. Is this practice is used, the reason(s) for this will be thoroughly documented in the final report.

DATA COLLECTION:

Crop Injury: YES__X___ NO_____ OPTIONAL_____
Crop injury data will be collected at 7, 14 and 28 days after crop seeding. 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 will be collected at 7, 14 and 28 days after application. Specify the weed(s) and the method used to evaluate the level of weed control.

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

Soil-applied, Residual Herbicides[1]:
IS00426.23-ID02

Trt#	Product	Active ingredient	Rate of formulated product/a	Rate of active ingredient (lb ai/a)	Application Placement & Timing	Spray Volume Range (GPA) *
01	Weed Free[2]	N/A	N/A	N/A	N/A	N/A
02	Weedy[3]	N/A	N/A	N/A	N/A	N/A
03	Devrinol 2XT	napropamide	4 pt	1.0	Broadcast Preemergence (PRE**)[4]	20-100
04	Devrinol 2XT	napropamide	8 pt	2.0	PRE	20-100
05	Outlook	dimethenamid	14 oz	0.65	PRE	≥5
06	Outlook	dimethenamid	28 oz	1.31	PRE	≥5
07	Zidua SC	pyroxasulfone	2.5 fl oz	0.08	PRE	≥5
08	Zidua SC	pyroxasulfone	5 fl oz	0.16	PRE	≥5
09	Matrix	rimsulfuron	0.5 oz	0.008	PRE	≥15
10	Matrix	rimsulfuron	1.0 oz	0.016	PRE	≥15
11	Reflex	fomesafen	0.5 pt	0.125	PRE	≥10

12	Reflex	fomesafen	1.0 pt	0.25	PRE	≥10
13	Prowl H2O	pendimethalin	1.0 pt	0.48	PRE	≥10
14	Prowl H2O	pendimethalin	2.0 pt	0.95	PRE	≥10
15	Dual Magnum	s-metolachlor	0.66 pt	0.63	PRE	≥10
16	Dual Magnum	s-metolachlor	1.32 pt	1.26	PRE	≥10
17	Sonalan HFP	ethalfluralin	1.5 pt	0.56	PRE	>5
18	Sonalan HFP	ethalfluralin	3 pt	1.125	PRE	>5
19	Ro-Neet	cycloate	4 pt	3.0	PRE	10-50
20	Ro-Neet	cycloate	5.33 pt	4.0	PRE	10-50

*GPA=gallons per acre
**PRE=after crop is seeded but prior to crop and weed emergence.
[1]Hand-weeding and/or mechanical weed control is allowed for each treatment after the last weed control evaluation, if needed.
[2]TRT 01 should be kept as weed-free as possible through the use of registered herbicides and/or mechanical and hand weeding. Trade name, active ingredient name, application date(s) and rate(s) of maintenance herbicides will be included in the final report.
[3]Hand-weeding and/or mechanical weed control is allowed for TRT 02 and other herbicide treatments after the last weed control evaluation in the trial, if needed.
[4]Rainfall or overhead irrigation of approximately 0.5" is required within 2 days of seeding quinoa.

Application description: Make one broadcast application to the soil at specified timings listed above.

DATA COLLECTION:

Crop Injury: YES__X__ NO_____ OPTIONAL_____
Crop injury data will be collected at 7, 14 and 28 days after seeding. 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 will be collected at 7, 14 and 28 days after application. Specify the weed(s) and the method used to evaluate the level of weed control.

Crop yield: YES__X__ NO_____ OPTIONAL_____
Yield data (fiber or seed) 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.

Postemergence Herbicides[1]:
IS00426.23-ID03

Trt#	Product	Active ingredient	Rate of formulated product/a	Rate of active ingredient (lb ai/a)	Application Placement & Timing	Spray Volume Range (GPA) *
01	Weed Free[2]	N/A	N/A	N/A	N/A	N/A
02	Weedy[3]	N/A	N/A	N/A	N/A	N/A
03	Select Max + adjuvant**	clethodim	16 fl oz	0.12	Broadcast postemergence (POST) when grass weeds are ≤6" tall	5-40
04	Select Max + adjuvant	clethodim	32 fl oz	0.24	Broadcast POST when grass weeds are ≤6" tall	5-40
05	Assure II + adjuvant	quizalofop	8 fl oz	0.055	Broadcast POST when grass weeds are ≤6" tall	15-40

06	Assure II + adjuvant	quizalofop	16 fl oz	0.11	Broadcast POST when grass weeds are ≤6" tall	15-40
07	Fusilade + adjuvant	fluazifop	12 fl oz	0.19	Broadcast POST when grass weeds are ≤6" tall	5-40
08	Fusilade + adjuvant	fluazifop	24 fl oz	0.375	Broadcast POST when grass weeds are ≤6" tall	5-40
09	Outlook	dimethenamid	14 oz	0.65	EPOST, 2-4 lf quinoa	≥5
10	Outlook	dimethenamid	28 oz	1.31	EPOST, 2-4 lf quinoa	≥5
11	Zidua SC	pyroxasulfone	2.5 fl oz	0.08	EPOST, 2-4 lf quinoa	≥5
12	Zidua SC	pyroxasulfone	5 fl oz	0.16	EPOST, 2-4 lf quinoa	≥5
13	Prowl H2O	pendimethalin	2.0 pt	0.95	EPOST, 2-4 lf quinoa	≥10
14	Prowl H2O	pendimethalin	4.0 pt	1.9	EPOST, 2-4 lf quinoa	≥10
15	Asulox + NIS	asulam	3.6 pt	1.5	EPOST, 2-4 lf quinoa	≥20
16	Asulox + NIS	asulam	7.2 pt	3.0	EPOST, 2-4 lf quinoa	≥20
17	Dual Magnum	s-metolachlor	0.66 pt	0.63	EPOST, 2-4 lf quinoa	≥10
18	Dual Magnum	s-metolachlor	1.32 pt	1.26	EPOST, 2-4 lf quinoa	≥10
19	Matrix + NIS	rimsulfuron	0.5 oz	0.008	EPOST, 2-4 lf quinoa	≥15
20	Matrix + NIS	rimsulfuron	1.0 oz	0.016	EPOST, 2-4 lf quinoa	≥15
21	Devrinol 2XT	napropamide	4 pt	1.0	EPOST, 2-4 lf quinoa	20-100
22	Devrinol 2XT	napropamide	8 pt	2.0	EPOST, 2-4 lf quinoa	20-100

[1]It is highly recommended that the entire trial receive a Pretransplant application of a registered non-selective herbicide at an appropriate rate to assist with early season weed control. Hand-weeding and/or mechanical weed control is allowed for each treatment after the last weed control evaluation, if needed.
[2]TRT 01 should be kept as weed-free as possible through the use of registered herbicides and/or mechanical and hand weeding. Trade name, active ingredient name, application date(s) and rate(s) of maintenance herbicides will be included in the final report.
[3]Hand-weeding and/or mechanical weed control is allowed for TRT 02 and other herbicide treatments after the last weed control evaluation in the trial, if needed.
*GPA=gallons per acre
**Follow product label for type and rate of adjuvant allowed. Adjuvant type and rate will be included in the final report.

Application description: **Make one broadcast application to crop and weeds as listed above**

DATA COLLECTION:

Crop Injury: YES__X___ NO_____ OPTIONAL_____
Crop injury data will be collected at 7, 14 and 28 days after each 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 will be collected at 7, 14 and 28 days after each application. Specify the weed(s) and the method used to evaluate the level of weed control.

Crop yield: YES__X___ NO_____ OPTIONAL_____
Yield data (fiber or seed) 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
- Test site and application information; including soil characteristics, crop maintenance pesticides and cultural practices, description of the application equipment, environmental conditions at applications(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.

TRIAL SITE INFORMATION

Researcher	Field ID NO.	RFC
Pamela J.S. Hutchinson, Aberdeen Research and Extension Center, University of Idaho 1693 S.2700 W. Aberdeen, ID 83210 Cell phone: 208-681-1304; Email: phutch@uidaho.edu **(Preplant burndown)**	IS00426.23-ID01	WSR
Pamela J.S. Hutchinson, Aberdeen Research and Extension Center, University of Idaho 1693 S.2700 W. Aberdeen, ID 83210 Cell phone: 208-681-1304; Email: phutch@uidaho.edu **(Residual herbicides)**	IS00426.23-ID02	WSR
Pamela J.S. Hutchinson, Aberdeen Research and Extension Center, University of Idaho 1693 S.2700 W. Aberdeen, ID 83210 Cell phone: 208-681-1304; Email: phutch@uidaho.edu **(EPOST herbicides)**	IS00426.23-ID03	WSR

RFC = Regional/ARS Field Coordinator
Location:
WSR: Kari Arnold, University of California-Davis, 4218 Meyer Hall, Davis, CA 95616 (530) 752-7634; Cell# 530-574-9181; e-mail: klarnold@ucdavis.edu

Roger B Batts — 5-15-23

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

This protocol is dedicated to Stephen Flanagan, for his many years of valuable service to IR-4 and the specialty crops community.