Grant Code: AP5316
Title: Effect of irrigation timing on preemergence herbicide efficacy and crop injury
Personnel:

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Background: Broadleaved weeds such as common lambsquarters, redroot pigweed, and hairy nightshade, continue to be major weed problems in dry bean production systems. Herbicides remain one of the most important weed management tools in dry bean production. However, there is a relatively limited number of herbicides for broadleaved weed control in dry beans compared to other crops. Thus, there is a need to identify other effective herbicides that are safe to use in dry bean. This study evaluated Valor® (flumioxazin; Group 14), Zidua® (pyroxasulfone; Group 15), and Fierce® (flumioxazin plus pyroxasulfone; Group 14 & 15) for weed control efficacy and safety in dry bean. The specific objectives were to:

1. Assess the effect of irrigation timing on residual weed control with Valor®, Zidua®, or Fierce® in dry bean
2. Assess the effect of irrigation timing on Valor®, Zidua®, or Fierce® injury in dry bean

Methodology:
This field study was established under sprinkler irrigation at the University of Idaho Kimberly Research and Extension Center in 2021. The field was tilled, and pinto bean was planted on June 4, 2021 at a spacing of 22 inches. There were 14 treatments (Table 1) arranged in a randomized complete block with four replications. Each plot was 15 ft wide (8 rows) by 30 feet long. Preemergence herbicides (PRE) were applied on June 4, 2021. All plots, except the untreated and hand-weeded plots, were sprayed on July 7, 2021, with 20 oz/acre Varisto®.
Data collection: Pinto bean stand was counted four times to assess any stand loss due to treatments. Crop injury and weed control (by each weed species) were visually assessed multiple times on a scale of 0 to 100%, with 0% being no injury/control, and 100% being plant death. At the end of the season, the center rows in each plot were harvested to determine seed yield. Data was analyzed following standard statistical procedures.

Accomplishments:
Objective #1: Effect of irrigation timing on residual weed control
Irrigation timing did not affect residual weed control from Valor®, Zidua®, or Fierce® (Table 1; Figure 1). This suggests that activating these herbicides within 8 days after application will not affect residual weed control. At 31 days after preemergence herbicide application, broadleaf (common lambsquarters, redroot pigweed, and hairy nightshade) control ranged from 58 to 87%, with Fierce performing slightly better than Valor®, Zidua®, or Eptam® (Table 1).

Objective #2: Effect of irrigation timing on dry bean injury
Delaying activation irrigation until 8 days after herbicide application slightly increased Valor® injury on dry bean by reducing stand density early in the season (Table 2). However, the crop recovered thereby reducing the impact of the herbicide injury on dry bean yield (Table 2).

Projections: This study will be repeated in 2022 and results will be shared with Valent U.S.A and BASF for consideration and possible registration of Zidua® and Fierce® for use in dry bean in Idaho. Results from this study will be presented at the 2022 Western Society of Weed Science Conference to be held from March 7-10th, 2022.

Publication/ Outreach:
This study was showcased at the 2021 Kimberly Field Day.

Table 1. Weed control and crop response to treatments on July 6, 2021 (31 DAT[1])

No.	Treatment	Lambs.		pigweed		nightshade		barnyard		Injury	
		---------- % ----------									
1	Untreated	0	d*	0	f	0	e	0	e	0	b
2	Zidua; irrigation at 1 DAT[1]	60	c	73	bcd	74	bcd	83	abc	7	a
3	Zidua; irrigation at 4 DAT	65	bc	65	cde	71	bcd	72	bcd	5	a
4	Zidua; irrigation at 8 DAT	73	bc	77	bcd	79	bcd	82	abc	9	a
5	Valor SX; irrigation at 1 DAT	65	bc	64	cde	74	bcd	74	bcd	6	a
6	Valor SX; irrigation at 4 DAT	78	abc	66	cde	74	bcd	66	cd	8	a
7	Valor SX; irrigation at 8 DAT	72	bc	58	de	66	cd	56	d	7	a
8	Fierce EZ; irrigation at 1 DAT	70	bc	79	abc	79	bcd	70	bcd	8	a
9	Fierce EZ; irrigation at 4 DAT	83	ab	83	abc	76	bcd	76	bc	7	a
10	Fierce EZ; irrigation at 8 DAT	81	abc	87	ab	87	ab	84	abc	8	a
11	Eptam; irrigation at 1 DAT	67	bc	63	cde	75	bcd	68	bcd	9	a
12	Eptam; irrigation at 4 DAT	75	bc	78	bc	83	abc	85	ab	7	a
13	Eptam; irrigation at 8 DAT	64	bc	50	e	63	d	68	cd	6	a
14	Hand-weeded control	99	a	99	a	99	a	99	a	0	b

Table 2. Dry bean population and seed yield

No.	Treatment	Plants/acre				Yield (lbs/acre)	
		June 15		July 6			
1	Untreated	79596	a*	84051	a	285	c
2	Zidua; irrigation at 1 DAT[1]	60885	bcd	65043	a	3024	ab
3	Zidua; irrigation at 4 DAT	56430	cd	63558	a	2450	b
4	Zidua; irrigation at 8 DAT	65340	abc	74844	a	3546	ab
5	Valor SX; irrigation at 1 DAT	69795	abc	71874	a	2964	ab
6	Valor SX; irrigation at 4 DAT	70983	abc	81378	a	3330	ab
7	Valor SX; irrigation at 8 DAT	48708	d	59103	a	2560	ab
8	Fierce EZ; irrigation at 1 DAT	73953	ab	72171	a	3546	ab
9	Fierce EZ; irrigation at 4 DAT	76329	ab	82863	a	3814	a
10	Fierce EZ; irrigation at 8 DAT	68904	abc	72468	a	2929	ab
11	Eptam; irrigation at 1 DAT	67716	abc	73359	a	3226	ab
12	Eptam; irrigation at 4 DAT	71577	abc	79893	a	3154	ab
13	Eptam; irrigation at 8 DAT	67419	abc	76626	a	2982	ab
14	Hand-weeded control	65043	abc	64449	a	3439	ab

*within column, means followed by the same letter are not statistically different.
[1]DAT; days after herbicide treatment
Weed names: Lambs. = common lambsquarters; pigweed = redroot pigweed; barnyard = barnyardgrass

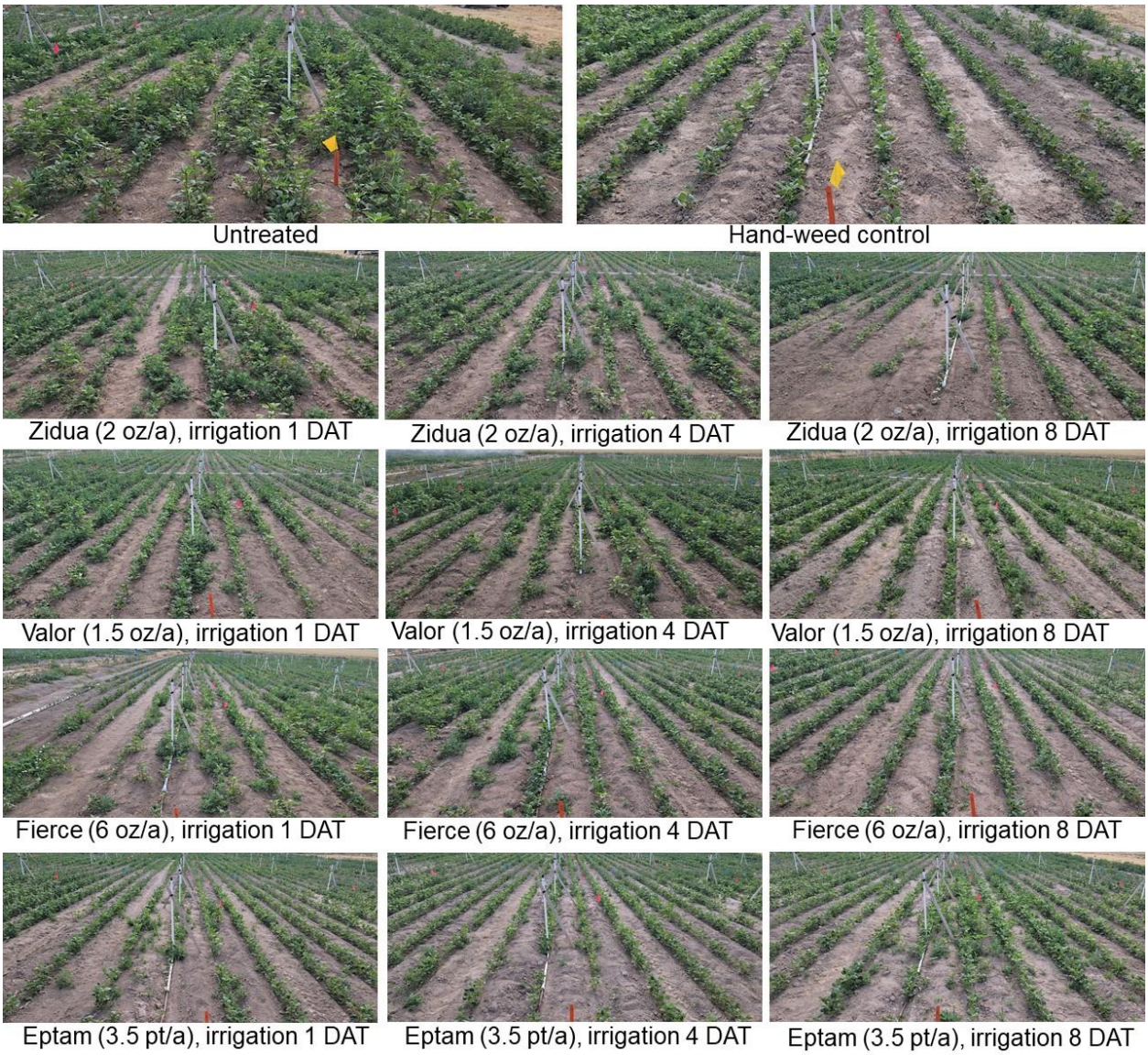

Figure 1. *Weed control and dry bean injury as influenced by herbicide and timing of activation irrigation. Photos were taken on July 7, 2021 (32 days after herbicide application). DAT = days after treatment*