

Weed Control in Garbanzo Bean

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Abstract

Adequate weed control in garbanzo beans (*Cicer arietinum*) depends on preemergence herbicides that are risky to use. Two trials were conducted in growers' fields in locations near Culver and Prineville, Oregon to evaluate these herbicides more carefully and to evaluate postemergence herbicides. None of the PPI or PRE herbicide treatments seriously injured the garbanzo beans. However, those treatments that were applied correctly did not control the weeds well. None of the POST treatments worked well on the weeds present. The likelihood of developing and registering better weed control options for garbanzo bean is very low.

Introduction

The current weed control program in garbanzo beans (also known as chickpea) consists entirely of preemergence herbicides; there are no herbicides registered for postemergence use. Due to the efficacy of these herbicides, growers have to use at least two in order to achieve adequate weed control. Some of the herbicide combinations pose a risk for crop injury and two of the herbicides used, imazethapyr (Pursuit[®], BASF) and sulfentrazone (Spartan[®], FMC Agricultural Products) are very persistent and pose major crop rotation restrictions. Weed control decisions in garbanzo bean production have to balance the need for broad spectrum preemergence weed control with the risk of crop injury and herbicide carryover. The objectives of these experiments were to (1) evaluate the efficacy of several herbicide combinations that pose fewer crop rotation restrictions, with emphasis toward efficacy on nightshade species, (2) evaluate crop safety of these herbicide combinations in garbanzo beans, and (3) evaluate postemergence herbicides for potential use in garbanzo beans.

Methods and Materials

Two trials were conducted in growers' fields in locations near Culver and Prineville, Oregon. Treatments included six preemergence herbicides in several combinations and three postemergence herbicides. Treatments were applied to 7-ft by 30-ft plots with four replications arranged as randomized complete blocks. Treatments were applied with a CO₂ backpack sprayer delivering 20 gal/acre operating at 20 psi and 3 mph. Crop injury and weed control were determined by making visual evaluations on a percentage scale. Crop tolerance was further established by averaging two stand counts per plot consisting of 2 yards each. Treatments were applied in three ways: (1) post plant, incorporated [PPI]; (2) premerge, surface [PRE]; or (3) postemergence [POST]. The PPI treatments were sprayed on the soil surface and then raked into the soil, 1 to 2 inches deep.

Results and Discussion

Several of the PPI and PRE treatments caused some injury to the garbanzo beans shortly after emergence (Table 1). Subsequent evaluations indicated that the plants recovered. Trials were evaluated in mid-July after flowering and there was no visible injury from any of the PPI or PRE treatments. Garbanzo bean stand counts were not statistically significant, indicating that none of the herbicide treatments caused a reduction in plant population.

Growth stages for the weeds at the time of the POST applications are listed in Table 2. All three POST treatments severely injured the garbanzo beans and injury persisted through the final evaluation in mid-July (data not shown). Furthermore, none of the POST treatments worked well on the weeds present (Table 3). Chlorimuron (Classic[®], DuPont) killed all the garbanzo beans, but thifensulfuron- (Harmony GT[®], DuPont) and 2,4-DB-treated beans showed some recovery. These POST treatments did not show enough margin for selectivity to merit more research to determine garbanzo bean tolerance.

Treatments with sulfentrazone controlled at least 99 percent of all the weeds present, but unfortunately the rate used was a misapplication and was 10 times higher than what is registered. Pursuit is the standard treatment and controlled at least 86 percent of all the weeds across both locations. None of the other stand-alone treatments adequately controlled the weeds present. Pendimethalin plus oxyfluorfen controlled hairy nightshade well at both locations, but common lambsquarters control was poor in Prineville. The likelihood of developing and registering better weed control options for garbanzo bean is very low.

Table 1. Garbanzo bean stand counts and visual injury following herbicide applications near Prineville and Madras, Oregon, 2006.

Treatment [†]	Rate (lb ai or ae/acre)	Applic. stage [‡]	Garbanzo bean, Prineville, May 18 [§]		Garbanzo bean, Culver, June 1 [¶]	
			Stand count	Injury	Stand count	Injury
			Plants/2 yds	%	Plants/ 2 yds	%
Ethalfuralin	0.75	PPI	9.3	16	10.8	1
Dimethenamid-P	0.75	PPI	9.5	19	9.0	5
Dimethenamid-P	0.75	PRE	9.2	0	7.9	4
Sulfentrazone	1.4 [#]	PRE	9.3	25	12.9	10
Pendimethalin	0.95	PRE	10.2	5	11.8	8
Oxyfluorfen	0.25	PRE	12	13	10.0	5
Imazethapyr	0.05	PRE	6.8	15	9.6	4
Dimethenamid-P fb Sulfentrazone	0.75 fb 1.4 [#]	PPI fb PRE	10.7	27	9.5	9
Dimethenamid-P + Sulfentrazone	0.75 + 1.4 [#]	PRE	7.8	29	9.1	14
Dimethenamid-P fb Oxyfluorfen	0.75 fb 0.25	PPI fb PRE	9.0	21	10.4	14
Dimethenamid-P + Oxyfluorfen	0.75 + 0.25	PRE	8.8	17	9.6	6
Sulfentrazone + Oxyfluorfen	1.4 [#] + 0.25	PRE	8.8	45	10.1	11
Pendimethalin + Oxyfluorfen	0.95 + 0.25	PRE	6.8	23	9.9	8
Check	0.0	---	9.3	0	11.5	0
LSD (P = 0.05)			NS	---	NS	---

[†] Treatments with a + indicate that herbicides were tank-mixed. A treatment with an 'fb' indicates that one herbicide was followed by another. Trade names commonly used for these herbicides: ethalfuralin = Sonalan[®] (Dow), dimethenamid-P = Outlook[®] (BASF), sulfentrazone = Spartan, pendimethalin = Prowl H20[®] (BASF), oxyfluorfen = Goal[®] (Dow), imazethapyr = Pursuit.

[‡] PPI = post plant, incorporated; PRE = preemerge, surface.

[§] In Prineville, treatments were applied April 12, 2006.

[¶] In Culver, treatments were applied April 26, 2006.

[#] A calculation error resulted in sulfentrazone being applied at a rate 10 times higher than what is currently registered. Using sulfentrazone at the rate listed would be a gross violation of the label.

Table 2. Application dates and weed stages at the time of herbicide application in garbanzo beans near Prineville and Culver, Oregon, 2006.

	Prineville		Culver	
	April 12 [†]	May 25 [‡]	April 26 [†]	May 27 [‡]
Hairy nightshade	preemergence	ht: 3 inch	preemergence	2-5 leaf, ht: 2 inch
Common lambsquarters	preemergence	ht: 3 inch	preemergence	ht: 3 inch
Wild buckwheat	preemergence	ht: 4 inch	---	---
Redroot pigweed	---	---	preemergence	4-8 leaf, dia: 2 inch
Volunteer carrot	---	---	preemergence	2-3 leaf

[†] Indicates PPI and PRE application stages.

[‡] Indicates POST application stage.

Table 3. Weed control from herbicides applied in garbanzo beans near Prineville and Culver, Oregon, 2006.

Treatment [†]	Rate (lb ai or ae/acre)	Applic. stage [‡]	Prineville, June 1 [§]			Culver, June 7 [¶]			
			Hairy nightshade	C. lambs-quarter	Wild buckwheat	Hairy nightshade	C. lambs-quarter	Redroot pigweed	Vol. carrot
----- % Control -----									
Ethalfuralin	0.75	PPI	45	38	50	45	48	53	0
Dimethenamid-P	0.75	PPI	48	20	0	68	59	79	20
Dimethenamid-P	0.75	PRE	58	40	75	45	60	75	43
Sulfentrazone	1.4	PRE	100	100	100	100	100	100	99
Pendimethalin	0.95	PRE	63	50	50	83	94	89	13
Oxyfluorfen	0.25	PRE	69	28	58	90	79	93	18
Imazethapyr	0.05	PRE	87	86	100	88	88	98	98
Dimethenamid-P	0.75	PPI							
fb Sulfentrazone	fb 1.4	fb PRE	100	100	100	100	100	100	100
Dimethenamid-P	0.75								
+ Sulfentrazone	+ 1.4	PRE	100	100	100	100	100	100	100
Dimethenamid-P	0.75	PPI							
fb Oxyfluorfen	fb 0.25	fb PRE	96	48	75	100	99	99	78
Dimethenamid-P	0.75								
+ Oxyfluorfen	+ 0.25	PRE	84	45	50	99	99	100	81
Sulfentrazone	1.4								
+ Oxyfluorfen	+ 0.25	PRE	100	100	100	100	100	100	100
Pendimethalin	0.95								
+ Oxyfluorfen	+ 0.25	PRE	89	60	100	97	98	98	50
Thifensulfuron	0.004	POST	23	40	28	23	57	43	27
Chlorimuron	0.01	POST	58	68	68	81	70	86	76
2,4-DB	0.2	POST	26	45	13	33	40	15	10

[†] Treatments with a + indicates that herbicides were tank-mixed. A treatment with an 'fb' indicates that one herbicide was followed by another. Trade names commonly used for herbicides not included above: thifensulfuron = Harmony GT; chlorimuron = Classic; 2,4-DB = Butyrac[®] (Albaugh, Inc.). Treatments applied POST included non-ionic surfactant at 0.25 percent v/v.

[‡] PPI = post plant, incorporated; PRE = preemerge, surface; POST = postemergence.

[§] In Prineville, treatments were applied April 12, 2006.

[¶] In Culver, treatments were applied April 26, 2006.