

Lorox[®] tankmix partners for weed control in garbanzo bean

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Lorox (linuron) is a broad spectrum herbicide labeled for use in soybean and other crops. A study was conducted at the Cook Agronomy Farm near Pullman, WA, over the years 2012, 2013, 2014 and 2015 to determine whether Lorox could be used tank-mixed with other pre-emergence herbicides in garbanzo bean.

Garbanzo bean (variety 'Sierra') was planted on May 16th 2012, May 8th in 2013, and May 1st in 2014 at a rate of 140 lb/A with a Monosem[®] precision vacuum planter. In 2015, variety 'Billy bean' was planted with a Horsch no-till disc drill on May 4th. Treatments were applied preemergence in early May each year (Table 1) and consisted in different rates of Lorox tank mixed with Sharpen (saflufenacil), Valor (flumioxazin), metribuzin, Reflex (fomesafen) and Zidua (pyroxasulfone) (Table 2). The experimental design was a randomized complete block with 4 replications. Plots were 8 ft wide by 30 ft long in 2012, 2013 and 2014 and 10 ft by 35 ft in 2015. Weed control was evaluated throughout the season. Common lambsquarters (*Chenopodium album* L.) and mayweed chamomile (*Anthemis cotula* L.) were present every year. Prickly lettuce (*Lactuca serriola* L.) was present in 2012, 2013 and 2014. Italian ryegrass (*Lolium multiflorum* Lam.) was present in 2015. Plots were harvested using a 5 ft wide combine in 2012, 2014 and 2015 and by sampling 22 ft² per plot in 2013.

Yields were not significantly different among treatments in 2012 (Table 2), and treatments had no significant effect on garbanzo biomass in 2013 (Table 3). In 2014, some herbicide treatments (mostly Lorox plus Sharpen mixes) resulted in yield over 300% higher than the non-treated check (Table 4). All herbicide treatments in 2015 resulted in higher yields than the non-check (Table 5).

No crop injury was observed in years 2012-2014 (data not shown). In 2015, mixes including Valor caused 14 to 26% injury 17 days after treatment (Table 5). Heavy rain 6 days after planting in 2015 (Table 1) might have leached Valor within the growing point of garbanzo bean seed, which hindered emergence. In other years, rain occurred within 3 days after planting (Table 1). Garbanzo grain yield in plots treated with Valor in 2015 was not lower than in plots treated with any other herbicide (Table 5).

Lorox plus Sharpen mixes provided the highest levels of control of common lambsquarters each year except in 2015 (Tables 2 through 5). Lorox applied at 16 oz/A plus any rate of Sharpen also controlled between 70 and 80% of mayweed chamomile in 2013 (Table 3) and 94% of mayweed chamomile in 2014 (Table 4). Control of mayweed chamomile with Lorox plus Sharpen mixes was above 87% in 2015 (Table 5).

Lorox plus Valor mixes controlled over 80% of common lambsquarters in 2012 (Table 2) and over 70% of common lambsquarters in 2013 (Table 3). In 2014, control of lambsquarters by Lorox plus Valor mixes hovered between only 55% and 75% (Table 4). In 2015, Lorox plus Valor mixes achieved between 65 and 69% control when Valor was used at a rate of 1.5 oz/A, and over 80% when the rate of Valor was 2 oz/A (Table 5).

Lorox plus metribuzin controlled only 29% of prickly lettuce in 2013 (Table 3). It controlled over 90% of the prickly lettuce in 2014, but only 33% of mayweed chamomile (Table 4).

Lorox plus Reflex mixes stand out by providing over 80% control of prickly lettuce in 2014 (Table 4), although they did not provide consistent control in 2013 (Table 3). Reflex has the potential to carryover to wheat, though, and is not currently labeled for use in Washington. Lorox plus Reflex mixes were outperformed by any other herbicide treatment for the control of common lambsquarters in 2015 (Table 5).

Table 1. Treatment application details for chickpea research conducted at the Cook Agronomy Farm near Pullman, WA, in 2012, 2013, 2014 and 2015.

Application date	5/21/2012	5/10/2013	5/2/2014	5/6/2015
Air temperature (F)	54	83	69	50
Soil temperature (F)	57	64	16	59
Wind velocity (mph)	8.4	3.5	0.7	4.4
Cloud cover (%)	100	15	100	30
Next rain occurred on	5/22/2012	5/13/2013	5/4/2014	5/12/2015

Table 2. Weed control 86 days after treatment (DAT) and garbanzo grain yield. Cook Agronomy Farm, 2012.

Treatment	Rate		Weed Control		Garbanzo grain yield
			86 DAT		
			Common lambsquarters	Mayweed chamomile	
	oz pr/A	lb ai/A	%		lb/A
Lorox	12	0.375	91	74	1550
Sharpen	1	0.022			
Lorox	16	0.5	90	88	1470
Sharpen	1	0.022			
Lorox	12	0.375	78	80	1510
Sharpen	1.5	0.033			
Lorox	16	0.5	83	78	1490
Sharpen	1.5	0.033			
Lorox	12	0.375	84	73	1360
Valor	1.5	0.048			
Lorox	12	0.375	90	89	1050
Valor	2	0.064			
Lorox	16	0.5	89	91	1190
Valor	1.5	0.048			
Lorox	16	0.5	88	83	1660
Valor	2	0.064			
Lorox	20	0.625	70	84	1720
Metribuzin	3	0.14			
Lorox	12	0.375	88	74	1720
Reflex	7.5	0.047			
Lorox	16	0.5	86	80	1130
Reflex	7.5	0.047			
Lorox	12	0.375	89	80	1720
Reflex	14	0.094			
Lorox	16	0.5	93	88	1540
Reflex	14	0.094			
Lorox	12	0.375	88	88	1770
Zidua	1.44	0.076			
Lorox	16	0.5	88	89	1300
Zidua	1.44	0.076			
Nontreated Check			-	-	1340

Table 3. Weed control 70 days after treatment (DAT) and garbanzo total biomass at the Cook Agronomy Farm in 2013.

Treatment	Rate		Weed Control			Garbanzo total biomass
			70 DAT			
			Common lambsquarters	Mayweed chamomile	Prickly lettuce	
oz pr/A	lb ai/A	%			lb/A	
Lorox	12	0.375	73	59	66	3960
Sharpen	1	0.022				
Lorox	16	0.5	64	60	44	3300
Sharpen	1	0.022				
Lorox	12	0.375	71	80	50	3340
Sharpen	1.5	0.033				
Lorox	16	0.5	79	71	48	2980
Sharpen	1.5	0.033				
Lorox	12	0.375	71	70	55	3770
Valor	1.5	0.048				
Lorox	12	0.375	75	70	63	3720
Valor	2	0.064				
Lorox	16	0.5	73	56	66	2940
Valor	1.5	0.048				
Lorox	16	0.5	74	74	54	3690
Valor	2	0.064				
Lorox	20	0.625	63	74	29	2510
Metribuzin	3	0.14				
Lorox	12	0.375	56	75	41	3150
Reflex	7.5	0.047				
Lorox	16	0.5	51	69	59	3140
Reflex	7.5	0.047				
Lorox	12	0.375	43	78	60	3140
Reflex	14	0.094				
Lorox	16	0.5	55	69	68	4240
Reflex	14	0.094				
Lorox	12	0.375	40	61	58	3630
Zidua	1.44	0.076				
Lorox	16	0.5	55	64	54	3220
Zidua	1.44	0.076				
Nontreated Check			-	-	-	3300

Table 4. Weed control 74 days after treatment (DAT) and garbanzo grain yield at the Cook Agronomy Farm in 2014.

Treatment	Rate		Weed Control			Garbanzo grain yield
			74 DAT			
			Common lambsquarters	Mayweed chamomile	Prickly lettuce	
oz/A	lb ai/A	%			lb/A	
Lorox	12	0.375	71	75 ab	71 ab	920 a
Sharpen	1	0.022				
Lorox	16	0.5	73	79 ab	89 ab	840 a
Sharpen	1	0.022				
Lorox	12	0.375	86	94 a	81 ab	740 ab
Sharpen	1.5	0.033				
Lorox	16	0.5	89	94 a	80 ab	900 a
Sharpen	1.5	0.033				
Lorox	12	0.375	65	71 ab	53 bc	750 ab
Valor	1.5	0.048				
Lorox	12	0.375	74	64 ab	54 abc	710 ab
Valor	2	0.064				
Lorox	16	0.5	55	59 abc	83 ab	740 ab
Valor	1.5	0.048				
Lorox	16	0.5	75	65 abc	83 ab	560 ab
Valor	2	0.064				
Lorox	20	0.625	75	33 c	91 a	520 ab
Metribuzin	3	0.14				
Lorox	12	0.375	68	49 bc	89 ab	560 ab
Reflex	7.5	0.047				
Lorox	16	0.5	64	62 abc	83 ab	730 ab
Reflex	7.5	0.047				
Lorox	12	0.375	75	81 ab	85 ab	770 a
Reflex	14	0.094				
Lorox	16	0.5	68	81 ab	90 ab	680 ab
Reflex	14	0.094				
Lorox	12	0.375	55	35 c	23 c	520 ab
Zidua	1.44	0.076				
Lorox	16	0.5	48	57 abc	63 ab	660 ab
Zidua	1.44	0.076				
Nontreated check			-	-	-	120 b

Table 5. Garbanzo injury 17 days after treatment (DAT), weed control 59 DAT and garbanzo grain yield, Cook Agronomy Farm, 2015.

Treatment	Rate		Crop injury	Weed Control 2015			Garbanzo grain yield
				59 DAT	17 DAT	Common lambsquarters	
	oz/A	lb ai/A			%		lb/A
Lorox Sharpen	12	0.375	6 de	61 abc	87 a	47 bc	1450
	1	0.022					
Lorox Sharpen	16	0.5	3 de	70 abc	92 a	70 ab	1530
	1	0.022					
Lorox Sharpen	12	0.375	8 cd	72 abc	90 a	47 bc	1790
	1.5	0.033					
Lorox Sharpen	16	0.5	8 cd	73 abc	92 a	23 cd	1910
	1.5	0.033					
Lorox Valor	12	0.375	14 bc	69 abc	76 ab	25 cd	1940
	1.5	0.048					
Lorox Valor	12	0.375	20 ab	89 a	87 a	18 cd	2040
	2	0.064					
Lorox Valor	16	0.5	18 b	65 abc	84 ab	40 bcd	1880
	1.5	0.048					
Lorox Valor	16	0.5	26 a	80 ab	91 a	20 cd	1870
	2	0.064					
Lorox Metribuzin	20	0.625	0 e	59 abcd	65 b	45 bc	1920
	3	0.14					
Lorox Reflex	12	0.375	1 de	48 cd	90 a	42 bcd	2060
	7.5	0.047					
Lorox Reflex	16	0.5	1 de	28 d	85 ab	25 cd	1960
	7.5	0.047					
Lorox Reflex	12	0.375	5 de	56 bcd	80 ab	0 d	1770
	14	0.094					
Lorox Reflex	16	0.5	1 de	71 abc	89 a	0 d	1900
	14	0.094					
Lorox Zidua	12	0.375	0 de	61 abc	89 a	94 a	1780
	1.44	0.076					
Lorox Zidua	16	0.5	1 de	60 abc	92 a	74 ab	1700
	1.44	0.076					
Nontreated			-	-	-	-	820

Disclaimer

Some of the pesticides discussed in this presentation were tested under an experimental use permit granted by WSDA. Application of a pesticide to a crop or site that is not on the label is a violation of pesticide law and may subject the applicator to civil penalties up to \$7,500. In addition, such an application may also result in illegal residues that could subject the

crop to seizure or embargo action by WSDA and/or the U.S. Food and Drug Administration. It is your responsibility to check the label before using the product to ensure lawful use and obtain all necessary permits in advance.