Weed Control and Crop Tolerance to Paraquat Applied At-Cracking to Chickpeas

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The objective of the study was to evaluate chickpea crop tolerance to paraquat in a field setting with the addition of a nonionic surfactant and weed efficacy by paraquat. This study was a repeat of previous studies conducted in 2016 and 2017.

The 2018 study was established at the Palouse Conservation Farm near Pullman, WA. Treatments were applied post emergence (POST) at several different timings starting at chickpea cracking, detailed in Table 1 and 2. Each study was conducted in a randomized complete block with 4 replications with 10' by 30' long plots. Studies were planted with chickpea variety 'Billy Bean' on May 2, 2018. Outlook at 21 fl oz A^{-1} and Lorox at 1.5 lb A^{-1} was applied preemergence (PRE) at planting. The entire study was blanket sprayed with RT3 (48 fl oz A^{-1}), NIS (0.25% v/v), and AMS Max (17 lb/100 gal) prior to harvest for burndown.

Crop injury was visually rated 9, 17, 28, and 37 days after crop emergence (DAE). Crop cover was assessed 28 and 37 DAE. Weed control of common lambsquarters was visually assessed 37 DAE. Crop heights were recorded 28 DAE by measuring 3 chickpea plants per plot. Plots were harvested using a plot combine on September 7, 2018. All data were subjected to an analysis of variance using the statistical package built into the Agricultural Research Manager software system (ARM 8.5.0, Gylling Data Management).

Visual crop injury was present after every treatment timing, however, the chickpea plants grow out of it and no crop injury was present 37 DAE (Table 2). At 28 DAE, there was no difference in crop cover. At 37 DAE, there was a reduction in crop cover for application timing B of 89 and 83% compared to 100% for the nontreated. Application B also had the most crop injury 9 DAE (41 & 49%) compared to the other timings, possibly a result of the high cloud cover (80%) at paraquat application (Table 2).

Treatment timing had no effect on plant heights or yield compared to the nontreated control. Although not significant, all treatments had numerically greater yields then the nontreated (Table 2).

Table 1. *Study treatment application details*

Study Application	A	B	C	D
Date	May 15, 2018	May 21, 2018	May 22, 2018	May 24, 2018
Timing	At-Cracking	6 DAC	7 DAC	9 DAC
Application volume (GPA)	15	15	15	15
Air temperature (˚F)	66	65	69	71
Soil temperature (˚F)	16	16.5	15	18
Wind velocity (mph, direction)	4, SW	5, NW	5, SE	6, SW
Cloud Cover (%)	73	80	0	50

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Table 2. Percent crop injury, crop cover, plant heights, weed control and yield following applications of paraquat with and without a nonionic surfactant at different application timings in chickpea. Pullman, WA, 2018. DAE = days after crop emergence. Means followed by the same letter are not statistically significantly different (α=0.05).

Treatment	Application Code	Rate field rate	Rate lb ai/A	May 24, 2018 (9 DAE) Crop Injury %	June 1, 2018 (17 DAE) Crop Injury %	June 12, 2018 (28 DAE) Cover %	June 12, 2018 (28 DAE) Crop Injury %	Plant Ht. cm	June 21, 2018 (37 DAE) Cover %	June 21, 2018 (37 DAE) Crop Injury %	July 10, 2018 (56 DAE) Weed Control %	September 20, 2016 Yield lb/A
Nontreated	-	-	-	-	-	-	-	28	-	-	-	1860
Paraquat	A	8 fl oz/A	0.125	1 h	2 d	100	0 c	25	100 a	0	96	1920
Paraquat NIS	A A	8 fl oz/A 0.25 % v/v	0.125	5 fg	3 d	100	0 c	27	100 a	0	100	1990
Paraquat	B	8 fl oz/A	0.125	41 b	14 b	100	8 abc	22	89 b	0	99	2270
Paraquat NIS	B B	8 fl oz/A 0.25 % v/v	0.125	49 a	16 b	97	8 abc	22	83 b	0	96	2080
Paraquat	C	8 fl oz/A	0.125	19 d	6 cd	100	0 c	26	100 a	0	96	2150
Paraquat NIS	C C	8 fl oz/A 0.25 % v/v	0.125	24 c	9 c	100	5 bc	24	96 ab	0	98	2230
Paraquat	D	8 fl oz/A	0.125	0 h	28 a	100	14 a	23	89 b	0	100	2190
Paraquat NIS	D D	8 fl oz/A 0.25 % v/v	0.125	0 h	28 a	100	9 ab	23	97 ab	0	100	1970
Paraquat	A	16 fl oz/A	0.250	3 gh	1 d	99	0 c	26	99 a	0	91	2170
Paraquat NIS	A A	16 fl oz/A 0.25 % v/v	0.250	6 f	1 d	100	0 c	27	100 a	0	95	2030
Sharpen NIS	A A	2 fl oz/A 0.25 % v/v	0.045	10 e	1 d	98	0 c	26	95 ab	0	98	2140
			LSD	2.92	4.29	NS	4.88	NS	9.97	NS	NS	NS