Bixlozone and Clomazone Crop Safety and Efficacy in Pulse Crops

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Bixlozone and clomazone are a selective preemergence herbicides with activity on both grass and broadleaf weeds. Both bixlozone and clomazone are novel herbicides to wheat production and inhibit carotenoid biosynthesis. Carotenoid biosynthesis inhibition causes 'bleaching' in weeds and sensitive crops. Pulse crops are an important part of the cropping rotations in the Pacific Northwest, however, weed management in chickpea is challenging because the crop is not competitive. Few options are available for annual grass and broadleaf weed control that are compatible with winter wheat in rotation. Therefore, herbicides that control annual grass and broadleaf weeds in pulse crops and do not carryover to wheat are critical. Bixlozone and clomazone have activity on Italian ryegrass. However, little is known of crop safety when applied to pulses. Therefore, the objective of these trials is to compare chickpea and pea response to bixlozone and clomazone to typical herbicide systems used for weed control.

Two trials were established near Pullman, WA in a newly seeded chickpea (var. Billy Beans) and spring pea. Treatments were applied to the soil as a preemergence tank mix (table 1). Treatments were applied with a CO_2 powered backpack sprayer and a 5 ft boom with 3 Teejet 11002VS nozzles with an effective spray pattern of 8 ft and calibrated to deliver 15 gallons per acre (GPA). The study was conducted in a randomized complete block design with 4 replications. Plots were 10 ft by 30 ft long. Treatments were assessed for crop response and weed control 19, 26, and 40 days after treatment. Plots were harvested on September 18, 2023, with a Wintersteiger plot combine with a 5-foot header. Data were subject to ANOVA using the Agricultural Research Manager software (Ver. 2023).

Table 1. *Treatment application details.*

	Study Application	
Crop	**Spring Pea**	**Chickpea**
Date	May 2, 2023	May 18, 2023
Application volume (GPA)	15	15
Timing	Preemergence	Preemergence
Air temperature (˚F)	70	70
Wind velocity (mph, direction)	6, E	9, NW
Cloud Cover (%)	30	70

Results

Injury was not evident in the spring pea but there was ample injury in the form of bleaching to the chickpea trial (Table 2). Bleaching was most evident in treatments that included higher rates of Command 3ME and F9600, however, injury was relatively low on any given rating date (5-25%). Injury was not apparent later in the season and did not impact yield. Bixlozone and clomazone appear to be safe on spring pea crops. Even at the highest rates, there was no bleaching found in spring pea. There may be some concern in chickpeas, though. The bleaching did not appear to affect yield of chickpeas (Table 2) but injury was evident in all treatments that included bixlozone and clomazone at rates over 9 oz/A.

Italian ryegrass control in chickpea was comparable among treatments and ranged from 57 to 100% (Table 3), which may be due to the field conditions in which the trial was located. Weed control in spring pea was variable, but generally greater than 70% for all treatments (Table 2). Although on June 6th, weed

control was only 57% in the treatment with the novel herbicide, F9600, at 27 oz/A mixed with RoundUp and Spartan Charge.

Yield for both crops were comparable and not significantly different among treatments (Tables 2 and 4). It should be noted that the yield was variable within each treatment for both trials (Figures 1 and 2), which may be due to field conditions rather than a product of the treatments.

Both Command 3ME and the new herbicide bixlozone can cause injury in chickpea and pea. When combined with Spartan Charge, control of Italian ryegrass can be near complete. However, rotation carryover is a concern. Both field sites will be monitored for carryover to winter wheat in 2024. Additional rotational trials evaluating the use of Command and bixlozone are also planned.

Table 2. Crop injury (%) and yield (lb/A) in chickpea in response to increasing rates of Command 3ME mixed with RoundUp PowerMax and Spartan Charge. Injury and yield were not different among treatments within each day of assessment ($\alpha = 0.5$).

			Injury (%)	Injury (%)	Yield (lb/A)
Treatment	**Rate**		**6/13/2023**	**6/27/2023**	**9/18/2023**
Command 3ME	4.5	oz/A	0	0	3500
Spartan Charge	8	oz/A			
RoundUp PowerMax	32	oz/A			
Command 3ME	9	oz/A	0	0	5480
Spartan Charge	8	oz/A			
RoundUp PowerMax	32	oz/A			
Command 3ME	18	oz/A	10	15	4900
Spartan Charge	8	oz/A			
RoundUp PowerMax	32	oz/A			
Command 3ME	24	oz/A	26	24	6400
Spartan Charge	8	oz/A			
RoundUp PowerMax	32	oz/A			
Authority Supreme	15.4	oz/A	0	0	4130
RoundUp PowerMax	32	oz/A			
Authority Supreme	15.4	oz/A	0	0	5980
Express	0.5	oz/A			
RoundUp PowerMax	32	oz/A			
F9600	12.8	oz/A	5	5	7630
Spartan Charge	8	oz/A			
RoundUp PowerMax	32	oz/A			
F9600	25.6	oz/A	5	5	4170
Spartan Charge	8	oz/A			
RoundUp PowerMax	32	oz/A			
RoundUp Power Max	32	oz/A	5	5	3850
F9600	12.8	oz/A	0	5	4710

Table 3. Italian ryegrass control (%) in chickpea in response to increasing rates of Command 3ME. Control was not different among treatments within each day of assessment (α=0.5).

			Control (%)	Control (%)	Control (%)
Treatment	**Rate**		**6/6/2023**	**6/13/2023**	**6/27/2023**
Command 3ME	4.5	oz/A	57	75	65
Spartan Charge	8	oz/A			
RoundUp PowerMax	32	oz/A			
Command 3ME	9	oz/A	85	77	75
Spartan Charge	8	oz/A			
RoundUp PowerMax	32	oz/A			
Command 3ME	18	oz/A	95	75	87
Spartan Charge	8	oz/A			
RoundUp PowerMax	32	oz/A			
Command 3ME	24	oz/A	100	85	95
Spartan Charge	8	oz/A			
RoundUp PowerMax	32	oz/A			
Authority Supreme	15.4	oz/A	95	90	95
RoundUp PowerMax	32	oz/A			
Authority Supreme	15.4	oz/A	95	72	87
Express	0.5	oz/A			
RoundUp PowerMax	32	oz/A			
F9600	12.8	oz/A	97	92	95
Spartan Charge	8	oz/A			
RoundUp PowerMax	32	oz/A			
F9600	25.6	oz/A	97	97	92
Spartan Charge	8	oz/A			
RoundUp PowerMax	32	oz/A			
RoundUp Power Max	32	oz/A	62	90	45
F9600	12.8	oz/A	62	95	50

Table 4. Italian ryegrass control (%) and yield (bu/A) for spring pea in response to increasing rates of Command 3ME mixed with RoundUp PowerMax and Spartan Charge. Means with different letters are significantly different ($\alpha = 0.05$).

			Control (%)	Control[1] (%)	Yield[1] (lb/A)
Treatment	**Rate**		**6/6/2023**	**6/27/2023**	**9/18/2023**
Command 3ME	4.5	oz/A	75 ab	82	5690
Spartan Charge	8	oz/A			
RoundUp PowerMax	32	oz/A			
Command 3ME	9	oz/A	75 ab	67	4910
Spartan Charge	8	oz/A			
RoundUp PowerMax	32	oz/A			
Command 3ME	18	oz/A	90 a	92	3660
Spartan Charge	8	oz/A			
RoundUp PowerMax	32	oz/A			
Command 3ME	24	oz/A	95 a	85	4460
Spartan Charge	8	oz/A			
RoundUp PowerMax	32	oz/A			
Authority Supreme	15.4	oz/A	95 a	90	3100
RoundUp PowerMax	32	oz/A			
Authority Supreme	15.4	oz/A	92 a	95	6120
Express	0.5	oz/A			
RoundUp PowerMax	32	oz/A			
F9600	12.8	oz/A	97 a	92	4820
Spartan Charge	8	oz/A			
RoundUp PowerMax	32	oz/A			
F9600	25.6	oz/A	57 b	88	4050
Spartan Charge	8	oz/A			
RoundUp PowerMax	32	oz/A			
RoundUp Power Max	32	oz/A	90 a	87	4130
F9600	12.8	oz/A	85 a	95	3170

[1]Weed control and yield were not different among treatments within day of assessment ($\alpha = 0.05$).

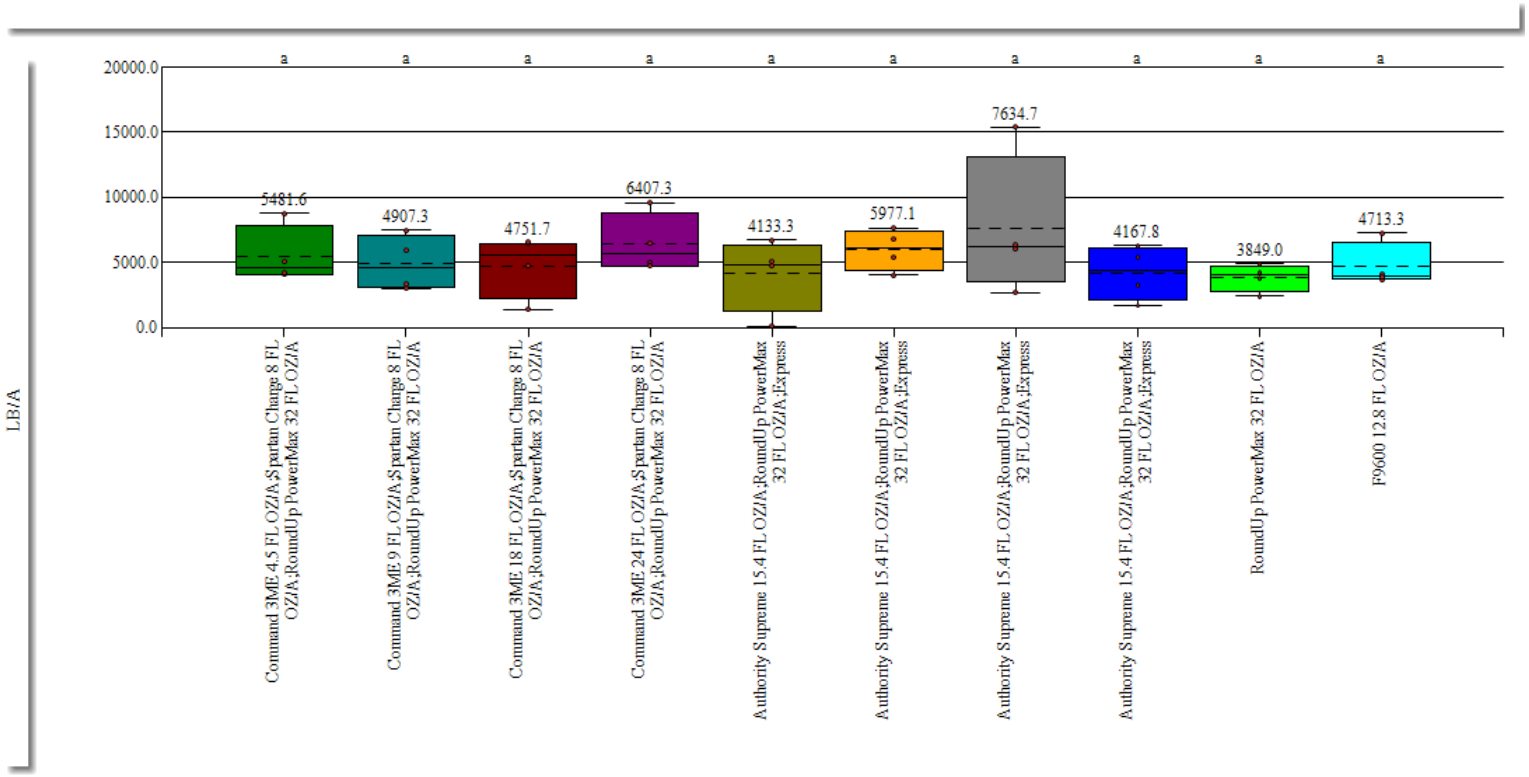

Figure 1. Chickpea yield (lb/A) in response to increasing rates of Command 3ME in comparison to Spartan Charge and bixlozone (F9600).

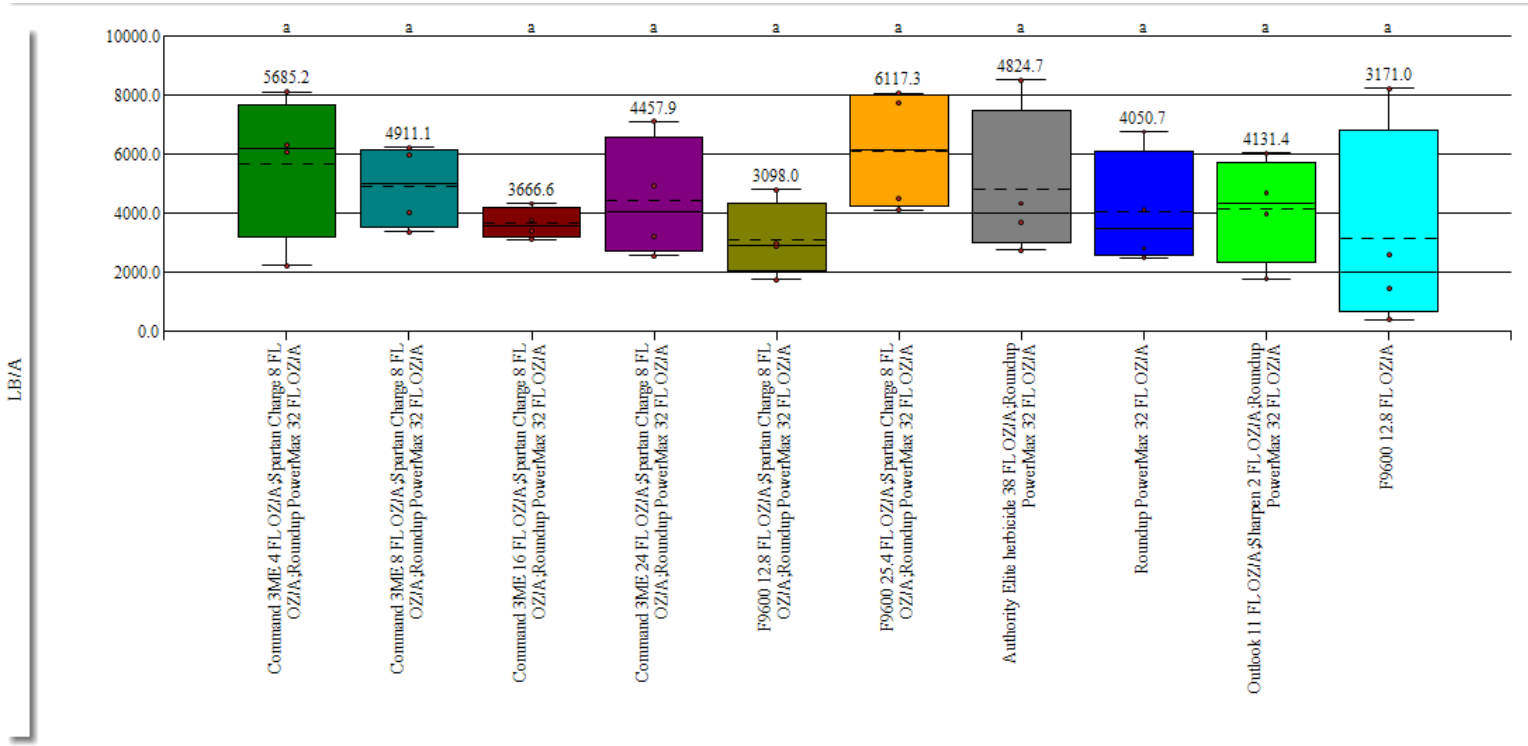

Figure 2. Spring pea yield (lbs/A) in response to increasing rates of Command 3ME in comparison to Spartan Charge and bixlozone (F9600).

Off-label or Experimental-Use Disclaimer

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