

Update on Weed Control with Pyridate and Clethodim in Chickpea

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Postemergence (POST) broadleaf weed control is currently not an option for chickpea (*Cicer arietinum*) growers in the Pacific Northwest – there are no registered products. Preemergence (PRE) options exist but require spring precipitation for activation. As a consequence, broadleaf weed control in chickpea is difficult and often unacceptable.

Pyridate, previously labeled as Tough 5EC in peanuts and corn, is a photosystem II inhibitor. Chickpeas are tolerant due to metabolic detoxification of the herbicide, making pyridate a possible fit as a POST broadleaf herbicide in chickpeas (Gimenez-Espinosa and De Prado, 1997). The objective of the study was to evaluate pyridate effectiveness for broadleaf weed control in a field setting.

Both studies were established at the Cook Agronomy Farm near Pullman, WA, over two years with one being conducted in 2016 and the repeated study in 2017. Treatments were applied post emergence (POST) at several different crop stages with and without the addition of a surfactant and clethodim (Select Max) detailed in table 1, 2 and 3. Both studies were conducted in a randomized complete block with 4 replications. Plots were 10' by 30' long. Studies were planted with chickpea variety Billy bean by the farm crew on May 4, 2016 and May 10, 2017, with both studies emerging 12 days later. No preemergent herbicides were applied to either study. In 2016, common lambsquarters (CHEAL) presented high weed pressure while in 2017 mayweed chamomile (ANTCO) was the dominant weed present with CHEAL also present.

Crop injury was visually rated 28 days after treatment (DAT16) of application A for the 2016 study (DAT16). CHEAL control was visually assessed 114 DAT16. The 2017 study was visually rated for crop injury 2 and 21 days after treatment of application A (DAT17), and CHEAL, ANTCO, and Italian ryegrass (LOLMU) control were visually assessed 23 days after the last application, or 43 DAT17 after the first application. Plots were harvested using a 5' plot combine on September 20, 2016 and September 11, 2017. All data was 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).

When the study was conducted in 2016, there was no significant crop injury for any of the treatments 28 DAT of application A or 15 DAT16 of application C. All treatments provided common lambsquarters (CHEAL) control compared to the nontreated. Pyridate applied at the highest rate (48 fl oz A⁻¹) without and with NIS applied at 8 to 10" chickpeas provided the best common lambsquarters control at 95% and 94%, respectively (Table 3). Pyridate provided significantly higher yield for all treatments compared to the nontreated control except when pyridate and Select Max were applied together at the earliest application timing of 2 to 4" chickpeas (application A). Pyridate with Select Max and COC applied in the same tank mixture at application timing A did not result in yield significantly different from the nontreated control (Table 3).



Fig 1 .2016 Pyridate Weed Control Study CHEAL Control. Left: Nontreated control. Right: Pyridate (48 fl oz A⁻¹) with NIS applied to 8 to 10" chickpeas.

The study, repeated in 2017, also observed no significant crop injury was observed for any treatment 21 and 43 DAT17 after the first application (A). All timings and pyridate rates provided excellent common lambsquarters control compared to the nontreated. Pyridate applied at the first application timing (A) at 2 to 4" chickpeas provided greater control of mayweed chamomile (ANTCO) with 99% control overall (23 DAT17) compared to the later application timing (C) at 8 to 10" chickpeas

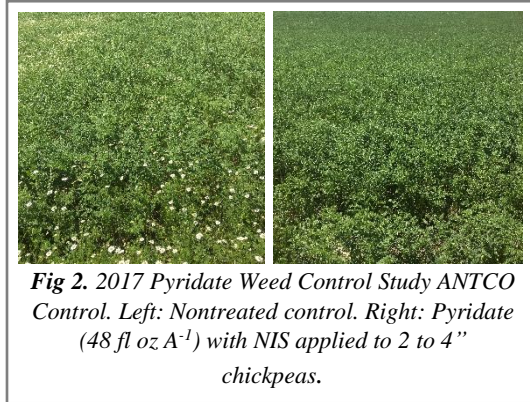


Fig 2. 2017 Pyridate Weed Control Study ANTCO Control. Left: Nontreated control. Right: Pyridate Control (48 fl oz A⁻¹) with NIS applied to 2 to 4" chickpeas.

which provided 78% to 90% control (Table 4). The earlier application likely had greater activity due to the ANTCO being smaller in size. At application A the ANTCO was ½" in diameter compared to 3" in diameter at the later timing of application C (Table 2). A consistent Italian ryegrass (LOLMU) population allowed grass weed control to be rated in 2017. Clethodim (Select Max) as a tank mix partner or applied alone was included in these studies to determine compatibility and crop safety. There was no significant difference between applying clethodim with pyridate or in a separate tank mix at a later timing (Table 4) for LOLMU control. However, waiting until the

chickpeas are at 8 to 10" or 15 days after chickpea emergence does significantly reduce LOLMU control because of the larger grass size. At application A and B, the LOLMU was 2" or less in height compared to application C where the LOLMU had doubled in size (Table 2).

Table 1. 2016 study treatment application details

Study Application	A	B	C
Date	May 24, 2016	June 3, 2016	June 6, 2016
Application volume (GPA)	15	15	15
Crop Stage	2-4"	6"	8-10"
Air temperature (°F)	57	67	80
Soil temperature (°F)	62	60	68
Wind velocity (mph, direction)	3, SE	4, S	4, E
Next rain occurred on	June 8, 2016	June 8, 2016	June 8, 2016

Table 2. 2017 study treatment application details

Study Application	A	B	C
Date	May 30, 2017	June 2, 2017	June 19, 2017
Application volume (GPA)	15	15	15
Crop size	3.5"	6"	8"
CHEAL height	1"	-	3"
ANTCO diameter	0.5"	-	3"
LOLMU height	1.5"	2"	4"
Air temperature (°F)	86	73	80
Soil temperature (°F)	66	64	68
Wind velocity (mph, direction)	10, E	4, NW	8.2, E
Cloud Cover	15%	10%	1%
Next rain occurred on	June 1, 2017	June 4, 2017	June 26, 2017

Table 3. Percent crop injury for chickpea, percent common lambsquarters control and yield following applications of pyridate and clethodim at different application timings. Pullman, WA, 2016. DAT = days after treatment for the 2016 study. Means followed by the same letter are not statistically significantly different ($\alpha=0.05$).

Treatment	Application Code	Rate		June 21, 2016	September 15, 2016	September 26, 2016
				28 DAT	114 DAT	
		field rate	lb ai/A	Crop Injury %	CHEAL control %	Yield lb/A
Nontreated	-	-	-	-	-	926 a
Pyridate	A	24 fl oz/A	0.940			
Clethodim	B	16.5 fl oz/A	0.125	10	88 ab	1840 b
COC	B	0.25% v/v				
Pyridate	A	48 fl oz/A	1.880			
Clethodim	B	16.5 fl oz/A	0.125	13	84 ab	1890 b
COC	B	0.25% v/v				
Pyridate	A	24 fl oz/A	0.940			
NIS	A	0.25% v/v				
Clethodim	B	16.5 fl oz/A	0.125	20	78 ab	1730 b
COC	B	0.25% v/v				
Pyridate	A	48 fl oz/A	1.880			
NIS	A	0.25% v/v				
Clethodim	B	16.5 fl oz/A	0.125	0	65 ab	1950 b
COC	B	0.25% v/v				
Pyridate	A	24 fl oz/A	0.940			
Clethodim	A	16.5 fl oz/A	0.125	3	85 ab	1500 ab
COC	A	0.25% v/v				
Pyridate	A	24 fl oz/A	1.880			
Clethodim	A	16.5 fl oz/A	0.125	5	82 ab	1510 ab
COC	A	0.25% v/v				
Pyridate	C	24 fl oz/A	0.940			
Clethodim	B	16.5 fl oz/A	0.125	5	58 b	1810 b
COC	B	0.25% v/v				
Pyridate	C	48 fl oz/A	1.880			
Clethodim	B	16.5 fl oz/A	0.125	15	95 a	2020 b
COC	B	0.25% v/v				
Pyridate	C	24 fl oz/A	0.940			
NIS	C	0.25% v/v				
Select Max	B	16.5 fl oz/A	0.125	18	87 ab	1800 b
COC	B	0.25% v/v				
Pyridate	C	48 fl oz/A	1.880			
NIS	C	0.25% v/v				
Clethodim	B	16.5 fl oz/A	0.125	8	94 a	2140 b
COC	B	0.25% v/v				
Pyridate	C	24 fl oz/A	0.940			
Clethodim	C	16.5 fl oz/A	0.125	15	85 ab	1870 b
COC	C	0.25% v/v				
Pyridate	C	24 fl oz/A	1.880			
Clethodim	C	16.5 fl oz/A	0.125	20	84 ab	1810 b
COC	C	0.25% v/v				
<i>LSD</i>				<i>NS</i>	22	557

Table 4. Percent chickpea crop injury, percent common lambsquarters (CHEAL), mayweed chamomile (ANTCO), and Italian ryegrass (LOLMU) control and yield following applications of pyridate and clethodim at different application timings. Pullman, WA, 2017. DAT = days after treatment for the 2017 study. Means followed by the same letter are not statistically significantly different ($\alpha=0.05$).

Treatment	Application Code	Rate		June 1, 2017	June 20, 2017	July 12, 2017		September 11, 2017	
				2 DAT	21 DAT	43 DAT			
				Crop Injury	Crop Injury	CHEAL Control	ANTCO Control	LOLMU Control	Yield
		field rate	lb ai/A	%	%	%	%	%	lb/A
Nontreated	-	-	-	-	-	-	-	-	1489
Pyridate	A	24 fl oz/A	0.940						
Clethodim	B	16.5 fl oz/A	0.125	0	0	99	99 a	36 ab	1793
COC	B	0.25% v/v							
Pyridate	A	48 fl oz/A	1.880						
Clethodim	B	16.5 fl oz/A	0.125	0	0	99	99 a	56 ab	2091
COC	B	0.25% v/v							
Pyridate	A	24 fl oz/A	0.940						
NIS	A	0.25% v/v		0	0	99	99 a	49 ab	1753
Clethodim	B	16.5 fl oz/A	0.125						
COC	B	0.25% v/v							
Pyridate	A	48 fl oz/A	1.880						
NIS	A	0.25% v/v		0	0	99	99 a	45 ab	2088
Clethodim	B	16.5 fl oz/A	0.125						
COC	B	0.25% v/v							
Pyridate	A	24 fl oz/A	0.940						
Clethodim	A	16.5 fl oz/A	0.125	0	0	99	99 a	25 ab	1991
COC	A	0.25% v/v							
Pyridate	A	24 fl oz/A	1.880						
Clethodim	A	16.5 fl oz/A	0.125	0	0	99	99 a	76 a	2106
COC	A	0.25% v/v							
Pyridate	C	24 fl oz/A	0.940						
Clethodim	B	16.5 fl oz/A	0.125	0	0	99	88 ab	34 ab	1965
COC	B	0.25% v/v							
Pyridate	C	48 fl oz/A	1.880						
Clethodim	B	16.5 fl oz/A	0.125	0	0	98	90 ab	49 ab	1871
COC	B	0.25% v/v							
Pyridate	C	24 fl oz/A	0.940						
NIS	C	0.25% v/v		0	0	99	78 b	28 ab	1624
Select Max	B	16.5 fl oz/A	0.125						
COC	B	0.25% v/v							
Pyridate	C	48 fl oz/A	1.880						
NIS	C	0.25% v/v		0	0	99	86 ab	51 ab	1855
Clethodim	B	16.5 fl oz/A	0.125						
COC	B	0.25% v/v							
Pyridate	C	24 fl oz/A	0.940						
Clethodim	C	16.5 fl oz/A	0.125	0	0	99	84 ab	6 b	1722
COC	C	0.25% v/v							
Pyridate	C	24 fl oz/A	1.880						
Clethodim	C	16.5 fl oz/A	0.125	0	0	99	84 ab	5 b	1489
COC	C	0.25% v/v							
			LSD	NS	NS	NS	10	34	498

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.