Residual Weed Control in Chickpea

Trial ID: **LB2302** **Location:** **Jandowae** **Trial Year:** **2023**
Investigator: **Linda Bailey**

For more than 25 years, broadleaf weed control in northern region chickpeas has been heavily reliant on herbicides from just two modes of action; Group 27 e.g. Balance or Group 5 e.g. Terbyne Xtreme or Simazine. Recent registrations of Group 14 herbicides (Terrad'or, Terrain, Reflex and Voraxor) for use in pulses has provided new options that may reduce the herbicide resistance selection pressure.

The primary objective of this project was to validate the benefits and fit of the Group 14 herbicides alone or in combination with existing chemistry to refine weed management strategies in chickpeas. Similar trials were conducted in winter 2022.

In addition, all the evaluated group 14 herbicides have equivalent use patterns in faba beans. Generating sound residual efficacy data in faba beans can be challenging because of the rapid crop development and canopy closure. Instead of duplicating trials in faba beans, 3 extra herbicide treatments, that are ONLY registered in faba beans, were included in the chickpea trials.

Objective:	**To evaluate Group 14 herbicide options in chickpeas when applied alone, or with Balance and Terbyne Xtreme**	
Crop & Variety:	**Chickpea cv. PBA Seamer**	
Planting Date:	**24/05/2023**	
Planting Details:	**John Deere single disc planter on 1 m row spacing and 40 kg/ha planting rate, ~75% ground cover**	
Application:	**A**	**B**
Application Timing:	**Pre-plant**	**PSPE (Post-sowing, pre-emergence)**
Application Date:	**19/05/2023 (5 days pre-plant)**	**29/05/2023 (5 days post-plant)**
Days After Previous Application:	**-**	**10 days**
Nozzles:	**AIXR11002**	
Volume:	**100 L/ha**	
Trial Design:	**Randomised complete block of 18 treatments x 4 replicates**	
Plot Size:	**4 m x 12 m**	
Keywords:	**Chickpea, common sowthistle, flaxleaf fleabane, African turnip weed, residual**	

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NB: **Treatments 15-17 are ONLY registered in faba beans.** These treatments were included in this project as benchmarks for weed efficacy in faba bean use patterns.

Trt No.	Treatment	Product Rate	Appln. Code				
Crop Name				**Chickpea**			
Crop Variety				**PBA Seamer**			
Pest Scientific Name					***Sonchus oleraceus***	***Conyza bonariensis***	***Sisymbrium thellungii***
Pest Name					**Common Sowthistle**	**Flaxleaf Fleabane**	**African Turnip Weed**
Assessment Date				**27/06/2023**	**7/08/2023**	**7/08/2023**	**7/08/2023**
Assessment Type				**EMERGENCE**	**COUNT**	**COUNT**	**COUNT**
Assessment Unit				**/m²**	**/m²**	**/m²**	**/m²**
Assessment Area				**6 m row**	**10 m²**	**10 m²**	**10 m²**
Pest Stage Majority				**-**	**~6 leaf**	**~7 leaf**	**~7 leaf**
Plant-Evaluation Interval				**34 DAP**			
Treatment-Eval Interval					**80 DAA/ 70 DAB**	**80 DAA/ 70 DAB**	**80 DAA/ 70 DAB**
ARM Action Codes					**AA**	**AA**	**AA**
1	Untreated	-	-	6.8-	0.14a	0.54a-d	0.09a
2	Terrain	180g/ha	A	11.7-	0.01bc	1.02a	0.01bcd
3	Terrad'or	40g/ha	A	6.6-	0.03bc	0.34a-f	0.07ab
4	Terrain Balance	180g/ha 100g/ha	A B	8.5-	0.01bc	0f	0d
5	Terrad'or Balance	40g/ha 100g/ha	A B	9.6-	0c	0.04def	0d
6	Terrain Terbyne Xtreme	180g/ha 860g/ha	A B	9.1-	0.04b	0.69ab	0d
7	Terrad'or Terbyne Xtreme	40g/ha 860g/ha	A B	7.5-	0c	0.13b-f	0.01cd
8	Reflex	1250ml/ha	B	9.0-	0c	0.64abc	0.05abc
9	Balance	100g/ha	B	8.3-	0c	0.19a-f	0d
10	Balance Terbyne Xtreme	100g/ha 860g/ha	B B	9.8-	0.01bc	0.05c-f	0d
11	Balance Simazine 900 DF	100g/ha 1000g/ha	B B	8.9-	0.01bc	0.06c-f	0d
12	Balance Reflex	100g/ha 1250ml/ha	B B	7.6-	0c	0.01ef	0d
13	Terbyne Xtreme	860g/ha	B	9.5-	0.03bc	0.86ab	0d
14	Terbyne Xtreme Reflex	860g/ha 1250ml/ha	B B	7.8-	0c	0.51a-d	0.01cd
15	Group 5 D	830g/ha	B	8.8-	0c	0.57a-d	0d
16	Group 2 S	70g/ha	B	8.3-	0c	1.00a	0d
17	Group 2 S Terbyne Xtreme	70g/ha 860g/ha	B B	9.4-	0c	0.38a-e	0d
18	Voraxor	200ml/ha	B	8.7-	0c	0.51a-d	0d
			LSD P=.05	nsd	0.058 - 0.100	0.479 - 0.844	0.054 - 0.070
			Treatment Prob.(F)=	0.8375	0.0036	0.0104	0.0013

Means followed by same letter or symbol (-) do not significantly differ (P=.05, LSD).
Mean comparisons performed only when AOV Treatment P (F) is significant at mean comparison OSL.
nsd – no significant difference
NB: A weed count of 0 = no surviving weeds were found in any plot

ARM Action Codes
AA = Automatic arcsine square root % transformation

DAP = Days after Planting
DAA = Days after Application A
DAB = Days after Application B

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Conclusions:

This project was designed to evaluate the residual efficacy of three Group 14 herbicides (Reflex, Terrad'or, Terrain) when applied as standalone options or in combination with Balance or Terbyne Xtreme. The previous crop was barley in 2022 with ~25 cm tall standing stubble and groundcover levels of ~75% at trial initiation. A fallow knockdown spray was applied prior to the trial commencement to control a range of broadleaf weeds and volunteer barley.

The Group 2 S and Group 5 D herbicides, although not registered for use in chickpeas, were included in the trial to benchmark Group 14 efficacy data for use in faba beans.

Application A (pre-plant treatments) were applied in mid-May with PBA Seamer chickpeas planted 5 days later using a single disc planter. Application B (PSPE treatments) were applied at 5 DAP (5 days after planting). Only two rain events of >5mm occurred after crop planting, 11 mm of rain at 41-42 DAP and ~6 mm at 134 DAP. Weed counts were conducted at 80 DAA (80 days after application A) with a final inspection at 158 DAA.

Crop establishment was assessed at 34 DAP. Emergence in the untreated was relatively poor at ~7 plants/m^2 but there was no significant difference for chickpea establishment or evidence of visual crop effects.

All treatments significantly reduced trace level populations of common sowthistle at 80 DAA. There were only ~0.1 sowthistle/m^2 in the untreated but with no sowthistle present in the treatments of Balance, Reflex, Group 2 S, Group 5 D or Voraxor alone, or Terrad'or followed by either Balance or Terbyne Xtreme, mixtures of Reflex with either Balance or Terbyne Xtreme or the faba bean option of Group 2 S mixed with Terbyne Xtreme.

Flaxleaf fleabane populations of ~1/m^2 were also present. Treatments of Terrain followed by Balance or Reflex mixed with Balance resulted in significantly reduced populations of flaxleaf fleabane (>98% control). Treatments of Terrad'or followed by Balance or Balance in mixture with either Terbyne Xtreme or Simazine also reduced the fleabane population by ~90%. All single product treatments, including Balance, were commercially unsatisfactory.

Trace levels of African turnip weed were also present with ~0.1 /m^2 in the untreated. All treatments except Terrad'or and Reflex alone significantly reduced the population of African turnip weed.

A second assessment of residual efficacy was conducted in late October. The interim period had been very dry with a total of ~7 mm over an 11 week period. Nearly all weeds were developing seed heads with results showing similar counts to the 80 DAA assessment (results not presented).

In this situation, all treatments demonstrated good crop safety. Weed densities were low to very low with <20 mm of rainfall in total over the 5 month trial duration. Residual efficacy was assessed at 80 DAA/ 70 DAB but germination and emergence was initiated from rainfall at ~46 DAA/ 36 DAB. This was the first rainfall received after product application. In the absence of incorporating rainfall prior to weed germination, treatments of Terrain or Terrad'or followed by Balance or mixtures of Terbyne Xtreme, Simazine or Reflex with Balance provided the most effective control of the weed spectrum present. The Group 14 herbicides alone provided good control of common sowthistle but were ineffective on flaxleaf fleabane.

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Application Description		
	A	B
Application Date:	19/05/2023	29/05/2023
Application Start Time:	11:00 AM	10:50 AM
Application Stop Time:	11:35 AM	1:15 PM
Interval to Previous Application:	-	10 DAYS
Application Timing:	PRE-PLANT	PSPE
Air Temperature Start, Stop:	17.5, 19.3 C	15.1, 19.6 C
% Relative Humidity Start, Stop:	52.5, 50.4	40.7, 34.4
Wind Velocity & Direction Start:	8.3 km/h, S	13.8 km/h, SSW
Wind Velocity & Direction Stop:	9 km/h, S	10.2 km/h, SSW
Soil Moisture:	SLIGHTLY DRY	DRY
% Cloud Cover:	5	0
First Moisture Occurred On:	4/07/2023	4/07/2023

Application Equipment		
	A	B
Application Equipment:	Polaris	
Equipment Type:	BOOM	
Operation Pressure:	400 kPa	
Nozzle Model:	AIXR11002	
Nozzle Spacing:	50 cm	
Boom Length:	4 m	
Boom Height:	60 cm	
Ground Speed:	9.5 km/h	
Application Amount:	100 L/ha	

Rainfall:

Closest Weather Station:	SILO grid point -26.80, 151.20
Distance:	1.1 km

Date	Daily Rainfall	Unit	Comments
14/05/2023	1.5	mm	
15/05/2023	5.1	mm	
16/05/2023	14.9	mm	
19/05/2023	-		Application A (preplant)
24/05/2023	-		Planting
29/05/2023	-		Application B (PSPE)
27/06/2023	-		Assessment 1 - chickpea emergence
4/07/2023	4.2	mm	
5/07/2023	6.9	mm	
7/08/2023	-		Assessment 2 - weed counts
6/09/2023	1.3	mm	
5/10/2023	5.6	mm	
24/10/2023	-		Final inspection - trial terminated