

L3 Herbicide Tolerance, LRZ Southern Mallee (Curyo), Victoria

Aim

To understand the genetic control in lentils relating to tolerance to the range of sulfonyl urea herbicides.

Treatments

- Varieties: PBA HurricaneXT and CIPAL1208 (Tolerant to imazethapyr, but with potential differential responses to the sulfonylurea 'su' herbicides), PBA Flash (Control, Intolerant).
- Herbicides: Twenty two herbicide treatments were applied and compared with an untreated 'control'. Three sulfonylurea herbicides (chlorsulfuron, metsulfuron-methyl, triasulfuron) and one Group I (clopyralid) were applied at four rates, and the imazadolinones (imazethapyr and imazapyr) at a high rate post-sowing pre-emergent (PSPE). Chlorsulfuron was also applied 6 weeks pre-sowing as a residual application at the four rates to mimic potential residual concentrations in soil (Table 1). *Note: All herbicide treatments used in this trial are not registered for use*

Other Details

- Sowing date: 19 May
- Row Spacing: 36 cm
- Stubble: Standing (approximately 15 cm), sown inter-row
- Fertiliser: MAP + Zn @ 60 kg/ha at sowing
- Plant Density: 120 plants/m²
- Soil type: Soil Type: Alkaline Sandy Loam over a heavy clay at about 40-60cm (Table 1 in Trial L1 above)

Results and Interpretation

- Key Message: PBA HurricaneXT has improved tolerance to the sulfonylurea herbicides relative indicating significant benefits where residues may be an issue in cropping systems.
- Herbicide Damage - Visual herbicide damage symptoms recorded July 14 were moderate to severe, resulting in crop death for many treatments applied to the intolerant genotype PBA Flash, particularly the higher rates (Table 1). CIPAL1208 showed a low level of damage with application imazethapyr and imazapyr, but all SU's and clopyralid caused significant damage at all application rates. Symptoms generally increased with increasing application rate and within the SU's chlorsulfuron caused the greatest damage. In comparison, PBA HurricaneXT only had significant damage scores in the highest application rate of chlorsulfuron applied PSPE and with imazapyr and the 3 higher rates of clopyralid. When plants were not killed by the initial herbicide application, in many cases, a level of recovery was observed throughout the season, which is reflected in the grain yields. (Table 1).
- Grain Yield - For the intolerant genotype PBA Flash, complete or significant yield loss was observed for most treatments (Table 2). Interestingly at the lower rates of triasulfuron, clopyralid and metsulfuron-methyl PBA Flash recovered sufficiently, so that grain yields were not significantly different from the 'Nil' (0.95t/ha). Within the tolerant lines, CIPAL1208, showed no significant yield loss with the application of imazapyr and imazethapyr, although yields tended to be lower (Table 2). Chlorsulfuron caused yield loss at all application rates and timings, while metsulfuron-methyl and triasulfuron, only caused loss at the highest rate. Clopyralid similar to other varieties caused yield loss at the two highest rates. PBA HurricaneXT was highest yielding (1.2 t/ha) and only showed significant yield loss when imazapyr, chlorsulfuron (PSPE) at the highest rate and clopyralid at the two highest rates were applied.
- Grain Weight – Within the tolerant lines there were no major impacts of the various herbicide treatments on grain weight.

Table 1. The effect of various Group B herbicide treatments and one Group I on visual damage score (0 – no damage, 100 – complete plant death) recorded July 14 of the imidazolinone tolerant lentil variety PBA HurricaneXT and genotypes, CIPAL1208, in comparison with an intolerant genotype, PBA Flash at Curyo, 2014. Significant damage scores have been shaded.

Herbicide ¹	App Rate	CIPAL1208	PBA Flash	PBA HurricaneXT
Nil	x0	0	0	0
Imazethapyr	x4	5	80	5
Imazapyr	x4	13	80	20
Chlorsulfuron 'res'	x0.125	40	30	7
	x0.25	53	43	3
	x0.5	53	53	0
	x1	70	77	10
Chlorsulfuron	x0.125	57	60	0
	x0.25	73	80	7
	x0.5	80	87	3
	x1	80	83	37
Metsulfuron-methyl	x0.125	17	13	0
	x0.25	23	33	0
	x0.5	47	53	3
	x1	63	57	3
Triasulfuron	x0.125	17	37	0
	x0.25	30	50	10
	x0.5	47	43	0
	x1	63	77	17
Clopyralid	x0.125	30	0	13
	x0.25	70	67	50
	x0.5	90	73	88
	x1	100	93	100

1. All herbicides applied Post Sowing Pre-emergent except Chlorsulfuron, which was also applied 6 weeks pre sowing to mimic potential residual concentrations ('res')

Table 2. The effect of various Group B herbicide treatments and one Group I on grain yield (t/ha) of the imidazolinone tolerant lentil variety PBA HurricaneXT and genotypes, CIPAL1208, in comparison with an intolerant genotype, PBA Flash at Curyo, 2014.

Herbicide	App Rate	CIPAL1208	PBA Flash	PBA HurricaneXT
Nil	x0	0.83	0.95	1.20
Imazethapyr	x4	0.54	0.00	0.96
Imazapyr	x4	0.62	0.00	0.50
Chlorsulfuron 'res'	x0.125	0.47	0.26	1.10
	x0.25	0.42	0.00	1.29
	x0.5	0.53	0.00	1.48
	x1	0.32	0.00	1.18
Chlorsulfuron	x0.125	0.47	0.18	0.93
	x0.25	0.48	0.00	1.25
	x0.5	0.37	0.00	1.16
	x1	0.06	0.00	0.78
Metsulfuron-methyl	x0.125	0.69	0.79	1.15
	x0.25	0.80	0.70	1.16
	x0.5	0.71	0.30	1.01
	x1	0.31	0.22	1.16
Triasulfuron	x0.125	1.06	1.02	1.44
	x0.25	0.81	0.59	1.22
	x0.5	0.54	0.52	1.25
	x1	0.10	0.07	1.16
Clopyralid	x0.125	0.84	1.06	1.06
	x0.25	0.76	0.67	1.18
	x0.5	0.19	0.51	0.26
	x1	0.00	0.00	0.00

1. All herbicides applied Post Sowing Pre-emergent except Chlorsulfuron, which was also applied 6 weeks pre sowing to mimic potential residual concentrations ('res')

Key Findings and Comments

- This data highlights the improved tolerance of PBA HurricaneXT to sulfonyl urea herbicides, particularly if they are used in a residual situation, i.e. in the preceeding cereal crop or during summer. It also creates opportunities to potentially change label recommendations for the SU's enabling them to be used within a closer period than currently indicated on, provided specific varieties of lentil are grown.
- It is important to look at these results with caution as the dry spring conditions limited grain yields and also may have prevented continued uptake of the SU's which could have resulted in larger yield losses similar to that observed in previous seasons in South Australia.
- As previously indicated the ongoing introduction and improvement of these herbicide tolerant lentils will result in significant farming systems benefits through improved weed control, increased control options in lentil crops and in the previous rotation phase, and decreased pressure on herbicides currently employed for broadleaf weed control in lentil. However we need to continuously monitor weed resistance levels and discuss define the optimum methods for maximising the benefits of this herbicide tolerance technology for the whole farming system. The benefit of PBA HurricaneXT is already demonstrated, with it being the largest ever release for a lentil and expected to be the dominant variety within 1-2 years. Growers must always follow label recommendations for herbicide application.

Table 3. Indicative ratings for the herbicide tolerant lentils based on all trials conducted throughout 2012 - 2014.

	PBA HurricaneXT	PBAHeraldXT	CIPAL1208	CIPAL1209
Imazethapyr	T	T	T	T
Imazamox	MT	MT	T	MT
Imazapyr	MS	MS	T/MT	T/MT
Imazapic	T/MT	T/MT	T/MT	T/MT
Flumetsulam	MT	MT	MS	MT
Metosulam	MS	MS	S	S
Metsulfuron	MS	MS	S	S
Chlorsulfuron	MS/MT	MS/MT	S	MS
Mesosulfuron	MT	T	MS	MS/MT
Triasulfuron	MS	MS	S	S