L3 Group B Herbicide Tolerance, MRZ Mid North (Mallala) and Yorke Peninsula (Arthurton), South Australia

Aim

The development of PBA Herald XT has been part of a concerted effort by the PBA lentil and the Southern Region Agronomy programs to improve weed control options in lentil. However little is known about performance of Herald to a range of group B herbicides. This trial aims to identify levels of tolerance to a range of group B herbicides, as preliminary work for the application of a registration for post-emergent use in this variety.

Treatments

Varieties: Nipper (intolerant)
PBA Herald XT, CIPAL1101 and CIPAL1102 (tolerant)

Sowing date: 27 May (Pinery), 22 June (Arthurton)

Treatments:

Chemical (Timing) Rate
Nil
Imidazolinones
Imi (PSPE) L
Imi (PSPE) H
Imi (PE) L
Imi (PE) H
Imi mix (PE) L
Imi mix (PE) H
Triazolopyrimidines
Flumetsulam (PE) L
Flumetsulam (PE) H
Metosulam (PE) L
Sulfonylureas
SU-1 (PE) H
SU-1 (Res) L
SU-2 (Res) L
SU-3 (Res) L

Res = Residual - light rate applied pre sowing to simulate herbicide residues
PSPE = Post Sowing Pre Emergent
PE = Post Emergent
L = low rate, H = high rate

Fertiliser: MAP + Zn @ 75kg/ha

Soil type: Sandy Loam (Pinery), Sandy Clay Loam (Arthurton)

Soil pH: 8.3 (Pinery), 8.2 (Arthurton)

Results and Interpretation

- Plant establishment – good early plant establishment was achieved in these trials in 2011.
- Herbicide Damage Scores – the intolerant variety Nipper showed damage in all herbicide treatments at Arthurton except for 'Imi' applied post-sowing pre-emergent (both Low and High rates), and 'SU-1' and 'SU-2' applied at low rates to simulate carryover residues (Table L3.1). At Pinery, Nipper showed significant damage symptoms in all treatments except "residual" 'SU-2'.
  Flumetsulam, which is registered for PE use on lentils, caused low to moderate damage to Nipper at both sites at both rates. Significant damage to tolerant varieties, PBA Herald XT, CIPAL1101 and CIPAl1102, was also noted at the high rate only at Arthurton.
  Significant visual damage was caused to tolerant varieties at both sites by the application of PE metosulam and 'SU-1', and high rates of 'Imi mix'. Tolerant varieties also showed moderate damage from application of "residual" rates of 'SU-3' at Pinery only.
  In most cases where damage symptoms were observed these were much greater in the intolerant variety Nipper. The three tolerant lines generally showed similar damage symptoms for all treatments.

- Grain Yield – Untreated Nipper performed similarly to untreated PBA Herald XT at both sites, but was significantly outperformed by the two herbicide tolerant potential releases at Arthurton. PBA Herald XT was outyielded by CIPAL1101 at Pinery (Table L3.2).
  All herbicide treatments resulted in yield losses (ranging from 22 to 95%) in Nipper at the Pinery site. High yield losses (up to 100%) were observed in Nipper at Arthurton from the application of 'Imi' and 'Imi mix' (at low and high rates), post-emergent metosulam and 'SU-1', and the "residual" rate of 'SU-3' (Table L3.1). A low level of yield loss in Nipper was also generated by a high rate of flumetsulam at this site.
  The 'Imi (PSPE)' treatment behaved differently at the two sites, causing severe yield loss in Nipper at Pinery, but not at Arthurton. No yield loss was generated by this treatment in tolerant varieties at either site.
  Yield losses were generated in all tolerant varieties by application of post-emergent metosulam and 'SU-1' at both sites (except in PBA Herald XT at Pinery, which showed no yield loss from this treatment). High yield losses were also generated in PBA Herald XT and CIPAL1101 from the "residual" rate of 'SU-3' at Pinery. Several isolated incidences of low yield loss in tolerant varieties were caused by application of low rate of flumetsulam and high rate of 'Imi mix' to CIPAL1101 at Pinery, and the high rate of flumetsulam to CIPAL1102 at Arthurton.

Table L3.1 The effect of various Group B herbicide treatments on visual damage score (0-100) of tolerant and intolerant lentil varieties at Arthurton and Pinery in 2011. (0 = no damage, 100 = complete plant death).

Herbicide Treatment	Arthurton Damage Score (0-100)				Pinery Damage Score (0-100)			
	Nipper	PBA Herald XT	CIPAL 1101	CIPAL 1102	Nipper	PBA Herald XT	CIPAL 1101	CIPAL 1102
Nil	0	0	0	0	0	0	0	0
Imidazolinones								
Imi (PSPE) L	0	0	0	0	**60**	8	0	3
Imi (PSPE) H	0	0	0	0	**73**	7	2	8
Imi (PE) L	**80**	0	0	0	**30**	8	2	2
Imi (PE) H	**87**	0	0	0	**23**	10	3	**12**
Imi mix (PE) L	**87**	7	0	7	**50**	7	0	7
Imi mix (PE) H	**100**	**40**	**37**	**57**	**60**	**27**	**13**	**17**
Triazolopyrimidines								
Flumetsulam (PE) L	**13**	**13**	10	7	**40**	10	0	7
Flumetsulam (PE) H	**40**	**17**	**13**	**13**	**50**	8	0	2
Metosulam (PE) L	**90**	**73**	**70**	**73**	**77**	**63**	**63**	**63**
Sulfonylureas								
SU-1 (PE) H	**99**	**80**	**70**	**73**	**77**	**57**	**57**	**57**
SU-1 (Res) L	10	0	0	0	**37**	10	0	3
SU-2 (Res) L	0	0	0	0	7	7	3	3
SU-3 (Res) L	**73**	10	0	0	**67**	**27**	**20**	**27**
LSD (P<0.05)	11	7 (same treatment)			10	9 (same treatment)		

Figures in bold denote significant difference to the Nil treatment
Shaded figures denote significant difference to the corresponding Low rate

Table L3.2 The effect of various Group B herbicide treatments on grain yield (% of nil treatment) of tolerant and intolerant lentil varieties at Arthurton and Pinery in 2011.

Herbicide Treatment	Arthurton Grain Yield (t/ha)				Pinery Grain Yield (t/ha)			
	Nipper	PBA Herald XT	CIPAL 1101	CIPAL 1102	Nipper	PBA Herald XT	CIPAL 1101	CIPAL 1102
Nil (t/ha)	3.79	3.98	4.37	4.36	2.3	1.99	2.56	2.13
Imidazolinones								
Imi (PSPE) L	100	99	103	96	**25**	109	102	102
Imi (PSPE) H	105	103	101	97	**5**	106	98	100
Imi (PE) L	**48**	112	103	96	**72**	119	91	98
Imi (PE) H	**29**	107	113	102	**73**	98	99	93
Imi mix (PE) L	**8**	96	107	98	**23**	114	93	95
Imi mix (PE) H	**0**	93	98	99	**5**	104	**85**	92
Triazolopyrimidines								
Flumetsulam (PE) L	89	95	105	98	**68**	99	**82**	99
Flumetsulam (PE) H	**87**	93	99	**89**	**44**	94	93	107
Metosulam (PE) L	**22**	**63**	**64**	**50**	**45**	91	**73**	**80**
Sulfonylureas								
SU-1 (PE) H	**0**	**50**	**67**	**63**	**5**	**81**	**67**	**79**
SU-1 (Res) L	93	90	111	95	**47**	104	95	107
SU-2 (Res) L	105	96	96	99	**78**	101	90	90
SU-3 (Res) L	**21**	90	90	98	**5**	**82**	**74**	93
LSD (P<0.05) (% nil)	12	11	10	10	16	18	14	17

Figures in bold denote significant difference to the Nil treatment
Shaded figures denote significant difference to the corresponding Low rate

Key Findings and Comments

PBA Herald XT, together with tolerant breeding lines CIPAL1101 and CIPAL1102, show much improved tolerance to a range of group B herbicides compared to Nipper. The tolerant varieties showed no yield loss to a number of herbicides, whereas Nipper showed up to 100% yield loss (eg high rate of 'Imi mix').

While the tolerant varieties showed improved tolerance compared to Nipper to all chemistries tested, significant yield losses were still observed from application of a number of these treatments, especially at high rates. Post-emergent applications of metosulam and 'SU-1' showed consistent yield losses across the three tolerant varieties at both sites. Various yield losses were also seen from applications of flumetsulam, 'SU-3' and the high rate of 'Imi mix', but not as consistently as the previous two chemistries.

The incidence of yield losses was not as great as the incidence of visual damage, suggesting some recovery from early damage symptoms. This was most noticeable in flumetsulam treatments, where significant damage was noted in all varieties at the high rate at Arthurton while only two varieties showed significant yield loss. It is likely that recovery of symptoms was aided by the favourable seasonal conditions in 2011. Repeating these trials in further seasons will allow validation of results across variable seasons.

Different responses to the 'Imi (PSPE)' treatment occurred across the two sites, causing severe yield loss in Nipper at Pinery but not at Arthurton. It is not clear why this response was observed, but may be due to the different soil types at these sites. Soil pH was similar at both sites, however the soil at Arthurton (sandy clay loam) was heavier in texture than at Pinery (sandy loam). This may have resulted in greater tie-up of herbicide in the PSPE treatment at Arthurton.

The resistance of the three tolerant varieties tested in this study appears to be sufficient to support application for registration of these varieties to certain group B herbicide/s. This will have important benefits for current farming systems through improved weed control, both in the year of, and preceding, the lentil crop.