

L10 Group B Residual Herbicide Tolerance, MRZ Mid North (Pinery), South Australia

Aim

1. To assess the effect of various residual group B chemistries on growth and yield of tolerant and susceptible lentil varieties, and
2. To confirm in-crop tolerance of some group B chemistries applied post-emergence on Group B herbicide improved XT varieties and advanced lentil breeding lines compared with conventional standards.

Treatments

Varieties, Nipper (rated susceptible to Group B herbicides); PBA Hurricane XT, CIPAL1208, CIPAL1209, CIPAL1423 (improved tolerance to some Group B herbicides).

Residual group B Chemistry and application details are presented in Table 1 – Residue levels of Group B carry-over were simulated by allocating half, quarter and eighth rates of an appropriate application rate for each chemistry in cereals but applied pre-sowing on the 25th of March 2014. Post sowing pre-emergence (PSPE) and post-emergence (PE) treatments were also included.

*****Some of the herbicide treatments in this research contain unregistered herbicide, application rates and timings and were undertaken for experimental purposes only. The results within this document do not constitute a recommendation for that particular use by the author or author's organisation.***

Table 1: Treatments (applied as residual, post sowing pre-emergent (PSPE) and post-emergent (PE), timing and application dates for lentil Group B herbicide tolerance trial sown at Pinery South Australia, 2014.

Active Ingredient	Application Timing	Application Rate
Nil	-	-
Chlorsulfuron	PSPE	0.5x
Chlorsulfuron	Residual	0.5x
Chlorsulfuron	Residual	0.75x
Chlorsulfuron	Residual	1x
Chlorsulfuron	Residual	1.25x
Chlorsulfuron	Residual	1.5x
Metsulfuron	PSPE	0.5x
Metsulfuron	Residual	0.5x
Metsulfuron	Residual	1x
Metsulfuron	Residual	1.5x
Metsulfuron	Residual	2x
Metsulfuron	Residual	3x
Imazethapyr	PE	1x
Imazethapyr	PE	4x
Imazapyr	PE	1x
Imazapyr	PE	4x

Other Details

Row Spacing: 22.5cm (9 inches)
Stubble: Nil
Fertiliser: MAP + Zn (2%) @ 90 kg/ha at sowing
Seed Treatment: P-Pickel T (200ml/100kg seed)
Foliar Fungicides: Canopy Closure –Carbendazim @500ml/ha, Chlorothalonil @2L/ha
Mid flowering to Early Podding – Carbendazim @500ml/ha, Chlorothalonil @ 2L/ha
Plant Density: 120 plants/m²
Soil Type: Sandy loam / Limestone clay
Plant damage assessment timings: 18th August 2014; 28th October 2014

Results and interpretation

Plant damage

- A significant ($P<0.001$) treatment by variety interaction was found for plant damage which showed that varieties differed in the level of plant damage and was dependent on the herbicide chemistry.
- PBA Hurricane XT and the advanced lentil breeding line CIPAL1421 showed similar and significantly lower damage with chlorsulfuron, at both PSPE and residual rates, compared to other varieties whose level of damage differed amongst each other. Nipper and CIPAL1208 showed similar and significantly higher damage from the application of all rates of chlorsulfuron (both residual and PSPE), while CIPAL1209 showed an intermediate level of damage (Figure 6).
- Nipper showed significant plant damage from post emergence application of all rates of imazethapyr and imazapyr compared to other varieties which generally had similar damage.
- Imazethapyr (low and high rates) and imazapyr (low rates) applied post emergence caused no damage to PBA Hurricane XT along with the two breeding lines CIPAL1421 and CIPAL1209 whereas low (<10%) but equal damage was observed in CIPAL1208.
- Imazapyr chemistry applied post emergence is the only treatment that caused a somewhat high level of damage (30%) to PBA Hurricane XT compared to all other chemistries tested.

Grain yield

- There was a significant ($P<0.001$) treatment by variety response for grain yield which indicated that varieties yielded differently and the nature of these differences depended on herbicide chemistry.
- PBA Hurricane XT and CIPAL1421 yielded similarly across most of the treatments including their respective nil treatments, although not always the case in some treatments (Figure 2). This indicates that these two varieties are likely to be under the same genetic control for herbicide tolerance. Notably, neither variety yielded differently to their respective Nil treatments.
- PBA Hurricane XT and CIPAL1421 were the equal higher yielding varieties compared to other varieties in nil treatments.
- The intolerant Nipper variety suffered over 90% yield loss from the application of PSPE and residual rates of chlorsulfuron. In comparison, PBA Hurricane XT suffered no yield loss at similar rates and treatment.
- At rates evaluated chlorsulfuron caused a greater level of plant damage and grain yield loss than on conventional lentils than metsulfuron. A linear response for yield loss to metsulfuron rate was observed in the conventional variety Nipper, this was opposed to chlorsulfuron treatment where yields of Nipper remained consistently low across all rates (**Error! Reference source not found.**).

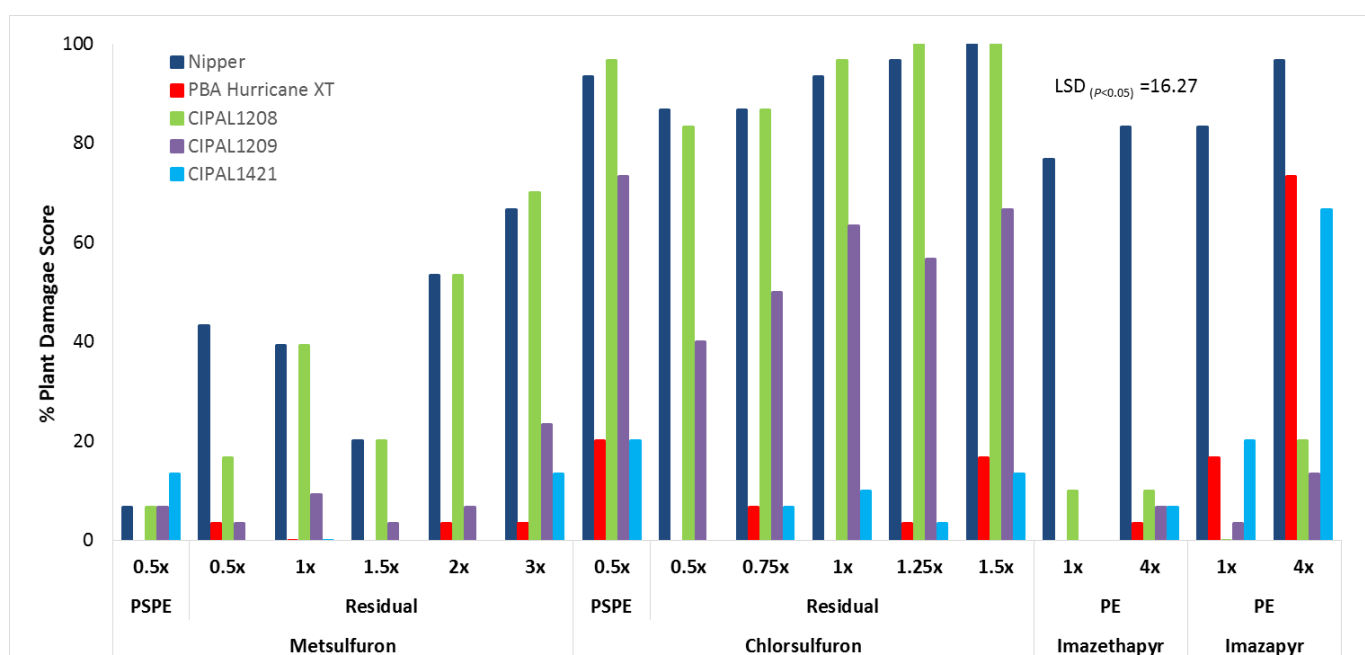


Figure 6: Effect of various Group B chemistries and application rates on damage score of four lentil lines at Pinery, 2014. Damage score: 0-50 = increasing levels of chlorosis. 50-100 = increasing levels of necrosis and plant mortality. 100 = whole plot dead.

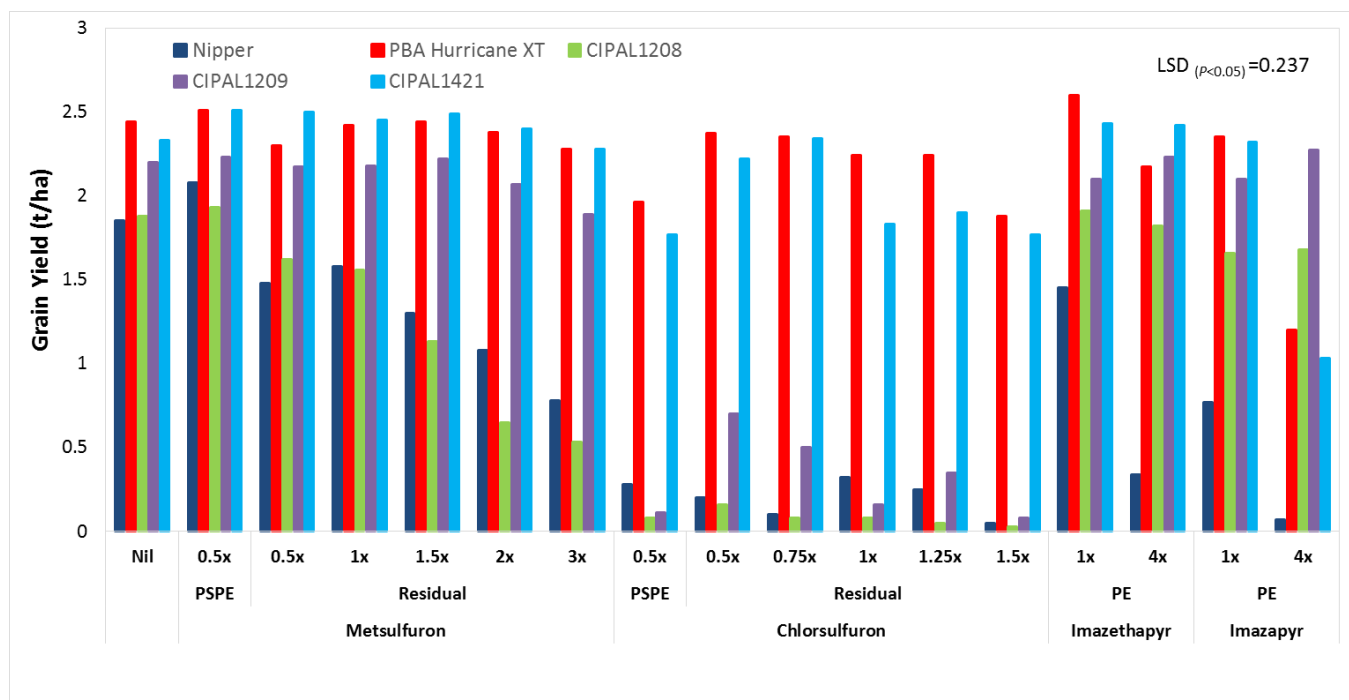


Figure 2: Effect of various Group B chemistries and application rates on grain yield of five lentil lines at Pinery, 2014.

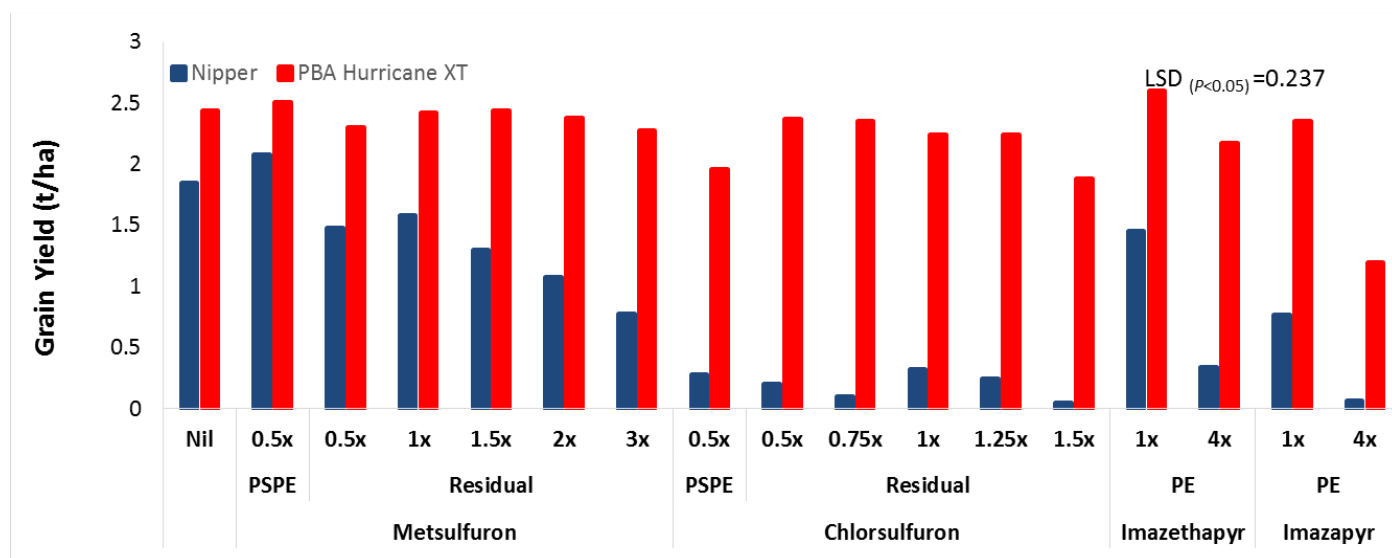


Figure 3: Effect of various Group B chemistries and application rates on grain yield of PBA Hurricane XT (tolerant variety) and Nipper (Intolerant variety) at Pinery, 2014.

Key findings and comments (*incorporating findings from previous experiments in 2012 & 2013 at Arthurton, Pinery and in Victoria*)

- Response of lentils to herbicide treatments varied with seasonal conditions, method of herbicide incorporation, stubble coverage, soil texture and fertility.
- Treatments that showed high plant damage generally incurred high yield losses, however low levels of chlorsulfuron plant damage still resulted in significant yield loss in some trials.
- XT lentil varieties showed improved tolerance compared to conventional lentil varieties to all treatments, however they still incurred yield loss to some chemistries under certain conditions, indicating low safety margins to these chemistries.
- Imazethapyr chemistry caused variable losses to the conventional varieties. Previous trials have reported between 6 and 52% yield loss from the application of the lowest rate of imazethapyr whilst highest rates (4x), though not recommended, have shown no yield loss in XT varieties.

- High rates of imazapyr have caused significant yield losses in XT varieties in previous trials but has had less effect on tolerant lines under different genetic control such as CIPAL1209, indicating a potential different registration opportunity for these lines if released.
- Chlorsulfuron and triasulfuron were the most damaging treatments in the trials. Metsulfuron was found to be the safest of the sulfonylurea chemistries tested.
- **Importantly, existing product labels, plant-back periods and directions for use must still be adhered to. Although the current and previous results indicate that XT varieties show improved tolerance to residual Group B chemistries compared to conventional varieties, it is worth noting that a yield loss was still incurred in some situations such as application of high rates of imazapyr as observed in this trial. This indicates a low safety margin to this chemistry. As such further research is required to identify if sufficient crop safety exists in XT lentils to seek changes to label recommendations for other Group B herbicides.**