

# Herbicide tolerant lentil varieties - a boost for reliable lentil production in WA

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## Key messages

Lentil can be grown profitably in many parts of the WA wheat-belt, with yields of 1-2 t/ha (and above) achieved in yield trials and commercial paddocks. Given the high commodity price for red lentils compared with other grains (currently above \$1000/t, but historically around \$5-600/t), lentil could be an attractive, profitable break-crop option for WA growers.

In recent years, Group B herbicide tolerant lentil varieties have been released to Australian growers and have proven very popular for giving more flexibility in herbicide control options, particularly around managing Group B residues in soils. PBA lentil breeding trials in WA have found a trend of unexpectedly higher yields of imidazolinone tolerant lentils on soils with unknown herbicide residues. This result suggests that Group B herbicide residues are relatively common and are a limitation to the adoption of conventional lentil varieties in WA. The high yielding "XT" lentil variety PBA Hurricane XT (and future XT varieties) are a good option for WA growers for more reliable and profitable production of lentils.

## Aims

Lentil is pulse legume produced very profitably in grain growing regions of South Australia, Victoria and parts of New South Wales. Historically, WA has seen limited adoption of lentil, which may be driven by the soil types in WA limiting lentil production. Lentil is better adapted to the heavier, higher pH soils of their primary production zones in eastern Australia, rather than the sandy, acidic soils that dominate many WA crop growing regions.

During the current phase of the PBA lentil breeding project (2010-2016), evaluation of new and existing lentil varieties has been performed at sites across the WA wheat-belt. Through trials of advanced breeding lines we have aimed to identify material suitable for WA grain growing regions. This report is a summary of selected findings over the last five years, with recommendations for WA grain growers who are interested in including lentil in their cropping rotations.

## Method

Replicated yield trials were performed in paddocks of farmer co-operators near Dalwallinu (2010-2011) and Mingenew (2011-2015), and at the DAFWA research farm at Merredin (2012-2015). The germplasm evaluated in WA lentil trials was also tested at NVT and PBA lentil sites in multiple years across SA, Vic and NSW. Advanced yield trials were performed with three replicates, arranged in a randomised complete block design and a spatial analysis (REML) was conducted that fitted terms for row and column spatial effects where significant.

Genotypic ranking of varieties for yield in WA was compared with mean yield data from SA and Vic (the main region for breeding selection) to establish if there were differences in performance of breeding germplasm across the regions.

## Results

In WA trials in 2010, 2011 and 2013 (2012 trials failed due to drought), we observed yield rankings of breeding lines that were not consistent with long-term means from NVT data. Specifically, the imidazolinone herbicide tolerant (Imi-T) lines performed significantly better than commercial checks. This was unusual as conventional lines generally out-perform Imi-T lines in long-term yield data. The performance of selected lentil cultivars (both conventional and Imi-T) is shown from mean NVT data sets for SA, Vic and WA trials (Fig. 1). Given the significant yield advantages of the Imi-T lines in most to the WA trials, it seems likely that Dalwallinu, Mingenew (2013) and Merredin were affected by Group B residual herbicides.

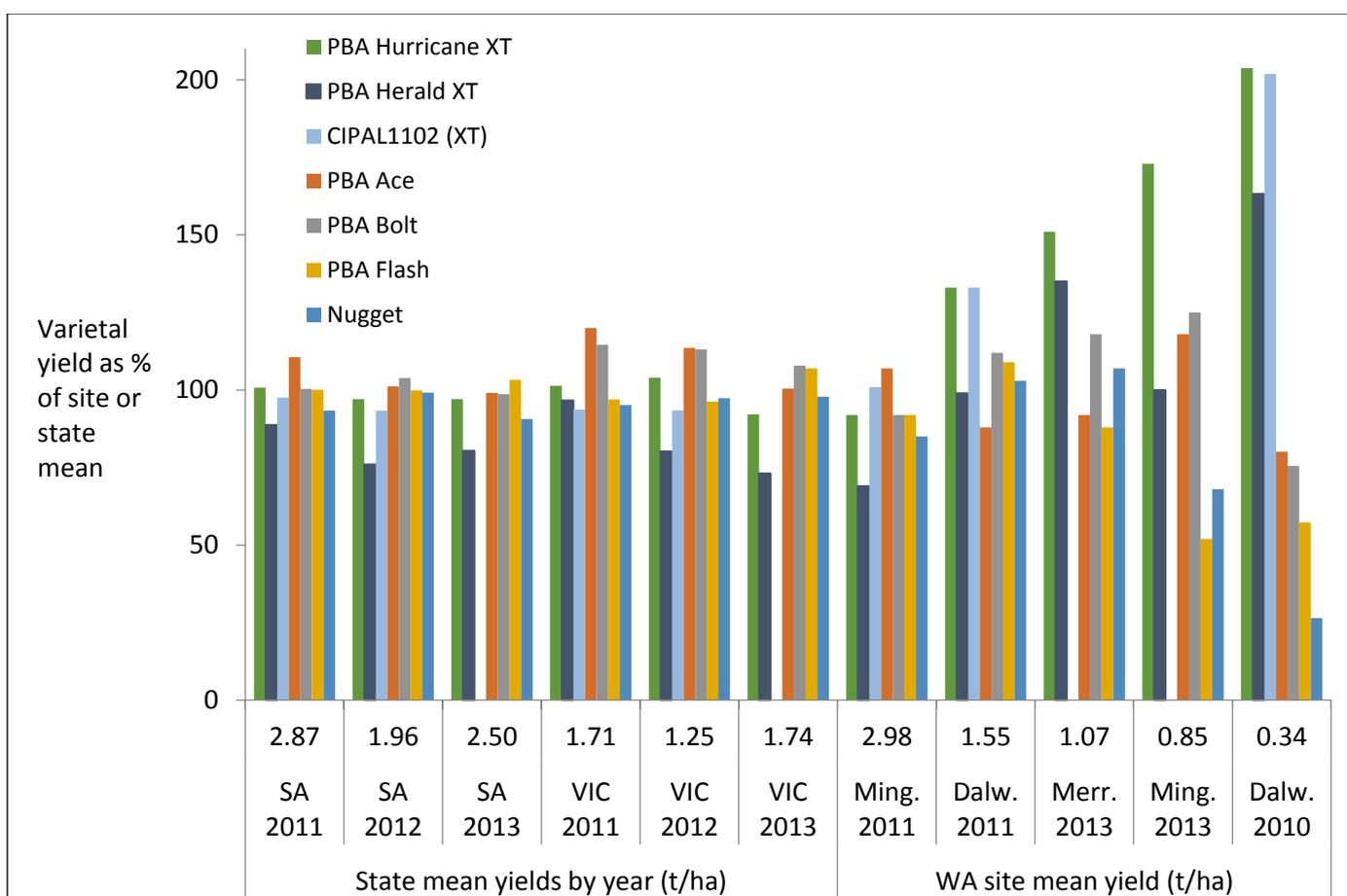
PBA Herald XT was the first Imi-T lentil released to Australian growers, but has lower yield potential relative to conventional cultivars such as PBA Ace and PBA Bolt (Fig. 1). However, in two of the four putatively residue-affected trials, PBA Herald XT yielded higher than both of these conventional cultivars. The second commercial Imi-T lentil,

PBA Hurricane XT yields higher than PBA Herald XT, but has generally lower yield potential than PBA Ace and PBA Bolt (Fig. 1). In contrast to this, state-wide mean data of PBA Hurricane XT showed that it yielded significantly higher than PBA Ace and PBA Bolt at Dalwallinu 2010 and Mingenew 2013, and higher than PBA Ace at Dalwallinu 2011. The trial at Merredin 2013 had highly variable replicates, a high CV and no significant difference between cultivars. These overall trial effects may also be attributed to herbicide residues, based on the relatively good performance of PBA Herald XT and PBA Hurricane XT at that site.

The trial at Dalwallinu 2010 was a large trial with 68 breeding lines evaluated. Although the trial was low yielding (site mean yield of 340kg/ha), 12 of the top 15 yielding lines were Imi-T, and none of the Imi-T lines ranked any lower than 15th. PBA Hurricane XT yielded 690kg/ha, 2.7 times that of PBA Ace (271kg/ha).

Not all of the herbicide-affected trials were low yielding. At Dalwallinu 2011, PBA Hurricane XT and CIPAL1102 (Imi-T) both achieved 2t/ha, compared with 1.3 and 1.7t/ha for PBA Ace and PBA Bolt respectively, two of the highest yielding lentil lines in long term yield data.

Mingenew 2011 was a significant contrast to the other WA sites as it had a site mean yield of 3t/ha and the lentil cultivar yield ranking was consistent with that seen in long term yields in eastern Australia. The yield of PBA Hurricane XT was consistent with its known yield potential in normal conditions in that it was similar to PBA Bolt but lower than PBA Ace and the newer variety PBA Jumbo2.



**Fig 1** Comparison of performance of conventional and "XT" (imidazolinone tolerant) lentil cultivars in Western Australian lentil trials (Mingenew, Dalwallinu and Merredin), alongside South Australian and Victorian mean NVT trial data

## Conclusion

PBA lentil breeding field trials in WA have shown a trend of unexpectedly high performance of imidazolinone tolerant lentils on soils without known residues, suggesting that Group B herbicide residues are relatively common. Imidazolinone residues are thought to persist longer in sandy, acidic soils and are a limitation to the adoption of conventional lentil varieties in WA. When the effects of soil herbicide residues were observed, commonly in lower rainfall years, Imi-T varieties suffered less yield penalty than conventional lentils. At current lentil prices (\$1000/t), this would have been a difference in economic return of around \$400/ha at the Dalwallinu trials (2010 and 2011) and

Mingenew 2013. For WA growers looking to adopt lentils, the high yielding “XT” varieties, PBA Hurricane XT and new varieties soon to be released, are a lower risk option for profitable lentil production.

### **Key words**

breeding, Group B herbicides, imidazolinone, break crops

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