

Still loving those legumes - more adventures with lentils

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Key messages

In 2017 new lentil cultivars produced seed yields at or above 1.5t/ha in the majority of experiments. Lower yields were observed following extensive frost at Kumarl (0.7t/ha) or delayed emergence/sowing at Dongara (1.2t/ha) and Gnowangerup (0.5t/ha).

The results from our density experiment at Grass Patch in 2017 are in line with the eastern states recommended target density of 100 to 110 plants/m². This equates to 45kg/ha for small seed types such as PBA Hurricane XT[®], 50kg/ha for medium sized varieties like PBA Bolt[®] and 60kg/ha for PBA Jumbo 2[®].

Aims

To highlight key findings from crop legume field experiments conducted throughout Western Australia (WA) in 2017. The presentation will cover off on a wide range of legume species, however this paper will concentrate on the results from lentil experiments conducted in 2017.

Method

Lentil germplasm/varieties experiments

In 2017 DPIRD managed seven lentil germplasm experiments in WA (row-column designs with 3 replicates). These included a S3 experiment at Dongara (96 lines, sown 30 May), four May sown S4 lentil germplasm experiments (30 lines) at Wittenoom Hills (sown 19 May) Kumarl (28km's north of Salmon Gums, sown 19 May), Grass Patch (sown 20 May) and Gnowangerup (sown 23 May) and two mid-April sown germplasm experiments which utilised seed kept from 2016 germplasm experiments (30 lines) at Kumarl (sown 19 April) and Grass Patch (sown 20 April). All plots were 10m long (cut back to ~8m at harvest) x 1.54m wide (6 rows in Esperance region and 7 rows elsewhere) with 2m centres (yields were calculated on 2m centres).

Lentil seed rate experiment

At Grass Patch on 20 April we sowed nine lentil varieties/lines at five seed rates. Trial design was split block (Rep/Variety/Seedrate) with lentil varieties x seed rate as treatments and 4 replicates. Lines were CIPAL1301, CIPAL1422, Nugget, PBA Ace[®], PBA Blitz[®], PBA Bolt[®], PBA Flash[®], PBA Hurricane XT[®], PBA Jumbo2[®] and seed rates were 12.5, 25, 50, 75 and 100kg/ha.

Results

Lentil varieties

This paper only presents the results from Pulse Breeding Australia (PBA) released varieties or near release lines as per our agreement with PBA. Further details for each experiment are available at the NVT web site (<https://www.nvtonline.com.au/>) and/or the Online Farm Trials web site (<https://www.farmtrials.com.au/>).

The Dongara experiment was sown later than anticipated due to the dry season in the northern agricultural region (NAR) in 2017. Sown on 30 May following 18mm of rain on 22 May the trial emerged better than expected and grew well in continued dry conditions. It made good use of higher than average August rainfall and seed yields were on average 1.2t/ha. No PBA released variety out yielded PBA Bolt[®], whilst the best breeding line produced 500 kg/ha higher yields than PBA Bolt[®].

The April sown experiment at Kumarl was sown into good soil conditions and looked even all winter and into the early stages of flowering. From the end of June to the beginning of October Kumarl had 34 nights below 0°C – compared to the long term average of 4 days below zero for Salmon Gums (28kms South of Kumarl) for the same period. This resulted in noticeable vegetative yellowing and flower and pod abortion, with early flowering lines being more affected by frosts. For example, over 50% of PBA Bolt[®] pods failed to fill compared to 37% for PBA Flash[®] which flowered 3 weeks later than PBA Bolt[®] and consequently avoided 10 nights below 0°C. This resulted in PBA Flash[®] yielding 1.0t/ha compared to PBA Bolt[®] 0.7t/ha.

The 19 May sown experiment at Kumarl was also affected by frost but to a much lesser degree with 15 nights below 0°C. PBA Bolt[®] yielded 1.5t/ha – with no released or near release line out yielding PBA Bolt[®]. At our Grass Patch site the plots in the variety experiment sown in April

were patchy with more sodic/hard sealing areas showing poorer establishment – a visual plot rating was used as a covariate in our final analysis to take into account the soil variation.

PBA Bolt[®] averaged 2.3t/ha when sown in mid-April at Grass Patch in 2017 – with no line out-yielding PBA Bolt[®]. The May sown variety experiment at Grass Patch emerged more evenly due to improved soil conditions and PBA Bolt[®] yielded 1.7t/ha - with no line out-yielding PBA Bolt[®].

The Wittenoom Hills S4 experiment was uneven due to sodic patches, old tramlines and mild transient waterlogging. We conducted an EM38 survey of this site to take into account this variation – no line out-yielded PBA Bolt[®], at 1.9t/ha.

The Gnowangerup site struggled all year – it was the most marginal soil type for lentils with top-soil pH of 4.8 in CaCl₂, which combined with a late May sowing in a cool region combined to produce slow and low growth to such a degree that machine harvest was not practicable. Consequently this trial was hand harvested. PBA Bolt[®] yielded 0.5t/ha - with no significant difference between lentil cultivars.

PBA Bolt[®] is the most widely grown lentil cultivar in WA. Alternative options are PBA Hurricane XT[®] and PBA Jumbo2[®]. PBA Hurricane XT[®] is the best available option if growers are concerned about sulfonylurea residues or they are planning to use imazethapyr in-crop for increased weed control. In our experiments in southern WA PBA Hurricane XT[®] has been noticeably slower growing than PBA Bolt[®] and yields are either on par or lower (Figure 1). PBA Jumbo2[®] has the best disease resistance package available therefore there is considerable interest in it amongst existing growers in southern WA. In our experiments PBA Jumbo2[®] has produced similar yields to PBA Bolt[®] (Figure 1). We have observed PBA Jumbo2[®] plots to be not as even as PBA Bolt[®] – particularly on sodic soil sites. Therefore growers may see more variability in paddocks of PBA Jumbo2[®] in WA – however the increased disease resistance may outweigh any variable growth concerns.

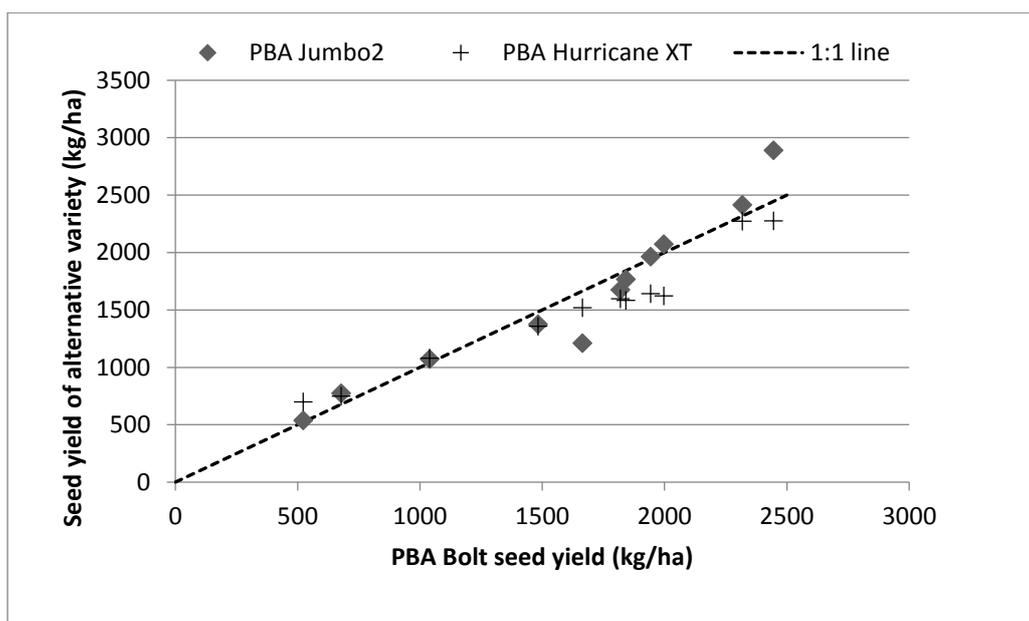


Figure 1. Comparison between the seed yield of PBA Bolt[®] and two alternative varieties in lentil variety experiments conducted in WA in 2016 and 2017

Lentil seed rate

On 20 April when the plots were sown at Grass Patch soil conditions were drying and we had to remove our coneseeder's press wheels and utilise a rolling harrow in order to get the seeding depth of 5cm we were aiming for. Despite the drying conditions field establishment was 95% (100% at seed rates below 50 kg/ha and <90% at seed rates above 50 kg/ha) and more even than our nearby germplasm trial. Plots sown at higher seeding rates quickly covered the ground with NDVI measurements taken five weeks after sowing on 29 May indicating a seeding rate of 100kg/ha had approximately twice the ground cover of plots sown at 12.5kg/ha and three times the cover at 10 weeks after sowing on June 28. Increasing seeding rate decreased days to flowering. On average for every 4kg/ha increase in seeding rate flowering occurred approximately 1 day earlier.

Seeding rates of 25 to 100kg/ha produced similar seed yield and similar gross margins ((Figure 2), with no significant variety x seed rate interactions ($P>0.05$). PBA Bolt[®] produced seed yields of 2.4t/h and gross margins of \$911/ha, significantly higher than PBA Bolt[®] and the equal of any other variety in the experiment.

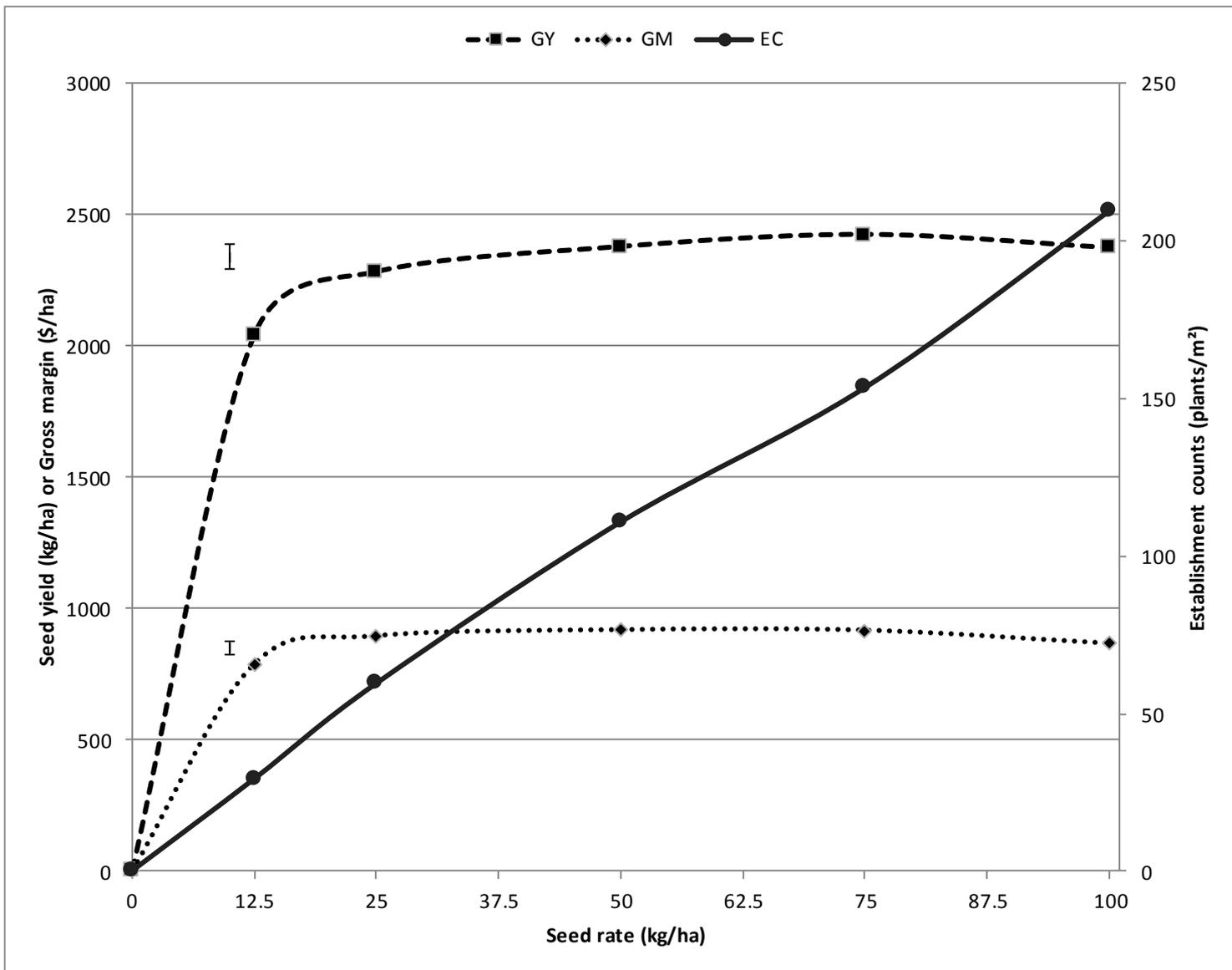


Figure 2. Mean response of lentil establishment (EC, plants/m²), seed yield (GY, kg/ha) and gross margin (GM, \$/ha) to increasing seed rate at Grass Patch in 2017 (vertical bars indicate Lsd at $P=0.05$)

Conclusion

In 2017 lentils produced profitable yields at the majority of sites. PBA Bolt[®] was found to produce equal highest yield to other PBA released cultivars in the majority of the experiments.

The results from our density experiment at Grass Patch in 2017 are in line with the eastern states recommended target density of 100 to 110 plants/m². This equates to 45kg/ha for small seed types such as PBA Hurricane XT[®], 50kg/ha for medium sized varieties like PBA Bolt[®] and 60kg/ha for PBA Jumbo 2[®].

Key words

Lentil, pulses, variety, seed rate, plant density

Acknowledgments

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[®] Varieties displaying this symbol beside them are protected under the Plant Breeders Rights Act 1994.

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Paper reviewed by Martin Harries