

PULSE VARIETIES

Claire Browne (BCG) and Jason Brand (DEPI)

TAKE HOME MESSAGES

- PBA Striker has a good fit in Mallee rotations, but ascochyta needs to be more carefully managed than with resistant varieties like PBA Slasher and Genesis 090.
- Early sowing was still beneficial for all pulses, but particularly lentils, despite the dry start.
- PBA Percy and PBA Gunyah are showing good potential for the Mallee, as is PBA Wharton.

KEY WORDS

Chickpeas, herbicide residue, lentils, Mallee, peas, pulses, varieties.

BACKGROUND

Including pulses into Mallee crop rotations has proven to be beneficial in some Mallee paddocks where wheat-on-wheat rotations previously dominated. The benefits of pulses include nitrogen fixation, disease break and more effective weed control with a wider range of herbicides. However, while there are many benefits associated with pulses, there can be some disadvantages. They can be a risky crop (particularly in drier seasons) and therefore potentially not as profitable. Their performance can also be affected by sub-soil constraints such as boron and sodium chloride in heavier soil types. Frost can also be a big risk. Leaving paddocks bare over summer also makes them susceptible to wind erosion.

Work completed by BCG in recent years has shown one of the major benefits of pulses is increased wheat yields in the following season (see BCG 2012 Season Research Results pp 42).

2013 SEASON REFLECTION

Incorporating pulses into 2013 rotations proved to be a challenge in some areas due to the dry summer. Minimal summer rain (2012/2013) resulted in herbicide residue carryover from the 2012 season, with Lontrel® the biggest concern. While there were many paddocks ear-marked for pulses in 2013, in some cases plans were changed in response to the season and barley was sown instead. As the season progressed, conditions were not unfavourable for pulse production. At Watchupga East, June rainfall (59mm) made up for the lack of rain initially and set the pulses up for the rest of the season. It was a similar story in the Wimmera with minimal summer rainfall a challenge for pulse inclusion in rotations. The timing of rainfall in 2013 was crucial, given limited stored sub-soil moisture; good rains fell and resulted in satisfactory pulse yields for Wimmera growers. Generally, mild temperatures were also favourable for pulses in 2013. However, late in the season some parts of the Wimmera experienced a severe frost (the worst since the late 90s) which affected both pulse and cereal yields.

Lentil prices continued to push higher through the harvest period and at the time of writing (January 2014) were relatively high (≈\$500/t). Chickpea prices have been down on what we have seen in previous seasons – desis just above \$350/t and small kabulis in the low \$400s. Field peas and faba beans have been trading at about \$300 and \$400/t, respectively.

PULSE VARIETY SUMMARIES

The following information was sourced from variety brochures available from the Pulse Breeding Australia website.

Kabuli chickpeas

PBA Monarch: high yield, medium sized kabuli chickpea well adapted to shorter season medium rainfall environments in traditional kabuli chickpea growing regions. Earlier flowering and maturing than Genesis™090, Almaz and Genesis™Kalkee contributes to its adaptability. Yields comparable to Genesis™090, but larger seed size. It is MS to ascochyta blight and requires a fungicide management program in higher risk years and regions. Released in 2013. Seed will be licensed to Seednet. EPR \$7.15.

Genesis™090: medium seeded kabuli, with good ascochyta blight resistance. Widely adaptable, with excellent yields in drier environments. Has the potential to be grown as a good alternative to desi chickpeas. Medium height, with yields similar to PBA Slasher.

Genesis™079: high yielding small-seeded kabuli type with good resistance to ascochyta blight. Seed size is generally smaller (6-7mm), than Genesis™090. Earliest flowering and maturing kabuli variety available. Released in 2009, marketed by Australian Agricultural Crop Technologies. EPR \$5.

Genesis™114: medium to tall erect kabuli type with medium to large seed size. Higher yielding than Almaz and Nafice but not usually as high as the smaller seeded Genesis™090. MS to ascochyta and likely to require strategic fungicide applications. Released in 2010, marketed by Australian Agricultural Crop Technologies. EPR \$5.

Genesis™Kalkee: erect kabuli type producing medium to large seed (largest of all commercial kabuli types) and later flowering than Genesis 114. MS to ascochyta blight, and likely to require a strategic fungicide strategy. Released in 2012, marketed by Australia Agricultural Crop Technologies. EPR \$5.

Desi chickpeas

PBA Slasher: mid flowering and maturing desi type with semi spreading habit. Ascochyta tolerance quite good, with fungicide trials indicating foliar sprays during podding is usually sufficient. Seed medium size tan-brown, suitable for split and whole seed markets. Susceptible to botrytis grey mould. Released in 2009, marketed by Seednet. EPR \$4.

Ambar: early flowering and maturing desi type out of WA with limited evaluation in other states. Early data indicate good resistance to ascochyta blight and likely to require only one spray during podding. In WA, high yielding, similar to PBA Slasher but smaller seed size. Released in 2012, marketed by Heritage Seeds. EPR \$4.

Neelam: mid flowering and maturing, medium-tall erect, desi type out of WA. Limited evaluation in other states. Early data indicates good resistance to ascochyta blight. Very high yields in WA, better than PBA Slasher, but smaller seed size. Released in 2012, marketed by Heritage Seeds. EPR \$4.

PBA Striker: high yielding early flowering, early maturing desi type with moderate resistance to ascochyta; likely to require strategic fungicide applications. Good early vigour; provides a high yielding alternative in short season, medium to low rainfall environments. Similar plant type to PBA Slasher, but producing larger seed, light in colour, with very good milling characteristics. Released in 2012, marketed by Seednet. EPR \$4.

Table 1. Chickpea variety specifications.

Variety	Type	Maturity	Seed size (mm)	Ascochyta blight foliage	Lodging
PBA Monarch	kabuli	Early	8-9	MS	MS
Genesis 090	kabuli	Mid	7-8	R	MR
Genesis 079	kabuli	Early	6-7	R	MR
Genesis 114	kabuli	Mid-Late	8-9	MS	R
Genesis Kalkee	kabuli	Late	8-10	MS	R
PBA Slasher	desi	Mid	Medium	R	MS
Ambar	desi	Early	Small	R	MR
Neelam	desi	Mid	Medium	R	MR
PBA Striker	desi	Early	Medium	MR	MS

Field peas

PBA Wharton: Kaspas type dun pea with improved powdery mildew and virus resistances, and better tolerance to high soil boron. Early-mid flowering and early maturing variety that is MS to black spot and S to bacterial blight. Fair-good lodging tolerance. Early maturity favours crop-topping. Released in 2013, marketed by Seednet. EPR \$2.60.

PBA Coogee: new dual purpose pea that can be left for grain or cut early for forage in drier years. Mid-late flowering and late maturing conventional dun pea with biomass production similar to Morgan; grain yield between Parafield and Kaspas. Resistant to powdery mildew, MS-MR bacterial blight, MS black spot; poor lodging resistance at maturity. Improved boron and salt tolerance than other varieties. Released in 2013, marketed by Seednet. EPR \$2.60.

PBA Gunyah: early flowering, semi-dwarf field pea producing Kaspas type grain. Broadly adapted and has high yield potential; better suited to shorter growing season environments. Disease profile similar to Kaspas; not suited to bacterial blight prone areas. R to downy mildew (Parafield strain), S to powdery mildew, although earlier maturity reduces yield penalty. Needs to be managed for powdery mildew, bacterial blight and black spot in disease prone areas. Early maturity favours crop-topping. Released in 2010, marketed by Seednet. EPR \$2.50.

PBA Oura: early-mid flowering, erect semi-dwarf variety which produces dun type grain. Improved resistance to bacterial blight, high yields and broad adaptation. MS to black spot, S to powdery mildew and Pea seed-borne mosaic virus, MRMS to bean leaf roll virus (provisional rating). Fair to good lodging and shatter resistance. Early maturity favours crop-topping. Released in 2011, marketed by Seednet. EPR \$2.60.

PBA Pearl: early-mid flowering, semi-dwarf white pea broadly adapted and high yielding. Good resistance to bean leaf roll virus and downy mildew, MS to bacterial blight; needs to be managed for black spot, pea seed borne mosaic virus and powdery mildew in disease prone areas. Market access the biggest hurdle as white peas are not widely received other than for domestic stock feed markets. Opportunity for niche marketing, but advice is to secure market before growing. Released in 2012, marketed by Seednet. EPR \$2.70.

PBA Twilight: early flowering semi dwarf Kaspas type with similar attributes to Gunyah. Broadly adapted; high yield potential; well suited to low rainfall and short season areas. Resistant to downy mildew, needs to be managed for black spot, bacterial blight, pea seed borne mosaic virus and powdery mildew in disease prone areas. Released in 2010, marketed by Seednet. EPR \$2.50.

PBA Hayman: late flowering, late maturing conventional pea suitable for forage production as a potential alternative to vetch, with high spring dry matter production. Improved resistance to powdery mildew over Morgan and MR to bacterial blight. Produces small pods with very small seed, yielding only 30-80% of grain varieties; stockfeed quality. Released in 2013, marketed by Seednet.

PBA Percy: very early flowering and maturing conventional pea with improved bacterial blight disease rating compared with PBA Oura. High yield potential of dun type grain; broadly adapted. Must be managed for black spot, pea seed borne mosaic virus, downy mildew and powdery mildew. Susceptible to lodging at maturity. Early maturity favours crop-topping. Released in 2011, marketed by Seednet. EPR \$2.60.

Table 2. Field pea variety specifications.

Variety	Maturity	Black spot	Bacterial blight	Height	Boron tolerance
PBA Wharton	early-mid	MS	S	med-tall	MT
PBA Coogee	mid-late	MS	MS-MR	tall	T
PBA Gunyah	early	MS	S	med-tall	S
PBA Oura	early-mid	MS	MR-MS	med-tall	MS
PBA Pearl	early-mid	MS	MS	med-tall	MS
PBA Twilight	early	MS	S	med-tall	S
PBA Hayman	late	MS	MR*	tall	MS
PBA Percy	very early	MS	MR	tall	S

*Provisional rating (treat with caution)

Lentils

PBA Ace: mid flowering and maturing red lentil with grey seed coat; vigorous growth and high yield potential. Broad adaptation, although best suited to longer season areas replacing Nugget and PBA Jumbo. Good disease package with excellent resistance to ascochyta and MR to botrytis grey mould. Intolerant to salinity and boron. Released in 2012, marketed by PB seeds. EPR \$5.

PBA Blitz: early flowering and maturing red lentil with grey seed coat; best suited to short growing seasons and areas. Early vigour and erect growth habit; with disease resistant; good yields of medium-large seed size; better milling quality than Nugget. MS to lodging and intolerant to salinity and boron. Released in 2010, marketed by PB Seeds. EPR \$5.

PBA Bolt: mid flowering, but early to mid-maturing with high yield potential in tough seasons; good lodging resistance. Improved tolerance to boron and salt over most other varieties, good resistance to ascochyta but moderately susceptible to botrytis grey mould. Early maturity favours crop-topping. Released in 2012, marketed by PB Seeds. EPR \$5.

PBA Flash: high yielding medium sized red lentil; green seed coat suited to all lentil growing regions, particularly shorter season growing areas with reliable yields. Now rated MS to ascochyta; requires appropriate management in disease prone areas and seasons. Susceptible to botrytis grey mould. Improved tolerance to boron and salinity over Nugget and better standability at harvest. Early maturity favours crop topping. Released in 2009, marketed by PB seeds. EPR \$5.

PBA Herald XT: the first lentil variety released with improved tolerance to Spinnaker® herbicide (permit renewal in progress) and Broadstrike™ and reduced sensitivity to some group B residues (product rates, plantback and other guidelines still need to be adhered to). Small red seeded, grey coated; mid-late flowering and maturity; best adapted to longer growing seasons with medium to higher rainfall. R to foliar and seed ascochyta, MR to botrytis grey mould. Released in 2011, marketed by PB Seeds. EPR \$5.

PBA Hurricane XT: the second lentil variety released with improved tolerance to Spinnaker® herbicide (permit renewal in progress) and Broadstrike™, and reduced sensitivity to some group B residues (product rates, plantback and other guidelines still need to be adhered to). Small red seeded, grey coated; mid flowering and maturity, slightly better seed size than Nipper and PBA Herald XT; better yielding than PBA Herald XT. MR to ascochyta, MRMS to botrytis grey mould. Better plant height and vigour over PBA Herald XT; better weed competition and harvestability. Released in 2013, marketed by PB Seeds. EPR \$5.

PBA Jumbo: mid flowering and maturing large seeded red lentil with high yield potential; suited to medium to high rainfall zones and targeted as a replacement for Aldinga. R to foliar and seed ascochyta, although 2013 suggested this resistance may be starting to break down. MS to botrytis grey mould, possibly requiring management in sensitive years. Tolerance to soil boron and salinity similar to PBA Flash. Released in 2010, marketed by PB Seeds. EPR \$5.

Table 3. Lentil variety specifications.

Variety	Maturity	Seed size	Shattering	Botrytis grey mould	Boron tolerance
PBA Ace	Mid	Medium	R	MR	I
PBA Blitz	Early-Mid	Medium/Large	MR	R	I
PBA Bolt	Early-Mid	Medium	R	MS	MI
PBA Flash	Early-Mid	Medium	MR	MS	MI
PBA Herald XT	Mid-Late	Small	MR	MR	I
PBA Hurricane XT	Mid	Medium	R	MS/MR	I
PBA Jumbo	Mid	Large	MR	MS	MI

BCG 2013 PULSE VARIETY TRIAL

This paper summarises BCG's pulse variety comparison trial at Watchupga East in 2013.

AIM

To evaluate new and existing pulse (field pea, chickpea and lentil) varieties and their suitability to the southern Mallee.

METHOD

Location:	Watchupga East	
Replicates:	Four	
Sowing date:	5 June	
Sowing rates:	peas and chickpeas	95kg/ha
	lentils	50kg/ha
Crop types:	Chickpeas	PBA Striker, Neelam, PBA Maiden, PBA Slasher, Genesis 090
	Field peas	PBA Twilight, PBA Percy, PBA Gunyah, PBA Oura, PBA Pearl
	Lentils	PBA Flash, PBA Ace, PBA Hurricane XT (1101), PBA Bolt, CIPAL 901
Fertiliser:	4 June	Granulock Supreme Z (50kg/ha)
Herbicides:	4 June	TriflurX® (2L/ha) + Weedmaster DUO® (1.5L/ha)
	4 June	Simazine® (550g/ha) + Balance® (80g/ha) – chickpeas only
	13 August	Verdict (100mL/ha) + Hasten (1%)

Fungicides and insecticides:	4 October	Barrack (1L/ha) + Lorsban (700mL/ha)
	21 October	Lorsban (350mL/ha) + Alpha Duo (200mL/ha)
Seeding equipment:	BCG Gason parallelogram cone seeder (knife points, press wheels, 30cm row spacing)	

The area that the pulses were sown onto was burnt on 15 April to remove stubble residue; Lontrel™ was sprayed in 2012 and is predominately stubble bound.

Emergence of all pulses was quite even across all plots, after being sown into a moist soil bed following 28mm at the beginning of June. A further 15mm was received on 14 June. During the spring, the pulses were sprayed for insects twice, which is not typical for the region. This was due to the large populations of insects.

RESULTS AND INTERPRETATION

Results discussed in this article are based on trials conducted in the southern Mallee: BCG's pulse variety comparison trial at Watchupga East and the GRDC-funded DEPI Southern Pulse Agronomy Program trials at Curyo. DEPI trials at Curyo were sown on May 1-3 (earlier than BCG trials).

Chickpeas

Chickpea yields were on average 1.2t/ha with PBA Striker and Neelam being the highest yielding varieties (Figure 1). PBA Maiden, Slasher and Genesis 090 were no different from each other, but were lower than PBA Striker and Neelam. Towards the end of maturity, Genesis 090 appeared to be greener than the other varieties suggesting a slightly later maturity. This highlights the fit of PBA Striker into the system in the Mallee: it yielded well even with a late sowing date.

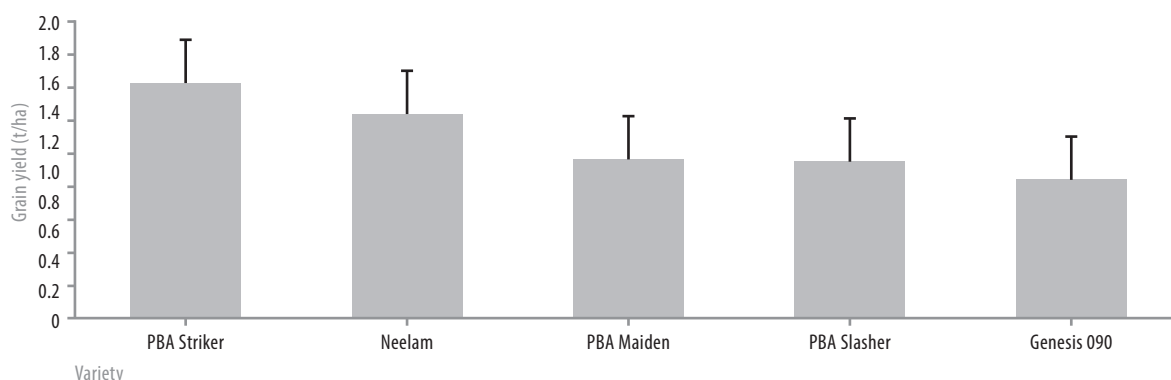


Figure 1. Mean chickpea yields (t/ha) at Watchupga East. Variety: $P=0.007$, $LSD=0.3t/ha$, $CV17.5\%$

PBA Monarch was the highest yielding kabuli variety. It yielded similarly to the desi types (PBA Striker, PBA Slasher and Neelam) at Curyo (Figure 2). PBA Monarch produces a much higher proportion of large seeds (8 and 9mm) than Genesis090, which resulted in gross margins \$200/ha greater than any other variety. This data highlights that it is one thing to look at yield in terms of selecting a variety, but the economics also need to play a role. These results follow a similar trend to the BCG chickpea data. Despite being sown a month earlier, PBA Striker and Neelam performed well.

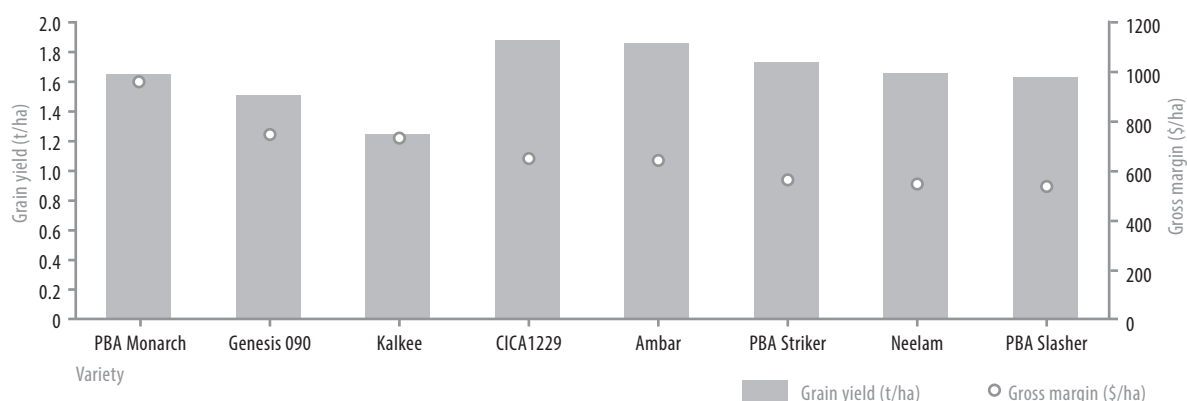


Figure 2. Curyo chickpeas grain yield (t/ha) and gross margin (\$/ha). Statistical analysis:

variety $P < .001$, $LSD = 0.2 \text{ t/ha}$; gross margin $P < .001$, $LSD = \$101$, $CV 14.1\%$

Gross margins based on production costs of \$180/ha + \$15/fungicide application ('R' varieties = 1 application, $MR=2$, $MS=3$) and grain prices: desi=\$450/t; kabuli=<7mm-\$330, 7-8mm-\$550, 8-9mm-\$750, 9-10mm-\$850, 10mm+-\$1000/t.

Table 4. Mean 2013 NVT chickpea yields (% yield relative to site mean) for sites at Birchip, Rainbow and Ultima.

	Birchip	Rainbow	Ultima
Sowing date:	16 May	17 May	18 June
Kabuli chickpeas site mean	0.6t/ha	1.5t/ha	1.0t/ha
Almaz	66	99	94
Genesis 079	129	113	101
Genesis 090	95	105	103
Genesis 114	83	108	94
Genesis Kalkee	95	84	98
PBA Monarch	143	100	109
Desi chickpeas site mean	0.8t/ha	1.5t/ha	1.1t/ha
PBA Striker	117	100	107
PBA Slasher	96	109	101
Neelam	97	103	103
Ambar	106	104	86
Genesis 079	90	100	93
PBA Maiden	92	90	99
Genesis 090	63	104	91

Lentils

Lentil yields were on average 1.5t/ha, with no significant differences observed between the varieties (Figure 3). A mild season in 2013 meant that none of the varieties was exposed to frost or heat stress in the Mallee. As a result, no differences between new and existing lines were observed. CIPAL 901 (still a development line at this stage) was selected for growth in more marginal areas where peas would normally have been used.

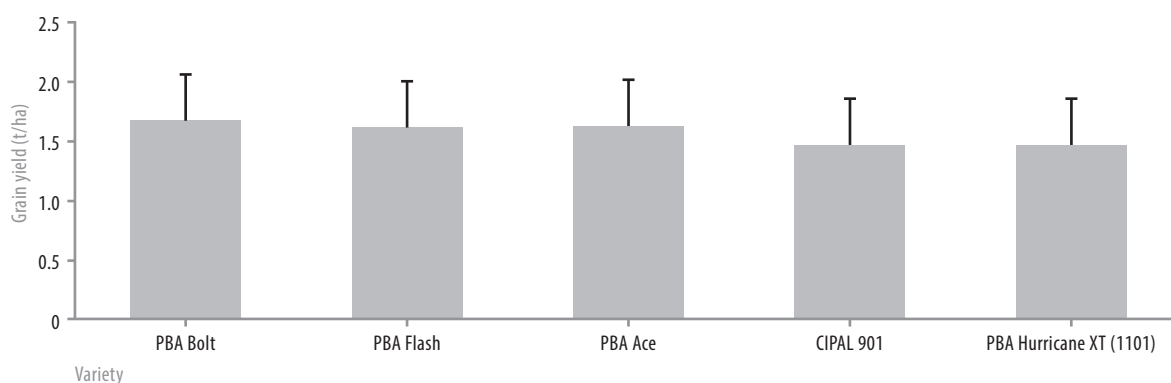


Figure 3. Mean lentil yield (t/ha) at Watchupga East. Variety: NS, CV17%

At Curyo, early sowing was still beneficial, despite the dry start, particularly for PBA Ace and PBA Hurricane (Figure 4). The early sown (May 2) treatment emerged only about 10 days ahead of the June 6 treatment. Early sown, PBA Ace had the highest yields while CIPAL 901 and PBA Flash were the most successful of the later sowings. The lentil data highlights the fact that there are options for early and later sowing of pulses in the Mallee. Ace had a high penalty for being sown late: it is best suited to longer growing seasons.

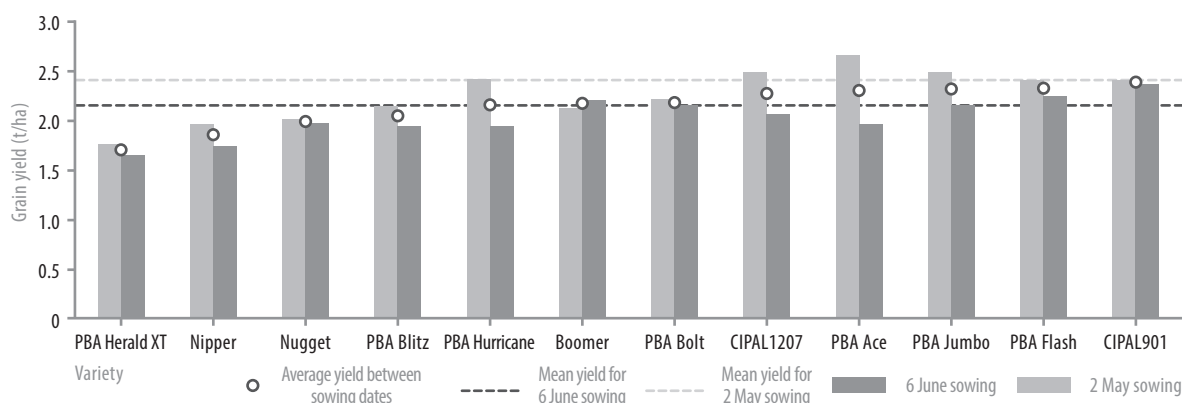


Figure 4. Curyo lentil yields (t/ha) for two sowing dates and mean yield. Variety: P<0.001, LSD 0.19t/ha, sowing date: P=0.015, LSD=0.15t/ha, sowing date x variety P=0.021, LSD=0.27t/ha, CV8.9%.

Table 5. Mean 2013 NVT lentil yields (%yield relative to site mean) for sites at Birchip, Rainbow, Ultima and Kaniva.

Sowing date:	Rainbow	Ultima	Kaniva
	17 May	30 May	18 June
Site mean (t/ha)	0.9	0.6	3.1
Nipper	64	45	92
Nugget	100	101	100
PBA Ace	111	119	105
PBA Blitz	58	54	91
PBA Bolt	125	121	92
PBA Flash	100	113	104
PBA Herald XT	60	71	84
PBA Hurricane XT	88	97	86
PBA Jumbo	77	87	95

Field peas

PBA Percy, PBA Oura and PBA Gunyah were the highest yielding pea varieties (Figure 5). Given the later than optimal sowing time, all peas yielded well. PBA Percy has a tendency to lodge at harvest time (this was observed in BCG's trial). Being a conventional variety, harvest is potentially more challenging compared with a variety such as PBA Twilight (renowned for its ability to remain erect). PBA Wharton (not in this trial) is a new field pea variety which is worth considering in Mallee environments.

Table 6 shows the mean pea yields at NVT sites across the Mallee and West Wimmera in 2013. The Mallee results do not show a high level of consistency with the Watchupga East yields (Figure 5), with PBA Percy and Oura being in the lower yielding varieties in the NVT. It is evident that these varieties have performed well in the Wimmera (Table 3). With the relatively high yields achieved at Watchupga East the conditions were conducive to field pea production which might explain the difference. The conditions were more suited to PBA Percy and Oura in the 2013 season. Analysis of field pea results from more than the 2013 season may be necessary to ensure the most suitable variety for the Mallee is determined.

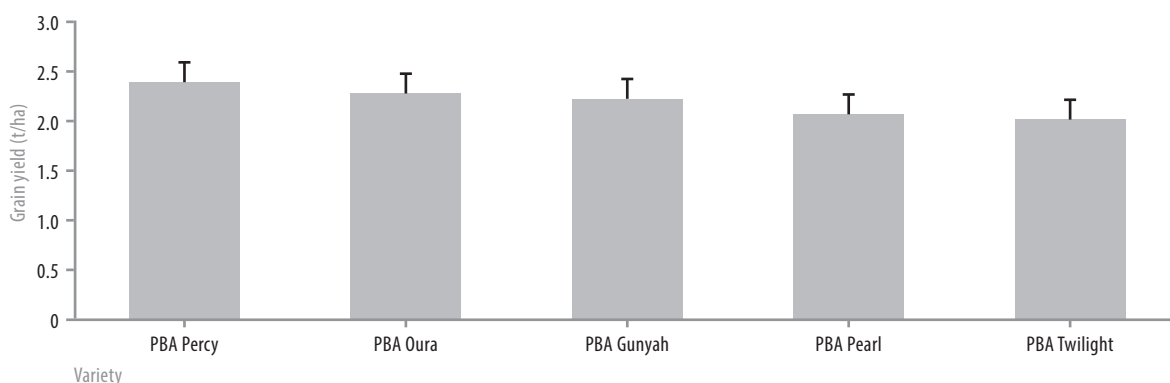


Figure 5. Mean pea yield (t/ha) at Watchupga East. Variety: $P=0.01$, $LSD=0.2t/ha$, $CV6\%$.

Table 6. Mean 2013 NVT pea yields (% yield relative to site mean) for sites at Birchip, Rainbow, Ultima, Kaniva and Tarranyurk.

Field peas	Birchip	Rainbow	Ultima	Kaniva	Tarranyurk
Sowing date	16 May	17 May	30 May	18 June	17 June
Site mean (t/ha)	1.2	2.2	1.2	4.2	1.8
Kaspa	104	99	61	92	88
PBA Gunyah	94	101	100	94	79
PBA Oura	87	98	93	98	97
PBA Pearl	98	105	97	103	105
PBA Percy	97	99	92	93	104
PBA Twilight	85	96	95	87	89
PBA Wharton	85	87	80	101	100

COMMERCIAL PRACTICE

BCG and DEPI research showed that there are some good options for pulses in the Mallee. Field peas can also be cut for hay and brown manured, strengthening this pulse crop's risk profile. PBA Wharton is a new field pea worth considering in the Mallee as it is a Kaspa type replacement.

Lentil variety PBA Hurricane yielded well, is a good fit into rotations in which herbicide residues are an issue.

PBA Striker was a consistent performer in BCG, DEPI, and NVT in 2013. However, when selecting chickpeas varieties, it is important to consider the type (desi or kabuli) and size as this can have a bearing on final gross margin (\$/ha). DEPI data showed that though Ambar was higher yielding than PBA Monarch, the latter had a higher gross margin.

The marketability of pulses is also an important consideration, particularly for chickpeas and lentils. In 2013, growers found marketing pulses difficult: demand was low for chickpeas and lentils. Tolerance to boron and salt is another important consideration for Mallee growers. Across the NVT sites and in BCG trials, PBA Bolt and PBA Flash were good yielders despite being moderately intolerant to boron.

Best bets in the Mallee for lentils include PBA Ace and PBA Jumbo for early sowing. However, if the season is a bit shorter or later sowing occurs then Boomer, PBA Bolt or CIPAL 901 are good options which were not as affected by the later sowing window.

Pulses may not always perform as well as they have in 2013, but there were cases of substantial profit gains from growing them in rotations, where growers could take advantage of incorporating them as a profitable break crop.

REFERENCES

SARDI Sowing Guide 2014

DEPI Victorian Winter Cop Summary 2013

www.nvtonline.com.au

Pulse Breeding Australia website: <http://www.grdc.com.au/Research-and-Development/Major-Initiatives/PBA/PBA-Varieties-and-Brochures>

ACKNOWLEDGMENTS

This trial was funded by BCG members through their membership.

DEPI results from Curryo were funded the through GRDC Southern Pulse Agronomy Program.

The NVT results were funded by GRDC.