CHICKPEA

Chickpea, Spring Sowing, HRZ Southern Wimmera (Gymbowen), Victoria
Faba bean, field pea, lupin, vetch and lentil, Spring Sowing, HRZ Southern Wimmera (Gymbowen), Victoria

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Aim
To investigate adaptability chickpea, faba bean, field pea, lupin, vetch and lentil varieties and breeding lines to spring sowing. Specifically, in chickpea there was a focus on new early flowering breeding lines with improved cold tolerance during the pod set phase.

Treatments
Varieties: Chickpeas: See Table 1
Other Crops See Figure 2

Table 1: Relative flowing and maturity of chickpeas in spring sown trials at Gymbowen in 2019. *Note: AB008 and WR2005 are reported to have some improvement in cold tolerance during the podding phase*

Variety	Seed Type	Flowering	Maturity
AB008	Desi	E	E/M
PBA Striker	Desi	E	E/M
WR2005	Desi	M	M/E
CICA1841	Desi	M	M
PBA Royal	Kabuli	M	M
Genesis090	Kabuli	M	M/L
CICA1454	Kabuli	M/L	M/L
Kaniva	Kabuli	L	L

Sowing Dates: Autumn - April 30, Spring – September 17
Plant Densities: Chickpea – 35 plants/m^2; faba bean – 20 plants/m^2; field pea – 40 plants/m^2; lupin – 45 plants/m^2; vetch – 70 plants/m^2; lentil - 120 plants/m^2.

Other Site Details

	Gymbowen
Stubble height (cm)	Standing (30)
Row Spacing (cm)	25.4
Fertiliser (kg/ha)1	100

[1] MAP (9.2, 20.2, 0, 2.7) + Zn (2.5)

Results and Interpretation

- Key Messages**:** Chickpeas were the most profitable crop sown in spring producing estimated returns up to $900/ha. In comparison, many varieties sown autumn failed to produce a return. The new early flowering, cold tolerance trait may further improve yield and stability in spring sowing, once incorporated into more broadly adapted breeding material.
  In contrast faba bean was the most profitable crop overall, producing a gross margin of up $2800/ha, from high yield and grain prices received in late 2019.

- Establishment and Plant Growth: Establishment of all crops was good at both autumn and spring sowing dates. In the autumn sown treatment, waterlogging became a significant issue during winter for chickpea and lentil, causing significant yellowing and stunting of growth in many plots. In addition, some of the autumn sown lupin plots were grazed by hares early in the season, although they were able to recover in spring. All spring sown plots were unaffected by waterlogging and grazing, however warm spring conditions lead to earlier initiation of flowering, and maturity was rapidly progressed by hot and

dry conditions during December and early January.
Hence in chickpeas, the difference in time to maturity between the varieties was marginal. Kaniva was relatively late maturing than other varieties, while PBA Striker, D11022 and D12084 were the earliest to mature. In the other crops high temperatures in early summer, resulted in stunted growth of faba bean and lupin, while vetch, field pea and lentil, appeared vigorous.

Figure 1. Grain yield (t/ha) and Gross margin ($/ha) of chickpea varieties and breeding lines sown in Autumn (April 30) and Spring (September 17) at Gymbowen in 2019. *Gross margin based on a grain price of $800/t for desi's and $640/t for Kabulis with fixed management costs of $350/ha.*

- Grain Yield and Profitability:
  Chickpeas
  The grain yield of all varieties was higher when sown in spring compared with autumn. At the autumn sowing the newly released kabuli variety had the highest yield (1.0 t/ha) followed by the industry standard Genesis090 (0.9 t/ha). PBA Striker was highest yielding desi variety (0.65 t/ha), while the new potential cold tolerant breeding lines, D12084 and D11022, had the lowest yields (0.40 t/ha).

  At the spring sowing, grain yields were improved in all varieties by 10% to 234%. PBA Striker had the highest yield of 1.5 t/ha, with Genesis090, CICA1841 and WR2005 producing 1.40 t/ha. It was particularly notable that the early flowering cold tolerant line WR2005, had a 235% improvement on

yield from autumn sowing, indicating that this line may have traits which could improve yields for spring sowing in chickpeas. AB008 was again the lowest yielding, but still had a 120% increase in yield over the autumn sown treatment.

Estimated gross margins showed that the desi varieties and breeding lines, PBA Striker, CICA1841 and WR2005, would have been most profitable when spring sown, particularly due to the higher prices that were available for desi chickpeas in early 2020. Estimated gross margins were generally between $300 and $900, indicating that spring sown chickpeas could have a profitable in the higher rainfall zones, particularly with improved early flowering varieties. In addition, it is likely that production cost would be lower in spring due to reduced fungicide inputs to grow the crop. Several of the varieties sown early were only around the break-even point, indicating the risk of growing chickpeas in the higher rainfall zone in autumn.

Figure 2. Grain yield (t/ha) and Gross margin ($/ha) of faba bean, field pea, lupin, vetch and lentil varieties and breeding lines sown in Autumn (April 30) and Spring (September 17) at Gymbowen in 2019. *Gross*

margin based on a grain price of $650/t for faba bean, $700/t for lentil, $500/t for field pea and $600/t for lupin with fixed management costs of $350/ha.

Faba bean, Field Pea, Lupin, Vetch, Lentil

In contrast to chickpeas, all varieties and breeding lines of faba bean, field pea, lupin, vetch and lentil, except CIPAL1721 lentil, where much lower yielding when sown in spring compared with autumn. Faba Bean, field pea and lupin varieties and breeding lines were all between 70 and 85% lower, vetch 40% lower and PBA Ace lentil was 20% lower. The only line to produce higher yield (60%) was CIPAL1721, which may be due to waterlogging that significantly reduced growth and caused dead patches the some of the autumn sown plots.

As expected in this environment, faba bean produced the highest yield, averaging 4.8 t/ha when sown in autumn. While yield was reduced dramatically in spring, faba bean still produced yield equivalent to the other highest yielding crops from this date, lentil and vetch (1.2 t/ha). Field peas also produced excellent yields in autumns sowing with the new blue breeding producing 3.9 t/ha, significantly higher than PBA Butler (2.7 t/ha). In spring yields were reduced to 0.8 t/ha and 0.5 t/ha, respectively. Lupins produced adequate yield, given the grazing from hares, of 1.8 t/ha sown autumn and were very poor spring sown with less than 0.4 t/ha. Despite the waterlogging that was observed, lentil still produced yields of 0.7 and 1.5 t/ha for CIPAL 1721 and PBA Ace, respectively when sown in autumn. In spring, a profitable yield of 1.2 t/ha was observed. Vetch grain yields were also impressive with Timok procuding more than 2.0 t/ha from autumn sowing and 1.3 t/ha from spring sowing.

Estimated gross margins showed that faba beans sown autumn were highly profitable, producing returns up to $2800/ha, almost double that of any other crop variety grown at this site. The new blue field pea had excellent returns of $1600/ha when sown in autumn. All crops and varieties were profitable when sown in autumn. In contrast, field pea and lupin would have made a significant loss with spring sown, while faba bean and lentil showed returns up to $500/ha.

Acknowledgements

The research undertaken as part of the GRDC funded Southern Pulse Agronomy project is made possible by the significant contributions of growers through both trial cooperation and the support of the GRDC and the authors would like to thank them for their continued support. The continued assistance in trial management from AgVic and Frontier Farming teams is gratefully acknowledged and appreciated. The authors would also like to gratefully acknowledge private agronomists, pulse breeders, pathologists for their scientific input and assistance, as well as growers involved in the project.