Lentil, Nutrition to promote early vigour, MRZ Eyre Peninsula (Tooligie), South Australia
Lentil, Nutrition to promote early vigour, HRZ Eyre Peninsula (Strawberry Hill), South Australia
Lentil, Nutrition to promote early vigour, LRZ Eyre Peninsula (Kimba), South Australia

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Aim
To promote early vigour to improve biomass and yield partitioning in lentil

Treatments
Table 1. Treatment and trial site details of early vigour lentil trials on the Eyre Peninsula, 2019.

Treatments	1. Nil 2. Nil inoculum + MAP 3. Standard rate inoculum + MAP 4. Double rate inoculum + MAP 5. Standard rate inoculum + MAP + phosphorus 6. Double rate inoculum + MAP + phosphorus 7. Standard rate inoculum + MAP + sulphur 8. Double rate inoculum + MAP + sulphur 9. Standard rate inoculum + MAP + calcium or gibberellic acid 10. Double rate inoculum + MAP + calcium or gibberellic acid
Fertilizer (kg/ha)[1]	75
Phosphorus rate	10 units of P applied as MAP
Sulphur rate	5 units of S applied as sulphate of ammonia
Calcium rate	4 units of Ca applied as lime (Tooligie and Strawberry Hill)
Gibberellic acid rate	40 ml/ha GALA + BS1000 applied at 6 node growth stage (Kimba)
Sowing date	Tooligie: 21 May Strawberry Hill: 3 June Kimba: 22 May
Varieties	Strawberry Hill, Tooligie: PBA Jumbo2 Kimba: PBA Bolt
Plant density (plants/m^2)	120

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

Results and Interpretation

- Key Messages: The application of inoculant at sowing has proven to be of high importance in optimising pulse production. Providing adequate level of available phosphorus boosts pulse production. Application of calcium shortened mature lentil plants diminishing harvestability, as pods formed closer to the ground.

- Plant height: Treatments were not significant on plant height at early vegetative growth, flowering and at crop maturity at Tooligie, 2019. At Strawberry Hill plant height increased by 2.5 cm in response to 75 kg/ha MAP at early vegetative stage compared to the nil (data not shown) on ripped soil. A higher rate of MAP fertiliser at 120 kg/ha increased plant height by 3 cm compared to 75 kg/ha (data not shown). As lentil reached flowering, plant height did not respond to MAP compared to nil. However, plant height increased in a rate dependent trend to the application of MAP fertilizer. This indicates the importance of applying adequate rates of fertiliser at sowing (Figure 1). Applying 120 kg/ha MAP increase flowering plant height by 6 cm compared to 75 kg/ha MAP applied at sowing. At crop maturity there was no response to MAP rate. However, there was a negative response to calcium application, with a 3 cm reduction in plant height compared to lentil where no calcium was applied, affecting lentil harvestability (Figure 1). Lentil plant height was increased in response to MAP fertiliser at both early vegetative growth stage and flowering, on un-ripped soil at Strawberry Hill (Figure 2). Plant height early in the season was increased by 2 cm where 75 kg/ha MAP fertiliser was applied compared to nil. Plant height response was greater when lentil was flowering, with 4.5 cm increase in plant height where MAP fertiliser was applied compared to the nil. However, plant height differences were not observed between treatments as lentil reached crop maturity (data not shown).

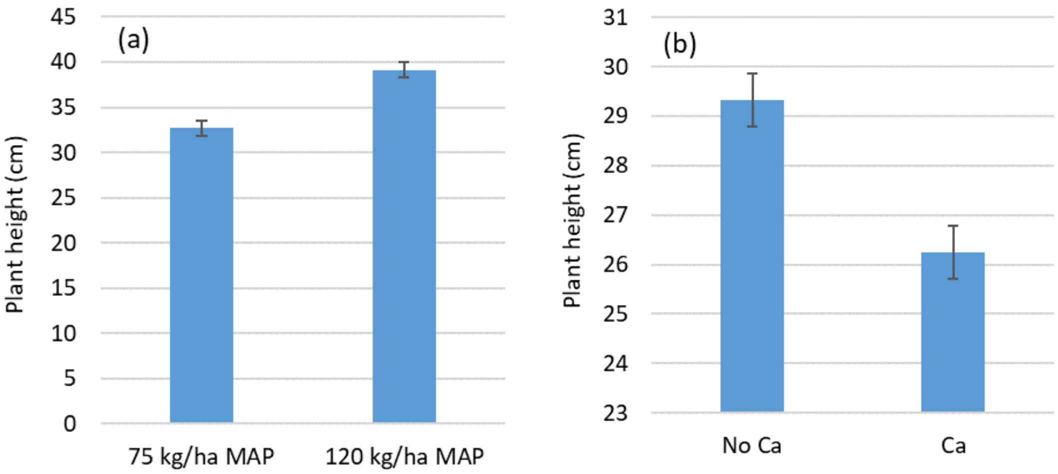

Figure 1. Lentil plant height in response to (a) MAP fertiliser at flowering and (b) calcium at crop maturity, on ripped soil at Strawberry Hill, 2019. Error bars represent standard error (P<0.05).

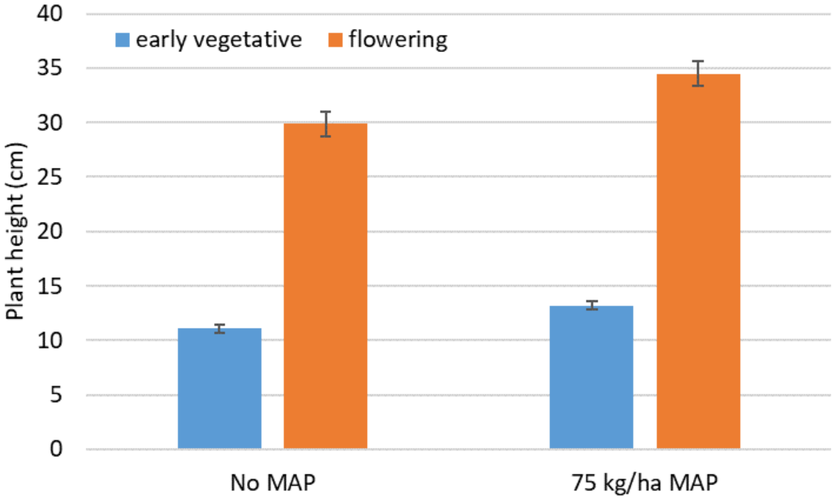

Figure 2. Height of plants at early vegetative growth and flowering stages in response to MAP fertiliser applied at sowing on un-ripped soil at Strawberry Hill, 2019. Error bars represent standard error (P<0.05).

- Biomass production: A biomass yield response at flowering and crop maturity was observed for inoculant rate and MAP rate at Tooligie, 2019 (Figure 3). Applying a standard rate of inoculant at sowing increased biomass production by 26% (240 kg/ha) at flowering and by 8% (200 kg/ha) at crop maturity, compared to the nil (Figure 3b). Doubling the rate of inoculant on lentil at this site was beneficial and increased biomass yield by 41% (370 kg/ha) at flowering and 22% (530 kg/ha) at crop maturity, compared to the nil (Figure 3b). Double rate of inoculant increased biomass production compared to the standard rate. However, it is unlikely that the small increase in biomass production (of 130-330 kg/ha) sufficiently covers the additional cost, unless there is a grain yield benefit or if the crop is being grazed or cut for hay. Applying 75 kg/ha of MAP at sowing increased biomass yield by 61% (460 kg/ha) at flowering and by 39% (780 kg/ha) at crop maturity (Figure 3a).

  Lentil biomass yield at flowering was increased in response to inoculant rate and MAP on un-ripped soil at Strawberry Hill, 2019 (Figure 4). Applying standard rate of inoculant at sowing increased biomass production by 25% (580 kg/ha). However, applying a double rate of inoculant did not increase biomass yield compared to lentil that was sown with a standard rate of inoculant. Applying 75 kg/ha MAP at sowing nearly doubled biomass production (1 t/ha increase) at flowering compared to lentil that was sown without MAP fertiliser. However, these benefits from MAP and inoculant were not seen by the time lentil reached physiological maturity.

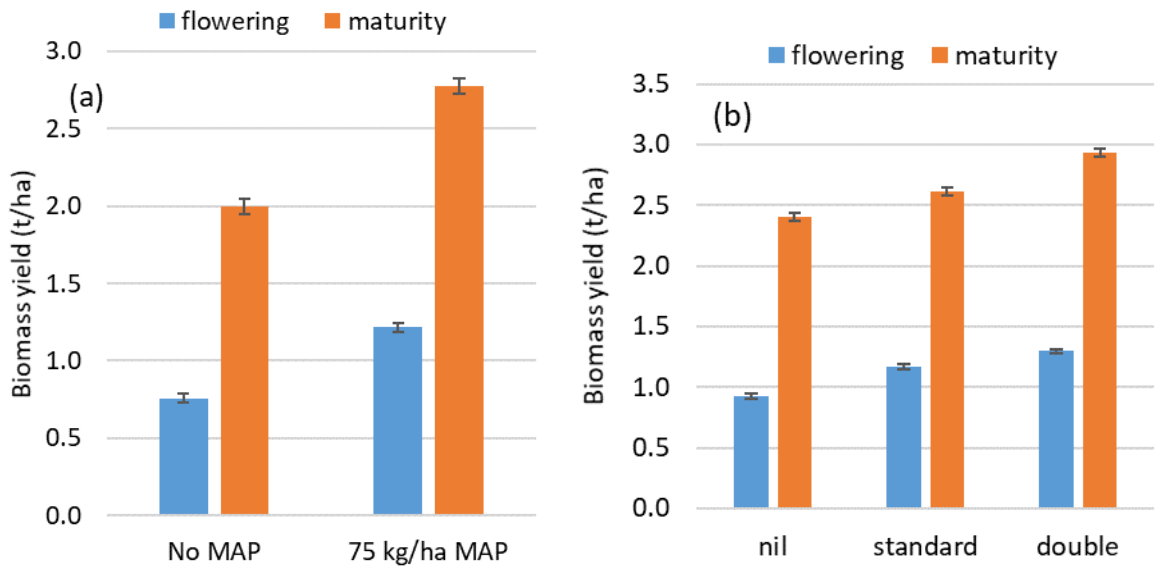

Figure 3. Lentil biomass yield at flowering and crop maturity in response to (a) MAP fertiliser and (b) inoculant rate at Tooligie, 2019. Error bars represent standard error (P<0.05).

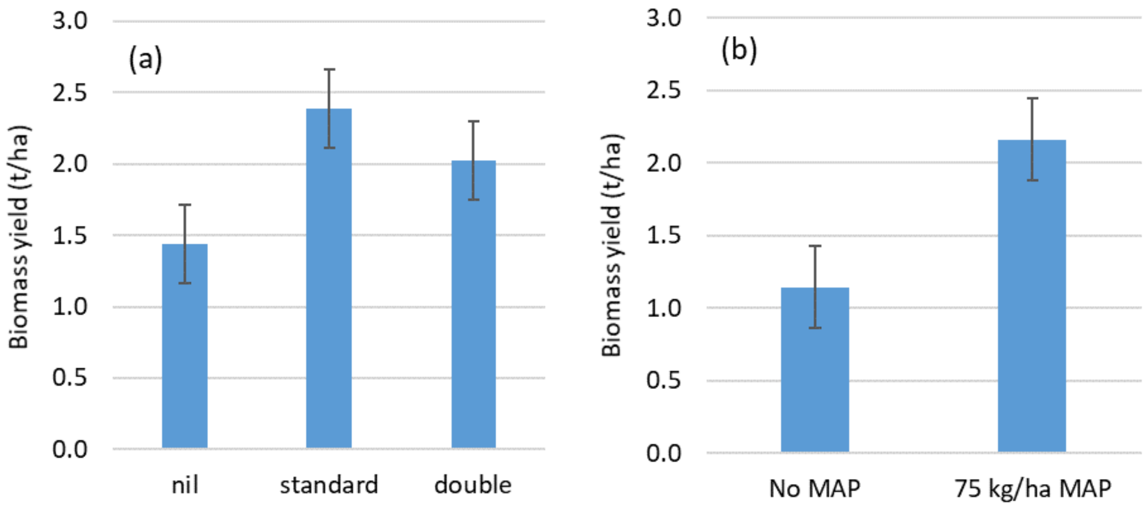

Figure 4. Lentil biomass production at flowering in response to (a) inoculant and (b) MAP fertiliser on un-ripped soil at Strawberry Hill, 2019. Error bars represent standard error (P<0.05).

- Grain yield: At Tooligie, 2019 applying standard rate of inoculant at sowing increased grain yield by 20% (120 kg/ha) compared to no inoculant (Figure 5). However, doubling the rate of inoculant reduced grain yield compared to the standard rate of inoculant. Therefore, it would not be beneficial to double inoculant to increase grain yield. Adequate availability of phosphorus was important to maximise grain yield potential. Applying 75 kg/ha MAP at sowing increased grain yield by 180 kg/ha compared to plants, which did not receive. Further, applying 120 kg/ha MAP increased grain yield by 21% (140 kg/ha) compared to lentil with 75 kg/ha MAP applied (Figure 6).

  A grain yield response to MAP rate was observed in lentil on ripped soil at Strawberry Hill, 2019 (Figure 6). Applying 75 kg/ha MAP did not increase grain yield compared to the nil. However, applying 120 kg/ha MAP at sowing increased grain yield by 38% (570 kg/ha) compared to the nil, showing the importance of adequate phosphorus availability for crop and grain production. Similarly, there was a positive grain yield response to inoculant rate and MAP fertiliser in lentil on un-ripped soil at Strawberry Hill, 2019 (Figure 7). A standard inoculant rate applied at sowing produced grain yield similar to the double rate of inoculant. However, applying a double rate of inoculant did increase lentil grain yield by 26% (310 kg/ha) compared to the nil. MAP fertiliser applied at 75 kg/ha increased grain yield by 33% (360 kg/ha) compared to no MAP applied.

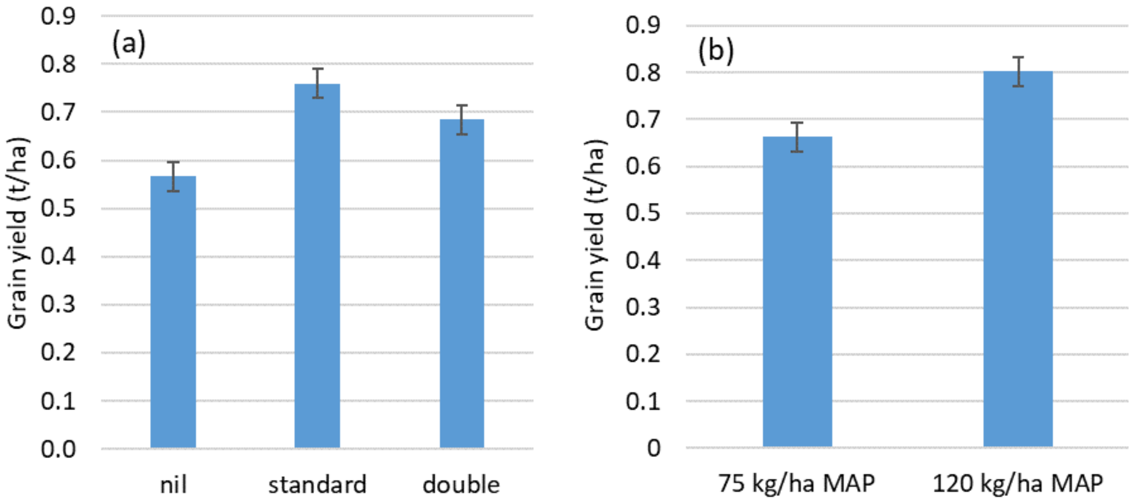

Figure 5. Lentil grain yield in response to (a) inoculant rate and (b) MAP fertiliser rate at Tooligie, 2019. Error bars represent standard error (P<0.05).

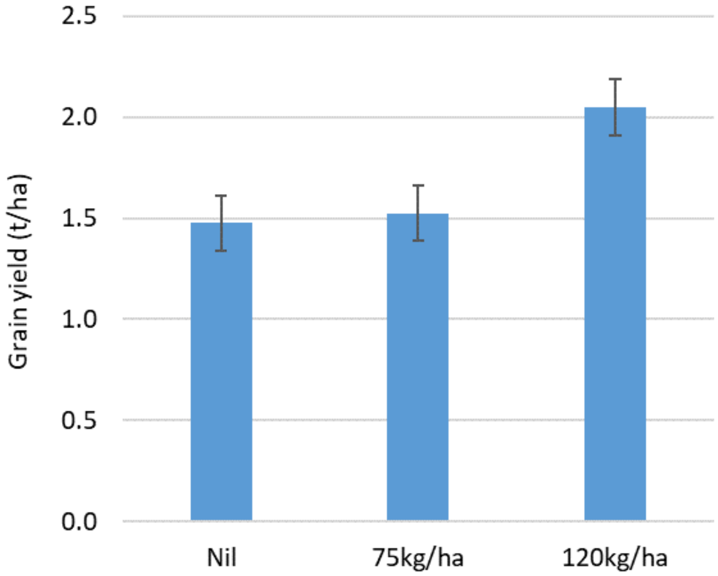

Figure 6. Lentil grain yield in response to MAP fertiliser on ripped soil at Strawberry Hill, 2019. Error bars represent standard error (P<0.05).

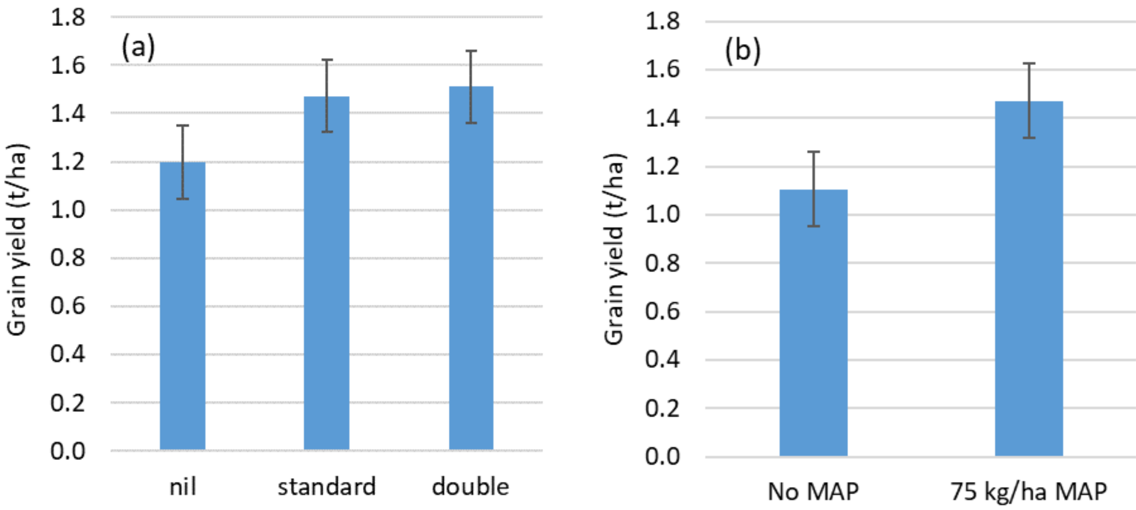

Figure 7. Lentil grain yield in response to (a) inoculant rate and (b) MAP fertiliser on un-ripped soil at Strawberry Hill, 2019. Error bars represent standard error (P<0.05).

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 SARDI Agronomy groups at Clare, Minnipa, Struan and Port Lincoln is gratefully acknowledged and appreciated. The authors would also like to gratefully acknowledge SARDI Plant Pathology and Soil Biology groups for their scientific input and assistance, as well as advisors and grower groups involved in the project.