

Effect of seed row spread, phosphorus fertilizer form and rate on emergence, biomass yield, phosphorus uptake and recovery by canola (*B. napus*)

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INTRODUCTION:

- ❖ Applying enough phosphorus (P) to Canola especially at early growing stage is essential in meeting the increasing demand for canola yield (CCC,2017).
- ❖ Generally, the P fertilizer is applied in the prairies as granular mono-ammonium phosphate (MAP, 11-52-0). However, MAP can be toxic if concentration near the seed is too high (Qian et al., 2012).
- ❖ There is little or no information on the relationship between opener width, maximum safe rate of seed-placed P, and the recovery and efficiency of utilization of the applied P fertilizer by the crop (Mooleki et al., 2010).

Hypothesis

- ❖ The greater spread will result in more soil-fertilizer contact and reduce the efficiency of utilization of the added P fertilizer, resulting in lower recovery of P fertilizer and yield per unit of P fertilizer added.
- ❖ Struvite, which is a source of P fertilizer that is less soluble than MAP, will allow higher safe seed row application rates of P with canola due to less salt effect, but the lower solubility of struvite will result in reduced uptake and efficiency of use by canola and following wheat and pea crops grown on struvite amended soil, especially at low rates.

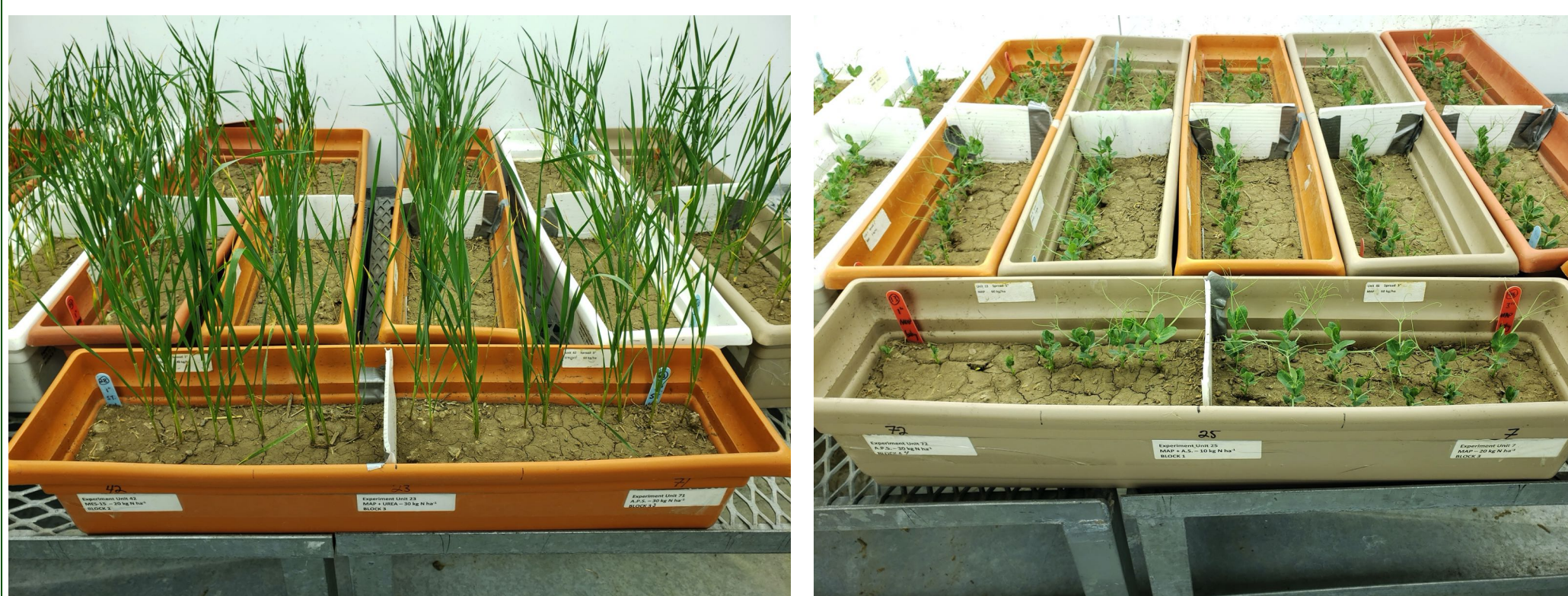
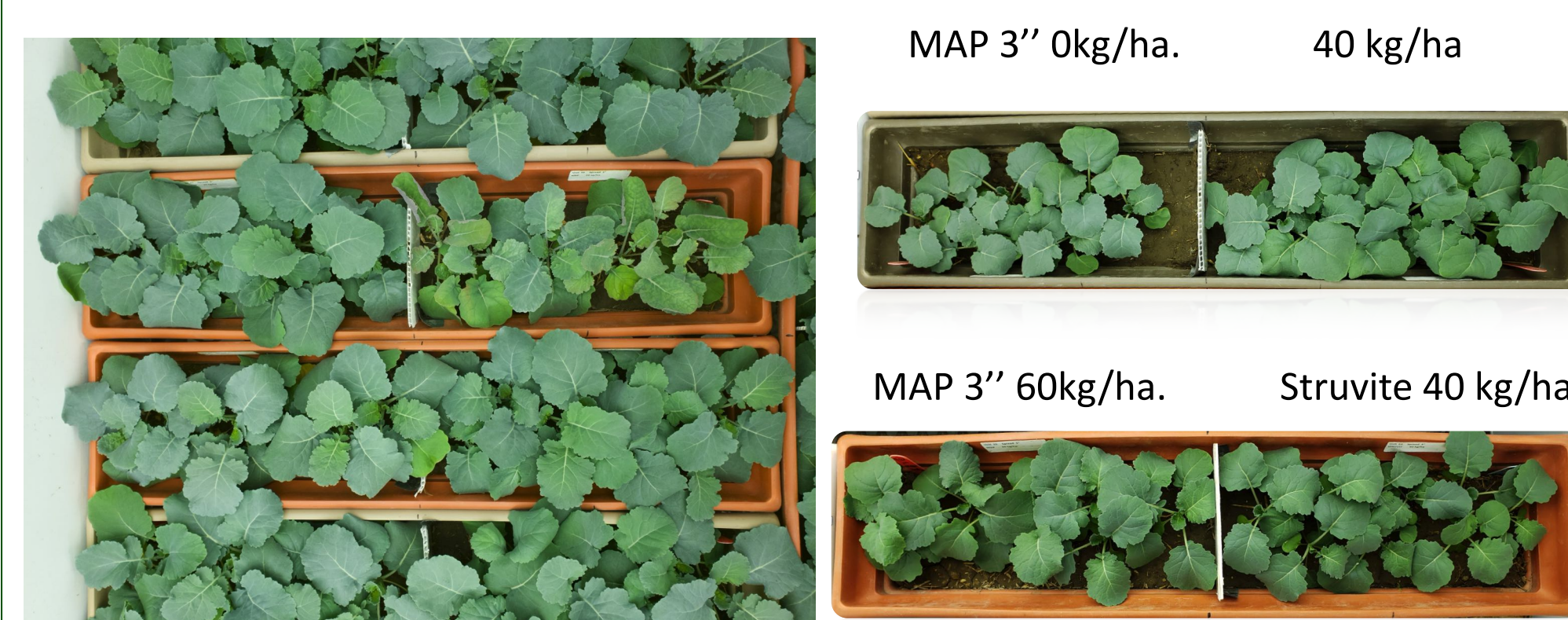
Objective

Assess how P fertilizer form (MAP versus struvite), P rate and opener spread affects emergence, early biomass yield, P uptake and recovery by canola, wheat and pea grown in rotational sequence in controlled environment conditions.

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Methods

- ❖ The soil used is a P deficient Brown Chernozem soil of Ardill association collected from the field during fall of 2018. The pH is 7.7 and the MK extractable P concentration is 11 mg P kg⁻¹.
- ❖ Canola (hybrid *B. napus* Invigor Liberty Link variety) was grown in the U of S phytotron facilities under controlled environment conditions and emergence, with collection of 30-day biomass yield, P uptake, recovery, and efficiency determined as a function of treatment. Wheat (hard red spring wheat var Brandon) and pea (dry green class var Stryker) were grown in sequence following the canola tested for in the same soil tray, respectively.
- ❖ Treatment includes: 1" and 3" opener spreads, MAP (11-52-0), Crystal Green™ struvite (5-28-0 with 10%Mg), and application rate 0, 20, 40, and 60 kg/ha.
- ❖ To duplicate fertilizer application as it would occur in the field, N and S were also side banded at 200 kg N/ha and 20 kg S/ha respectively as urea and ammonium sulfate.



Result and Discussion

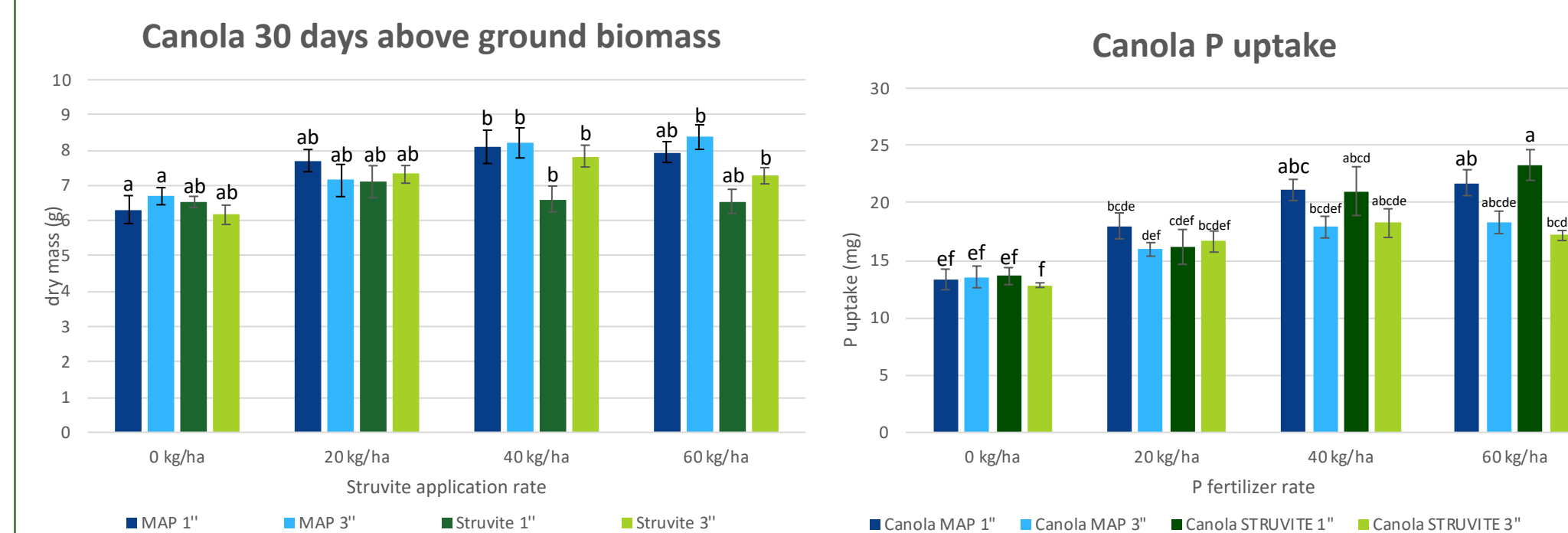


Figure 2: 1" spread appears to offer advantages in P uptake over the 3" spread for Canola, especially at high rate. Bar with the same letter are not significantly different (alpha=0.1).

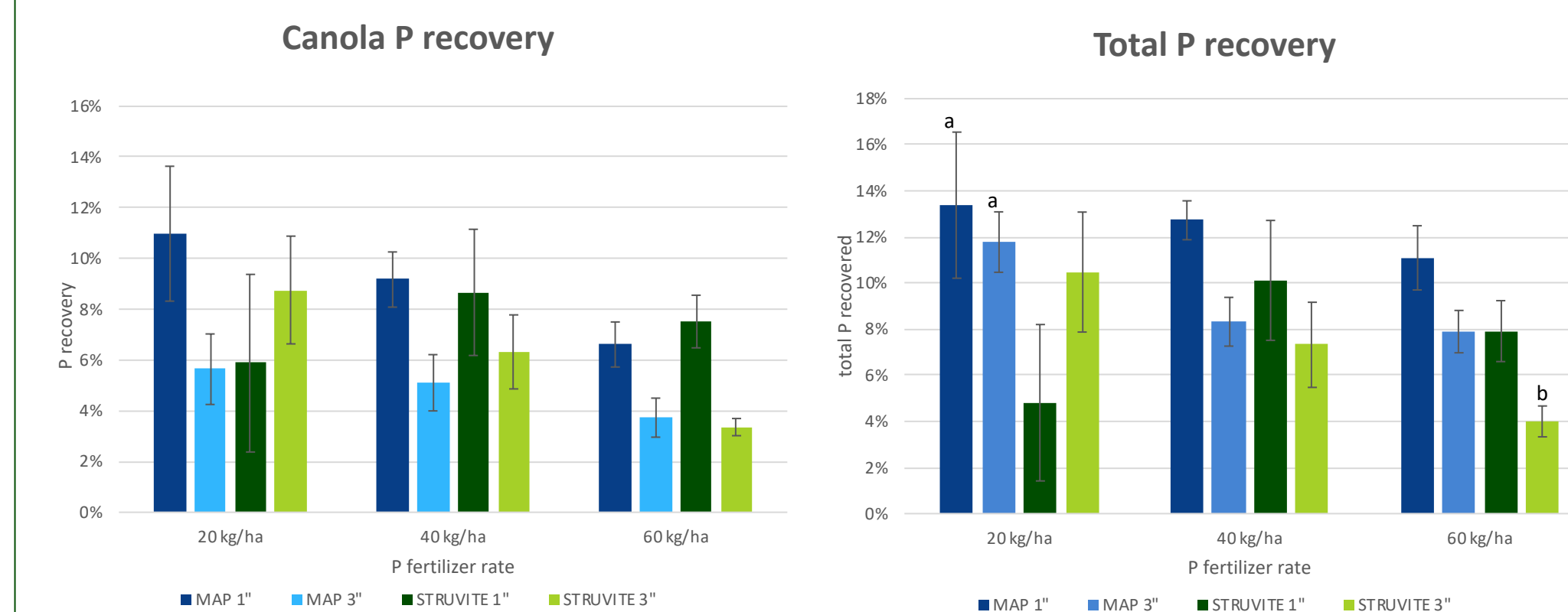


Figure 4: Statistical analysis shows that there is no significant different between MAP and Struvite in Canola P recover. However, MAP performed better in total P recover. Besides, 1" spread and 40 kg P₂O₅ ha⁻¹ have significant positive effect on Canola P recover.

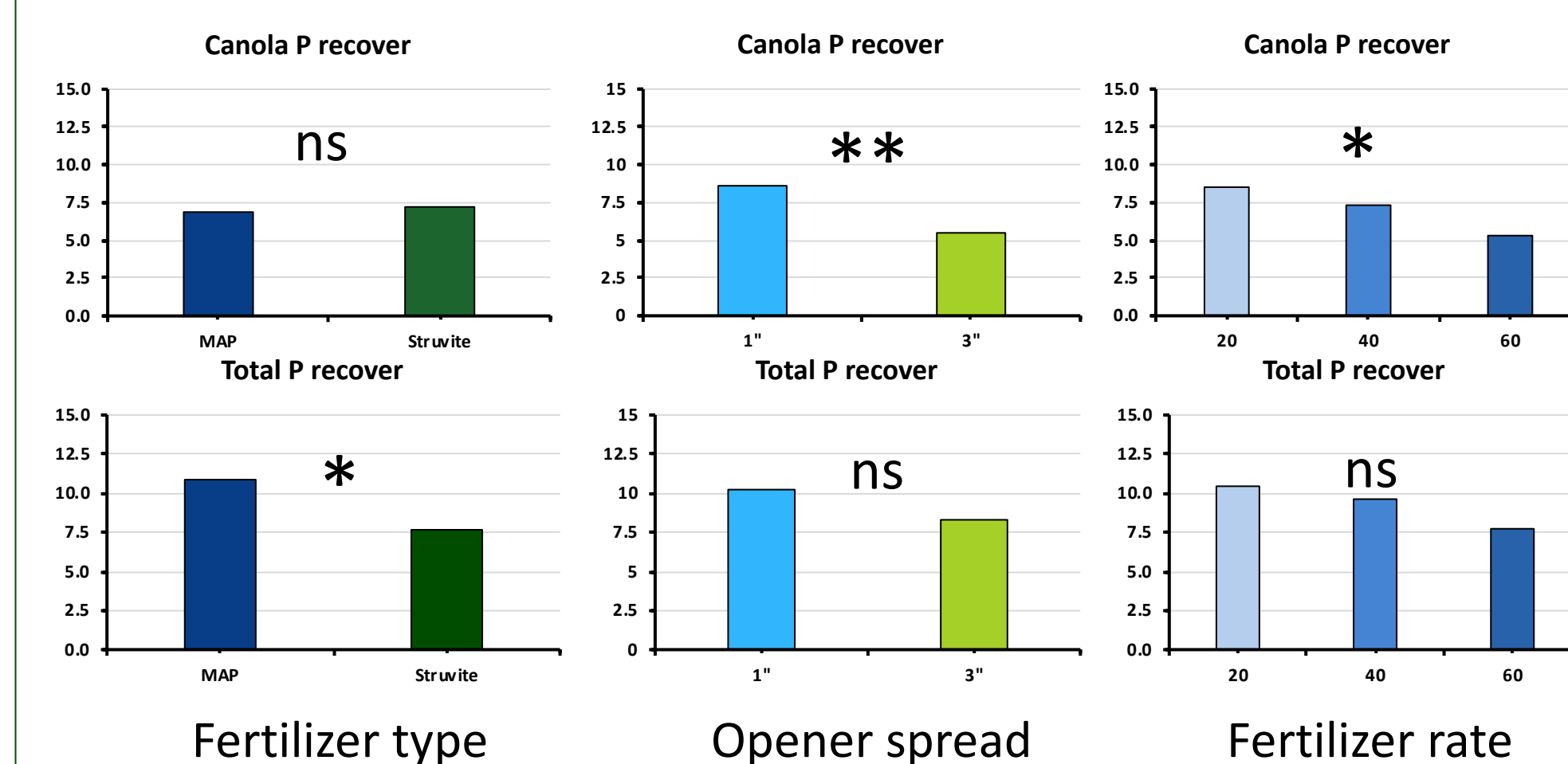


Figure 4: Statistical analysis shows that there is no significant different between MAP and Struvite in Canola P recover. However, MAP performed better in total P recover. Besides, 1" spread and 40 kg P₂O₅ ha⁻¹ have significant positive effect on Canola P recover.

- ❖ There is delayed emergence in Canola with MAP application at the 60 kg P₂O₅ ha⁻¹ rate for the first 5 days. After 10 days. there is no significant effect of rate or form on emergence and they were all similar (data not shown).
- ❖ At the rate of 60 kg P₂O₅ ha⁻¹, MAP and Struvite with 1" spread do not have significant higher biomass yield in compare to the control, which might be the result of concentrated fertilizer in seed row suppress the plant growth by salt effect (Fig.1).

- ❖ Both 40 and 60 kg P₂O₅ ha⁻¹ offer significantly higher P uptake in Canola. Struvite with 1" spread has the highest P uptake result which may be the result of narrower spread has reduced soil-fertilizer contact and fixation offers an advantage in P uptake over the 3" spread and increases the availability of Struvite (Fig.2).
- ❖ P recover result of Canola shows no significant different between MAP and Struvite. However, total P recovered from MAP is significantly higher than Struvite, which may be due to diluted fertilizer concentration caused by seeding the following crop (Fig 3 & 4).

Conclusion

There is no significant negative effect of seed row placed fertilizer on Canola emergence at up to 60 kg P₂O₅ ha⁻¹. 1" opener spread results in in a better P fertilizer availability and utilization compared to a 3" opener spread. MAP and Struvite have similar performance when placed in seed row with canola, especially at the rate of 40 and 60 kg P₂O₅ ha⁻¹, which is possibly due to a lower degree of soil fixation associated with the struvite product.

Reference

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