



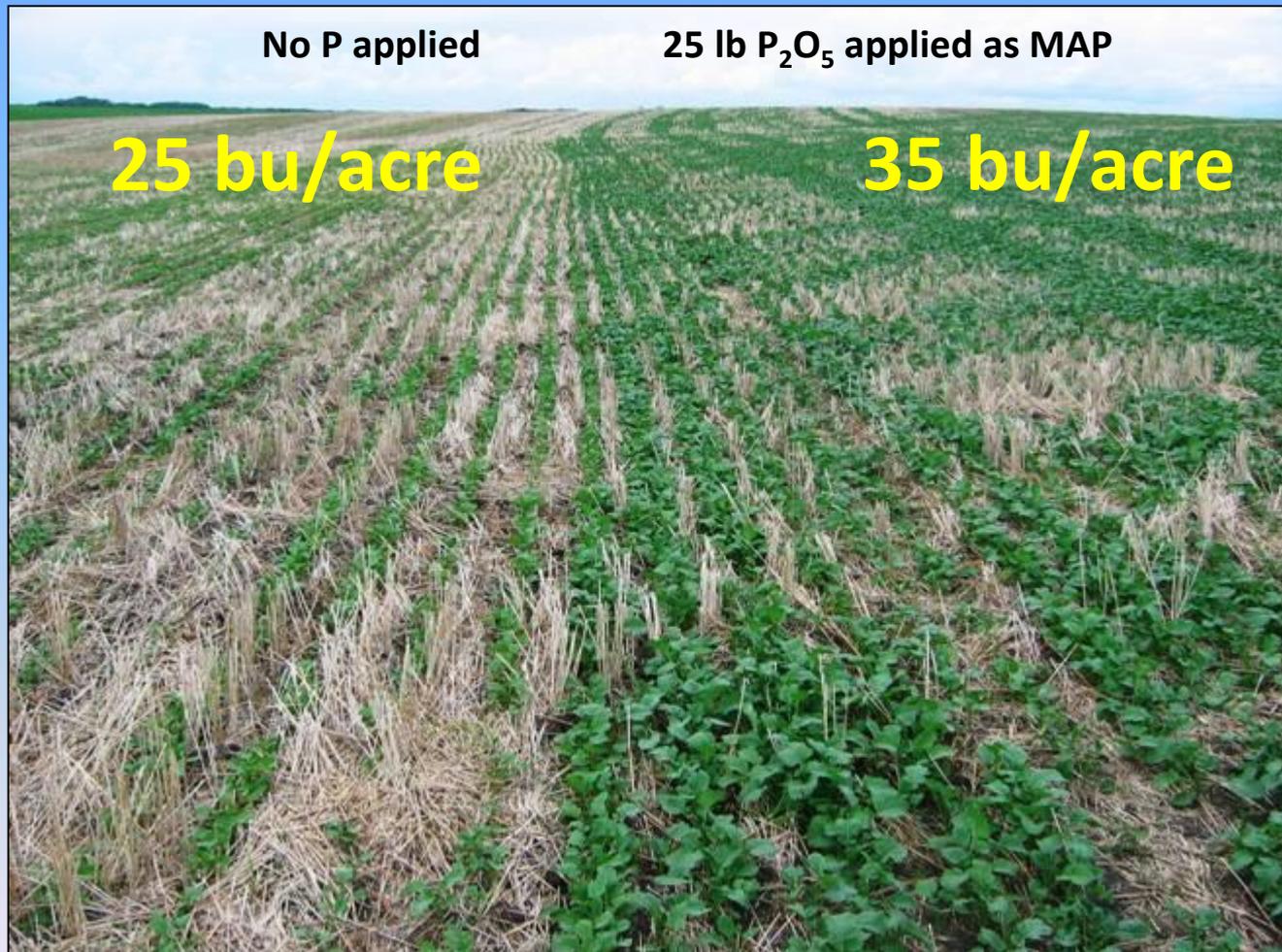
Seed-Placed P and S Fertilizers: Effect on Canola Plant Stand and Yield

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Early Season P Response in Canola Grown on Soil with Low Soil Test P*



*equiv. to ~ 7 ppm Olsen P

(John Heard, MAFRI)

S Deficiency Delays Maturity, Decreases Seed Yield and Oil Concentration



Challenges for Farmers

- 4R's - Right Source, Rate, Placement, Timing
- One pass, low disturbance, low SBU seeders
 - Limiting rate of seed-placed fertilizer
 - Yield limiting?
 - Depleting soil fertility?
- New P and S fertilizers
 - Seed Safety?
 - As effective as conventional sources?

What is an Acceptable Plant Stand for Canola?

- Canola Council of Canada suggests:
 - Seed canola at a rate of 5-8 lbs/ac
 - Target plant stand of 40-200 plants/m²

Environmental Conditions	Seeding Rate 150 seeds/m ² (~7lbs/ac)
“Optimal” Emergence = 60-80%	90 – 120 plants/m ²
“Normal” Emergence = 40-60%	60 – 90 plants/m ²

- Seed-row fertilizer can significantly reduce plant stands

Seedrow Toxicity from Ammonium Sulphate



Photo: John Waterer ... west of Elm Creek, MB

Fertilizer Toxicity

- Salt Toxicity (Osmotic stress)
 - Affected by fertilizer source, soil moisture content

Fertilizer	Salt Index
MAP (11-52-0)	26.7
APP (10-34-0)	20.0
AS (20-0-0-24)	88.3
ATS (15-0-0-30)	90.4

- Ammonia Toxicity
 - Affected by fertilizer source, soil pH, CEC, texture, temperature and water and lime content
 - Ammonium sulphate can react with lime in soil to form ammonia

Study Objectives

- In the field:
 - The effect of **various sources** and **rates** of seed-placed P and S fertilizers on plant stand and yield of canola
- In controlled environment:
 - The effect of soils from different **landscape positions** on the toxicity of **AS** and **MAP** fertilizers placed in the seed-row with canola

Field Study Treatments

- Phosphorus Fertilizers

- MAP (11-52-0)
- Coated MAP (11-51-0)
- APP (10-34-0)

- Rate Applied

- 0 lbs P₂O₅/ac
- 18 lbs P₂O₅/ac (**Low**)
- 35 lbs P₂O₅/ac (**High**)

- Sulphur Fertilizers

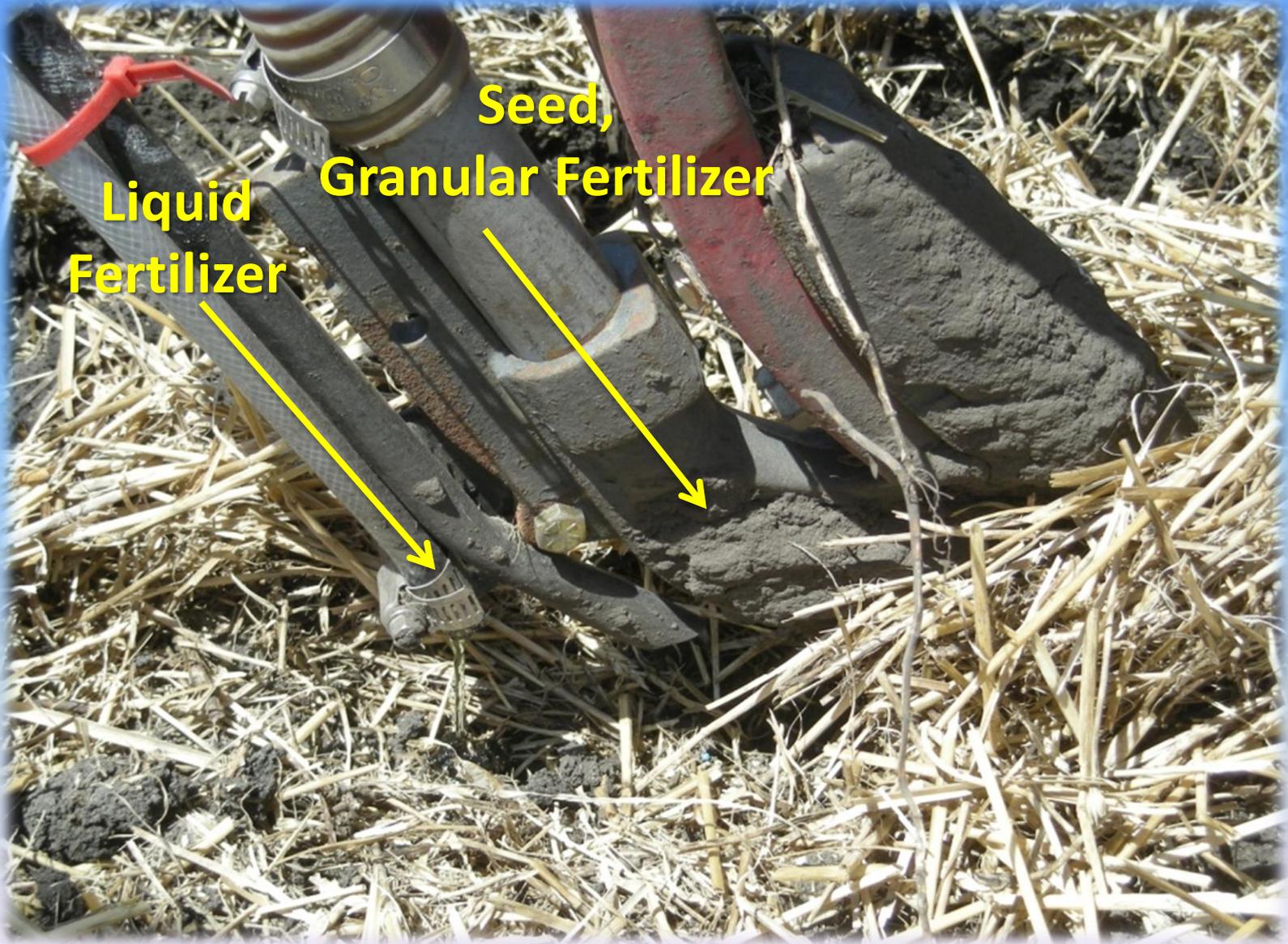
- AS (20-0-0-24)
- ATS (15-0-0-20)
- Vitasul (0-0-0-90)

- Rate Applied

- 0 lbs S/ac
- 8 lbs S/ac (**Low**)
- 16 lbs S/ac (**High**)

- Microessentials S15 (13-33-0-15)

- 18 lbs P₂O₅/ac – 8 lbs S/ac (**Low**)
- 35 lbs P₂O₅/ac – 16 lbs S/ac (**High**)

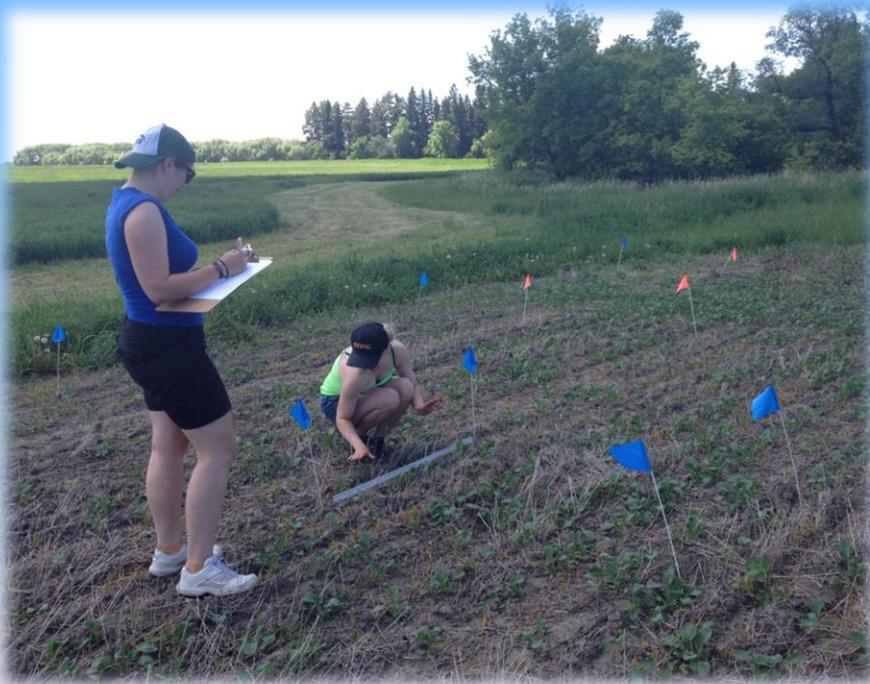


Liquid
Fertilizer

Seed,
Granular Fertilizer

Data Collection

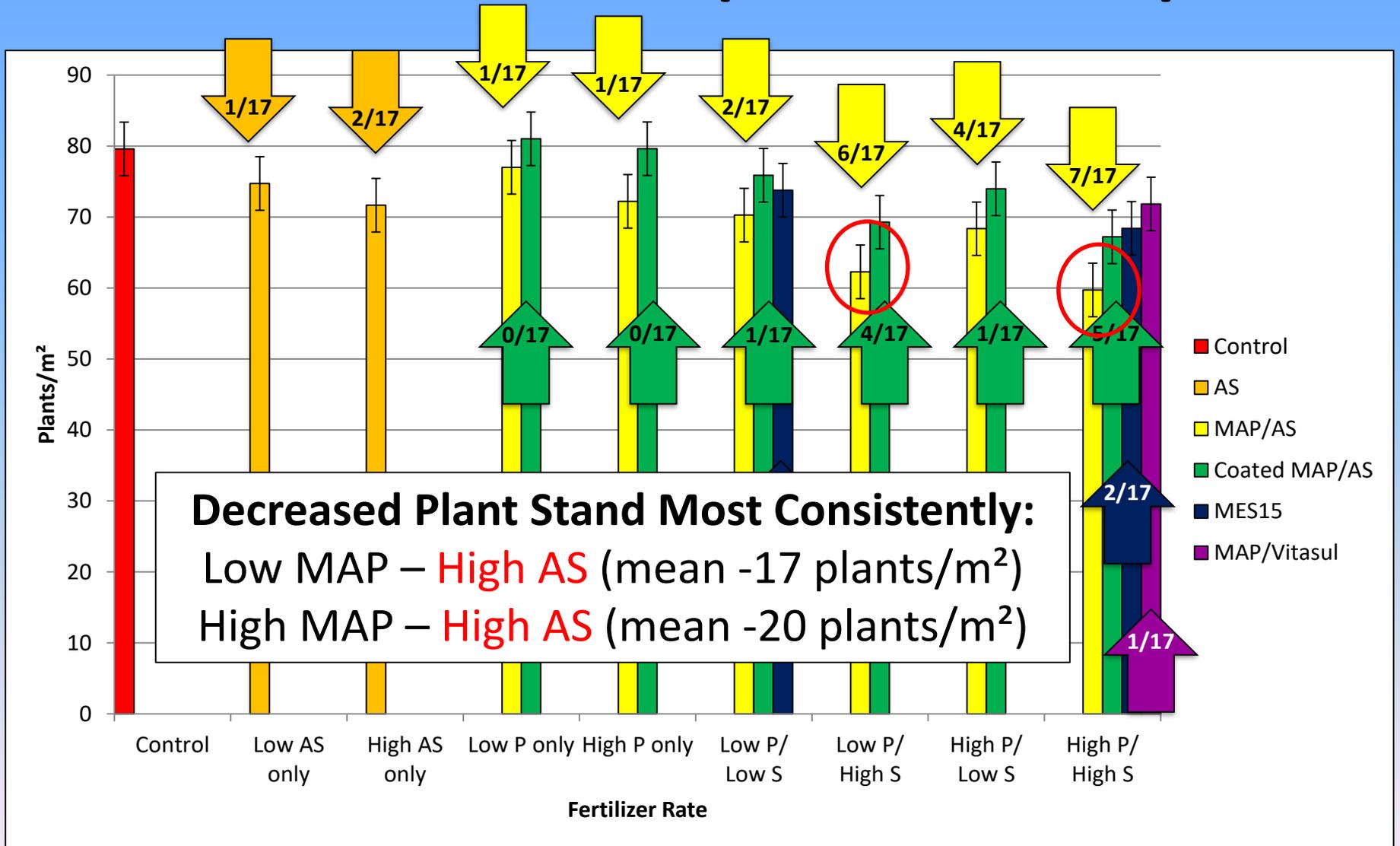
Plant Stand Assessment



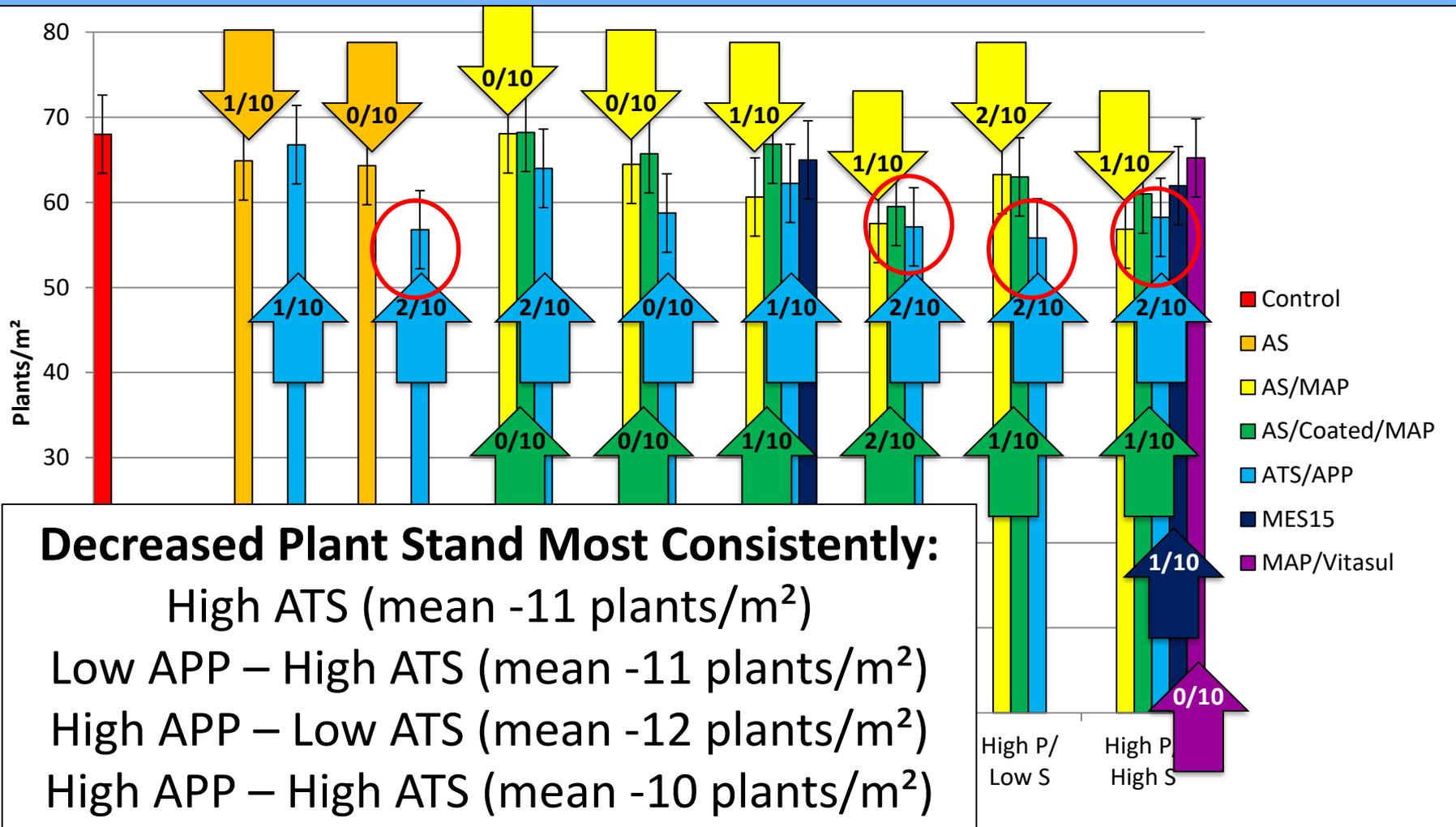
Harvesting Seed



Average Effect of Granular Fertilizers on Plant Stand (17 Site Years)



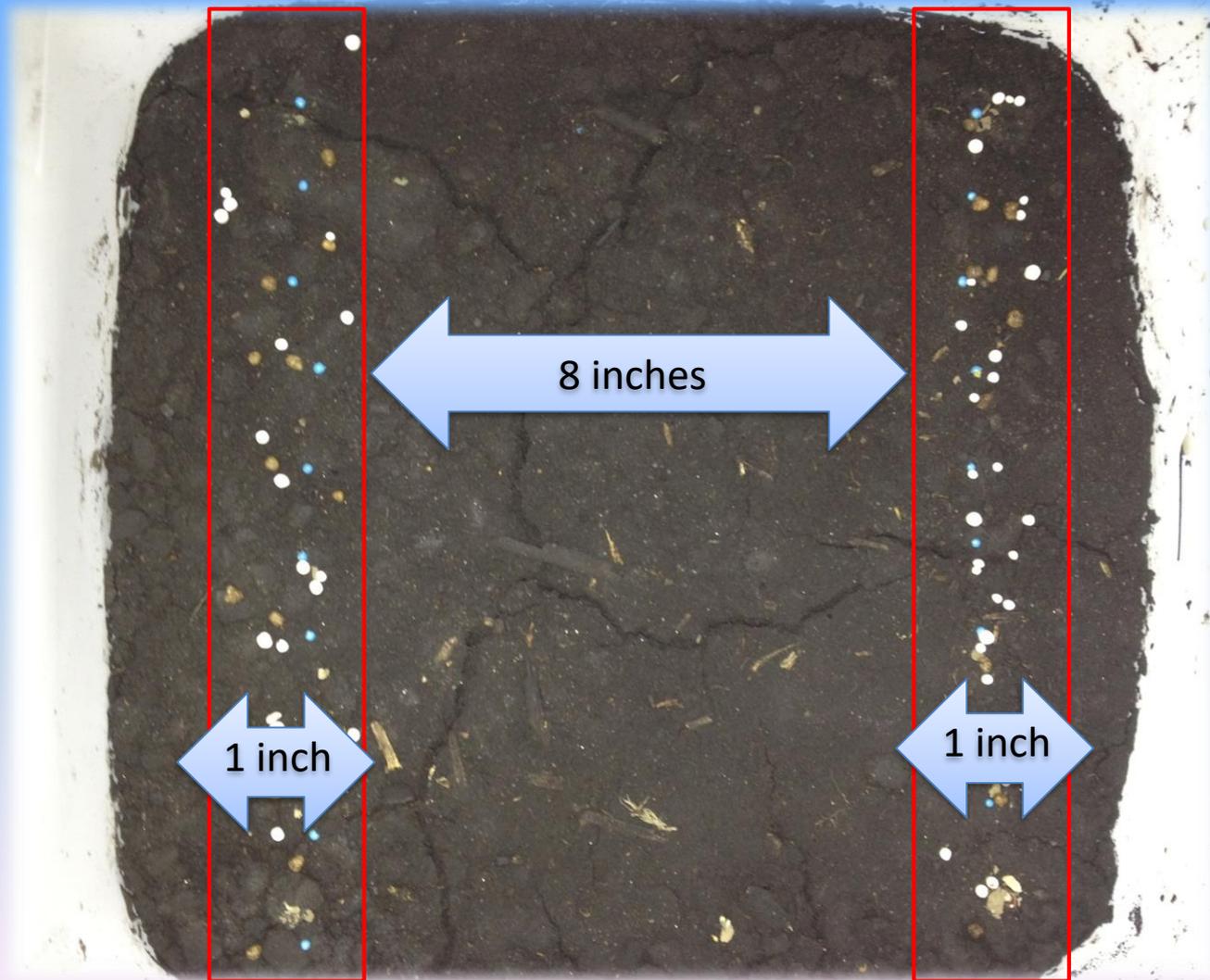
Average Effect of Liquid and Granular Fertilizers on Plant Stand (10 Site Years)



What About Fields with Variable Soil Properties?



Growth Chamber Experiment with Soils from Different Landscape Positions



Effect of MAP on Canola Seedling Emergence in Soil from Brandon

Knoll



Hollow



0

18

35 lb P₂O₅/ac

Effect of AS on Canola Seedling Emergence in Soil from Brandon

Knoll



Hollow

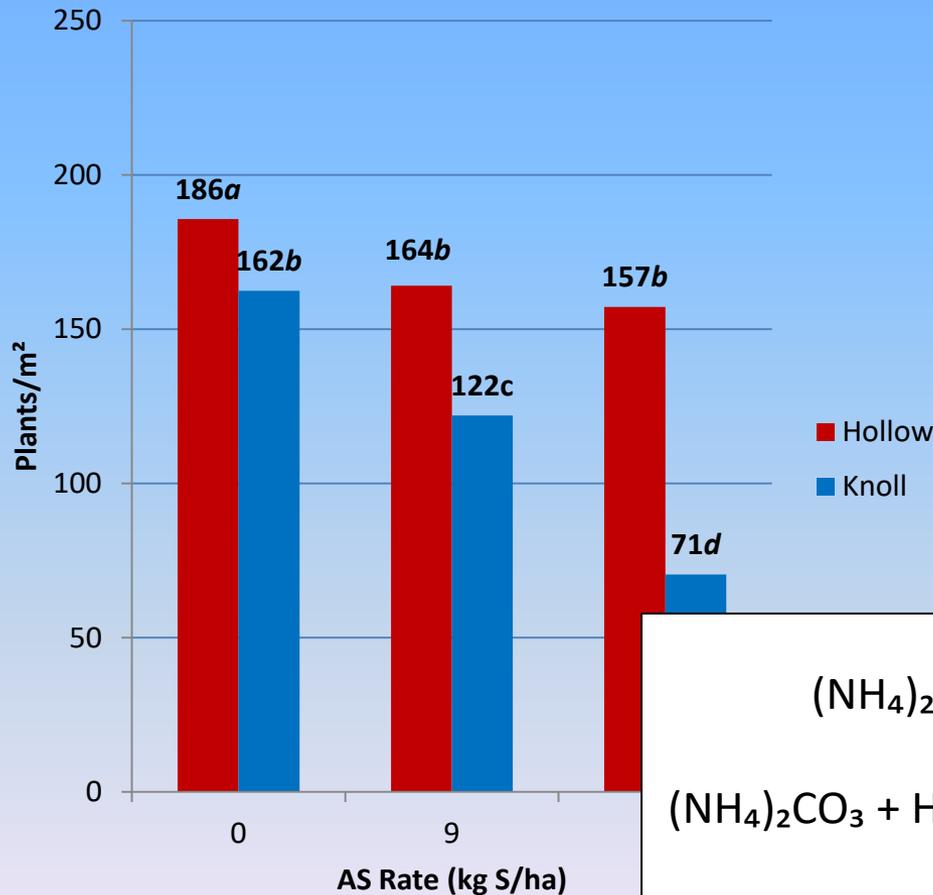


0

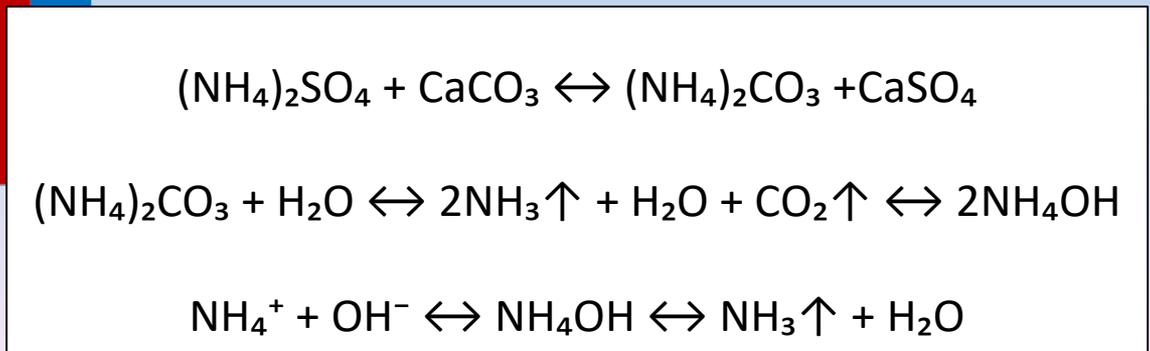
8

16 lb S/ac

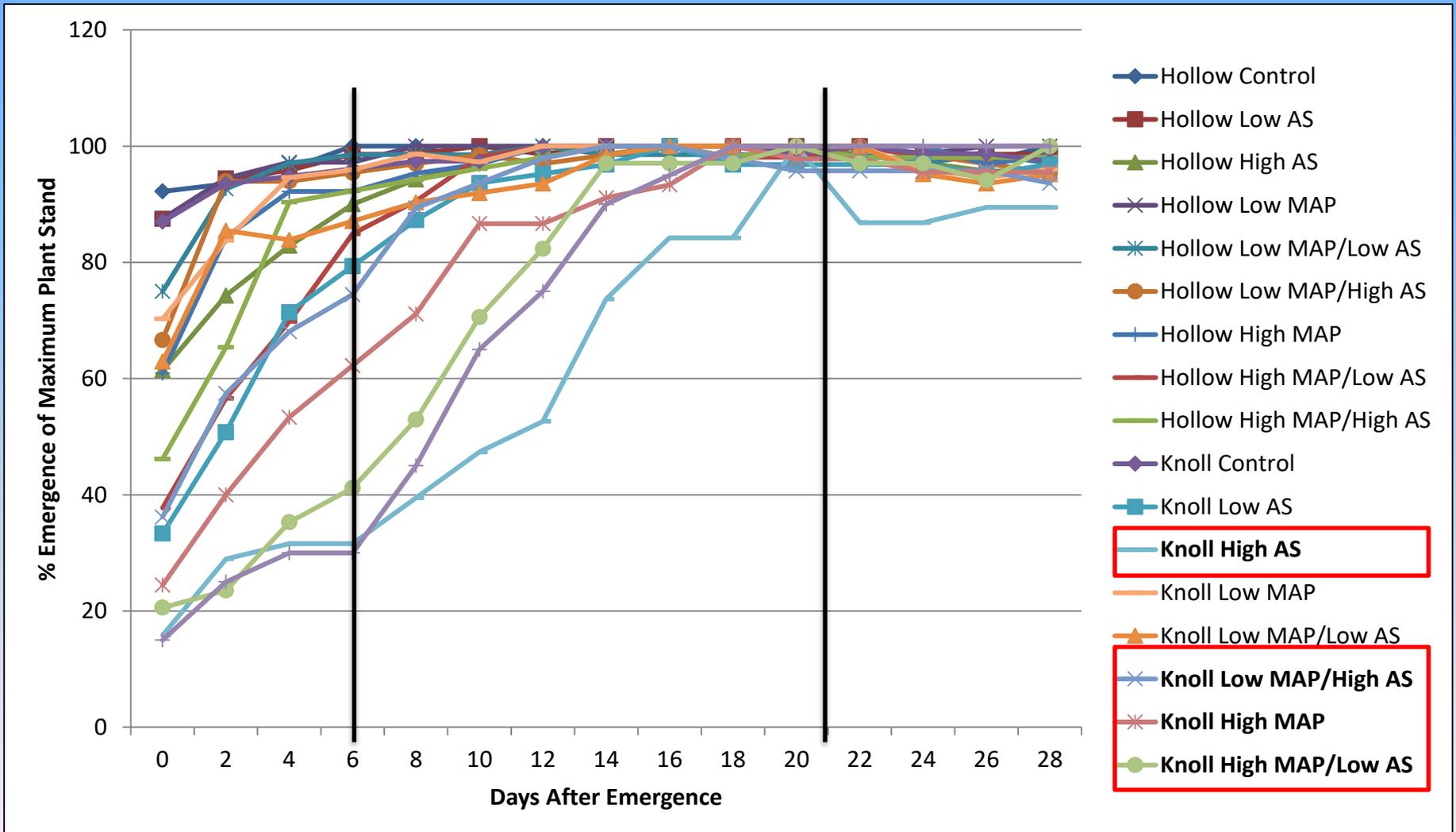
Landscape Position – AS Rate Interaction in Soils From Brandon



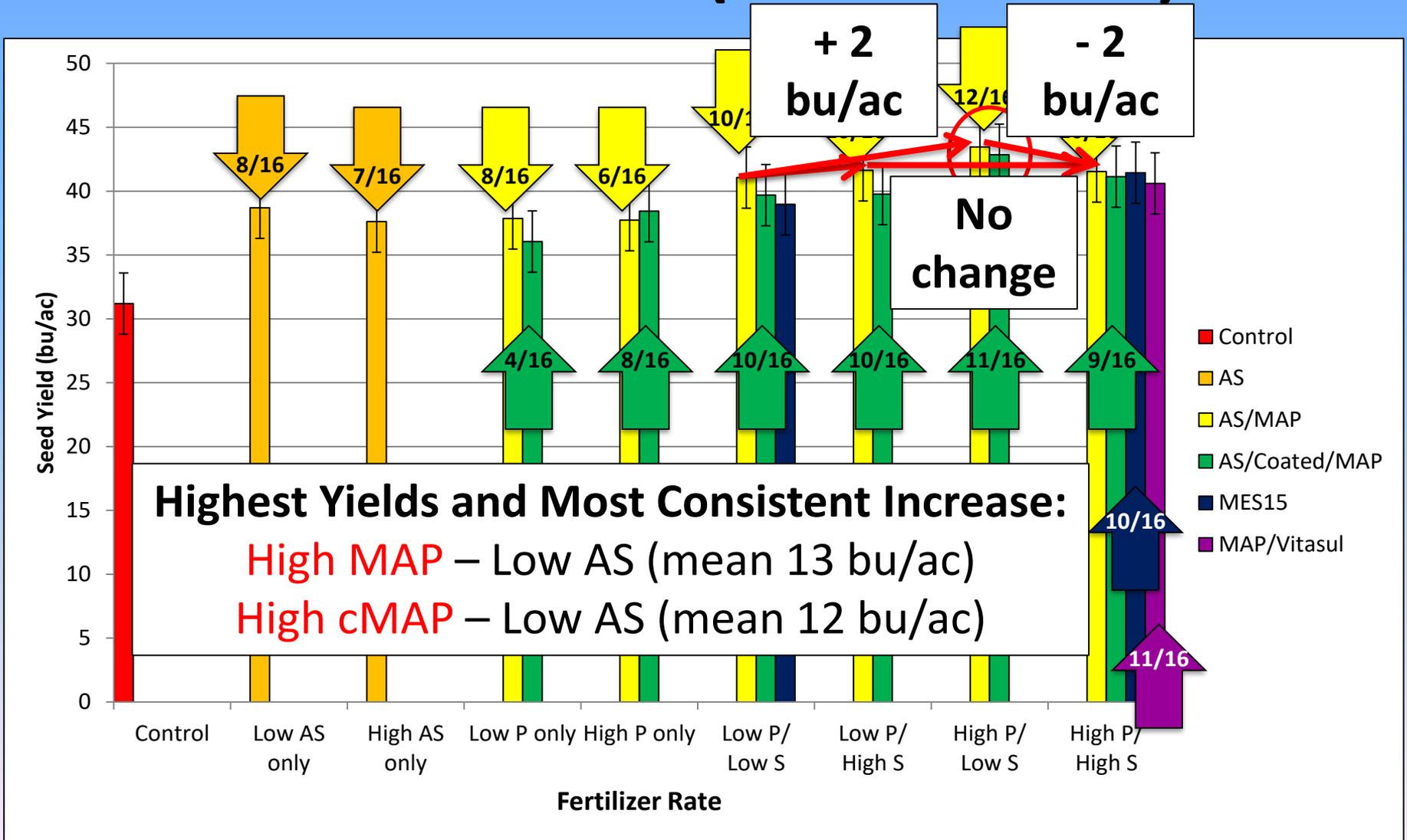
Soil Property	Hollow	Knoll
pH	7.7	7.9
CEC	26.3 meq	28.2 meq
OM	6.0%	1.8%
Texture	Sandy Loam	Loam
Carbonates	0.5%	21%



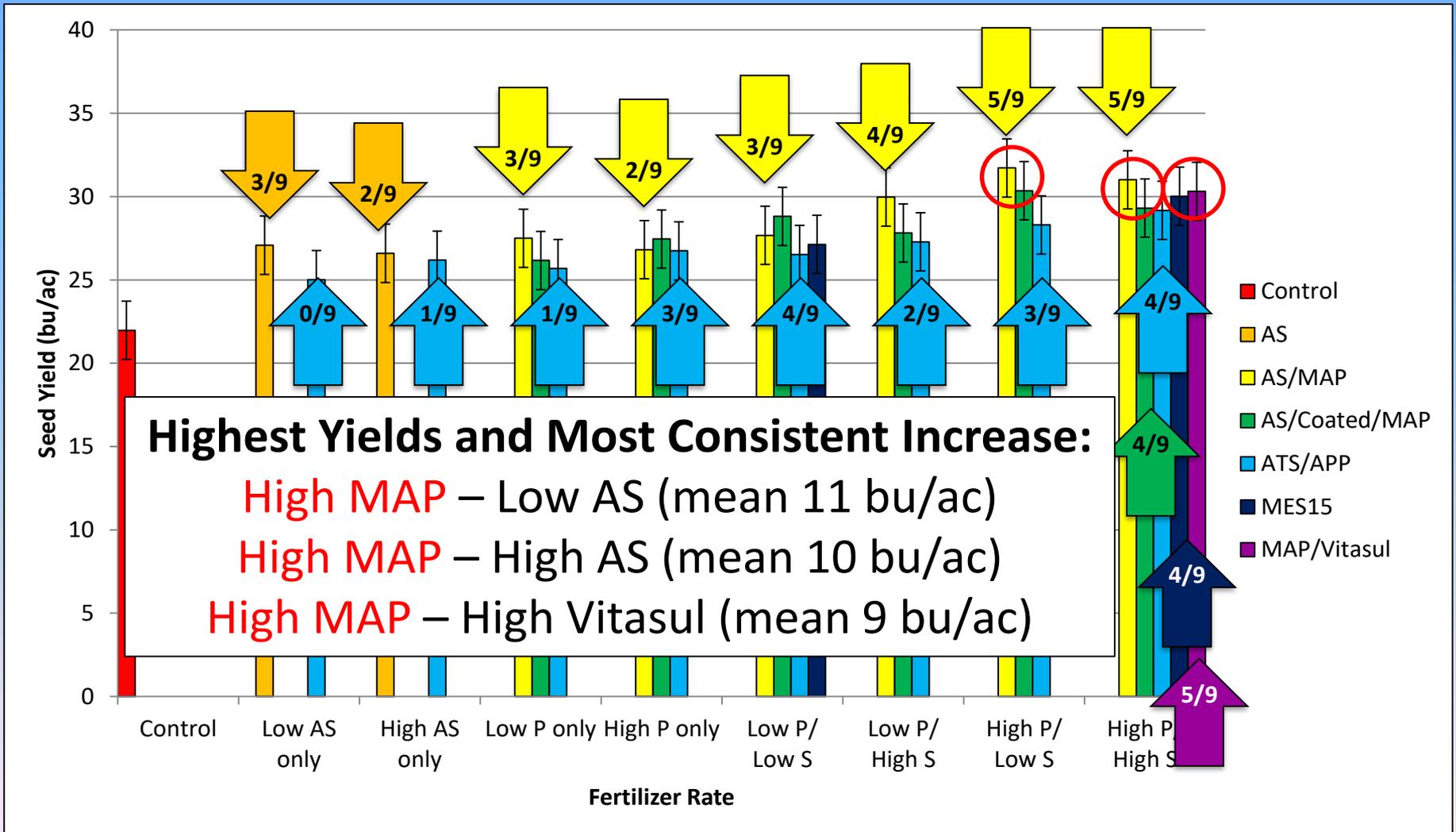
4-way Interaction: MAP Rate, AS rate, Landscape Position and Days After Emergence in Soil from Brandon



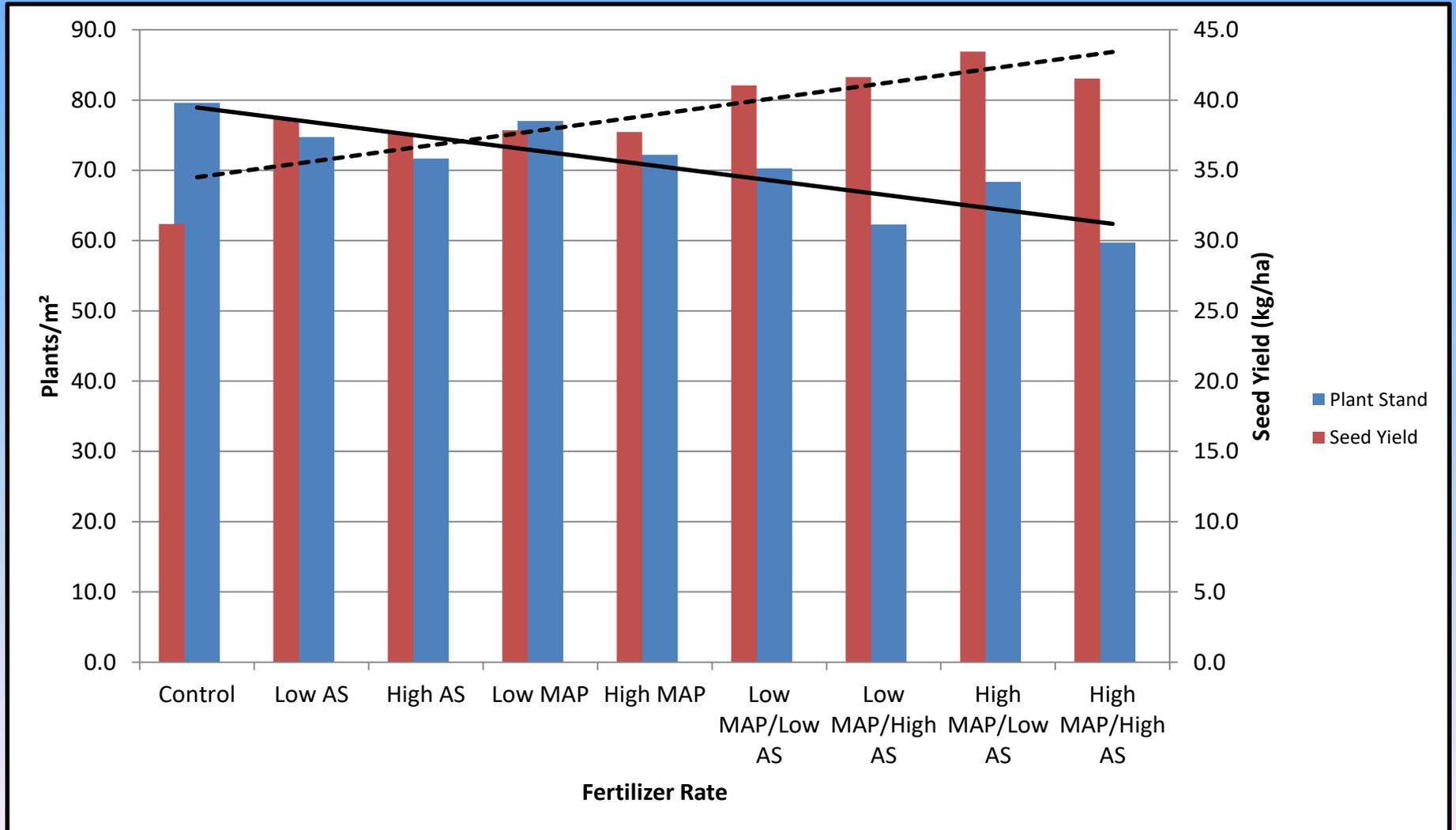
Average Effect of Granular Fertilizers on Seed Yield (16 Site Years)



Average Effect of Granular and Liquid Fertilizers on Seed Yield (9 Sites Years)



Plant Stand and Seed Yield Relationship Affected by Seed-Placed MAP and AS



In Summary – Rate and Source Effects on Canola Emergence

- **Canola emergence was reduced and delayed by conventional sources of seed-placed P and S fertilizers due to salt and ammonia toxicity**
- **AS has a high salt index and risk of ammonia toxicity, especially on calcareous soils; therefore, AS has a greater potential to reduced plant stands than P fertilizers**
- **Polymer coating was effective in reducing salt toxicity of MAP**
- **Liquid APP/ATS may be more toxic than conventional granular blends perhaps because the delivery increases the proximity of the liquid band with the seed**
- **MES15 and Vitasul may be less toxic than equivalent rates of MAP/AS because the elemental S requires time to oxidize and therefore has a low salt index**

In Summary – Rate and Source Effects on Canola Yield

- **The relationship between plant stand and yield is plastic and reaching yield potential depends on balancing optimum plant stand with adequate plant available P and S**
- **Increasing rates of conventional sources of P and S above the recommended rates can cause significant seedling damage which may reduce the capacity to reach yield potential**
- **AS applied at high rates can decrease yield compared to low rates even at a S responsive site because of a severe reduction in plant stand**
- **Seed-placed MES15 and Vitasul contain elemental forms of S, which may not be as effective as seed-placed AS in the year of application on S-responsive soils**

In Summary

- **Highly available sources of P and S increase the risk and severity of seedling toxicity, but they also increase the frequency and size of yield response**
- **If limited by single shoot, low SBU seeding equipment, reserve the limited tolerance of canola for seed-row fertilizer for P. Unlike P, S is mobile in the soil and could be placed away from the seed**
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