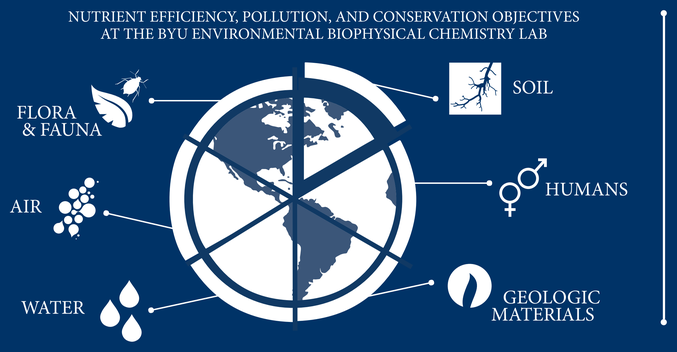

Organic Acid Binding of Phosphorus Enhances Early Season Maize Growth

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STUDY OBJECTIVES

- INCREASE P USE EFFICIENCY
- IMPROVE AGROECONOMICS
- DECREASE ANTHROPOGENIC POLLUTANTS
- CONSERVE RAW PHOSPHORUS

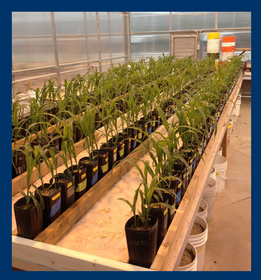
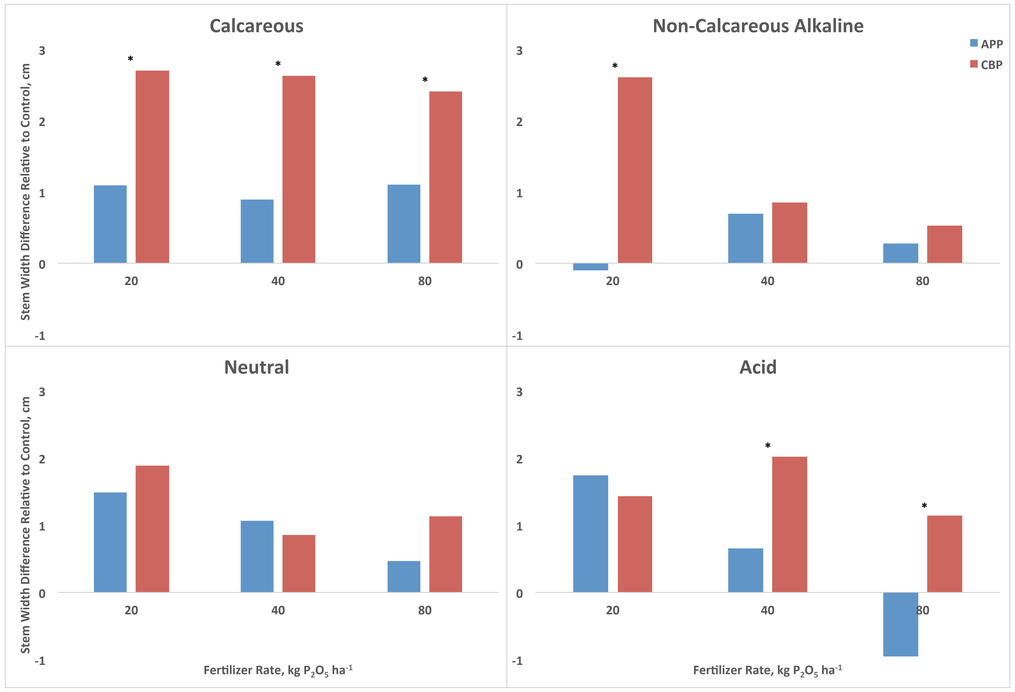


Figure 1. Maize soil pH study.

ABSTRACT

Phosphorus (P) fertilizer is essential for crop production, but reductions are warranted to conserve resources and minimize environmental impacts. Several lab, glasshouse, growth chamber, and field studies have been performed over the past six years with a new P fertilizer (Carbond P; CBP; Land View Fertilizer, Rupert, ID, USA) mostly in calcareous, low OM soil. Studies comparing CBP to ammonium polyphosphate (APP) and monoammonium phosphate (MAP) applied to soil show season-long increases in P solubility for CBP in many soils. Glasshouse and field studies with maize, dry beans, potato, sugarbeet, alfalfa, wheat, and bluegrass resulted in enhanced yields and/or crop quality in 23 of the 45 studies. Three glasshouse studies were done with maize grown in a sandy loam soil modified to be either calcareous, alkaline non-calcareous, acid, and neutral with six rates of P using CBP or APP. A soil by fertilizer source interaction was observed with most measured parameters. Phosphorus resulted in increased biomass, plant height, and total P uptake, especially for CBP at the lowest two rates (10 and 20 kg ha-1). Biomass was similar for CBP and APP at the highest rates. Stem width consistently increased with CBP greater than APP at all rates. Carbond P is an enhanced efficiency fertilizer that often increases yields and crop quality and almost always increases P uptake in plants compared to traditional fertilizers when applied at low rates on calcareous soils with relatively low soil test P.



RESULTS

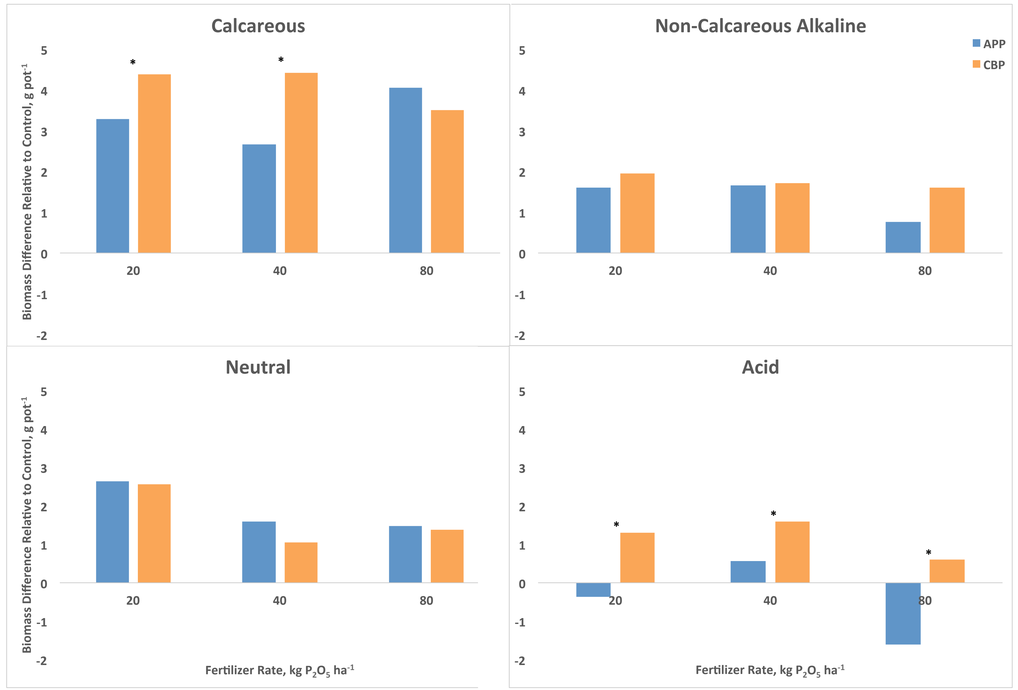
Biomass
- maize fertilized with CBP had significantly greater biomass at 2 lowest rates for both acid and calcareous soils
- high rate resulted in higher significant biomass for the acid soil only
- same trend evident for non-calcareous alkaline soil

Stem Width
- maize fertilized with CBP had significantly greater stem width at the 2 highest rates for both the acid and calcareous soils
- low rate also in resulted higher significant stem width for the alkaline and calcareous soils only

Heights
- maize fertilized with CBP resulted in significantly taller plants for acid, neutral, and calcareous soils at low rate
- highest 2 rates also resulted in significantly taller plants but only for the acid soil

METHODS

- glasshouse in Provo, UT, USA
- 3 maize (DeKalb DKC30-20 hybrid) seeds planted per pot and thinned to one plant, pot size 30.5 cm x 10.2 cm
- ammonium polyphosphate (APP; 10-34-0) and Carbond P (CBP; 7-24-0)applied 5 cm to the side and 5 cm below seed
- 7 rates (0, 11, 22, 44, and 88 kg P2O5 ha-1)
- 4 soils—all derived from a non-calcareous, alkaline sandy loam adjusted as follows:
  - *4.5 pH – adjusted by leaching with water at target pH
  - *6.8 pH – adjusted by leaching with water at target pH
  - *8 pH – alkaline soil
  - *8.2 pH – addition of CaCO3 on a 12% mass basis
- irrigated with water adjusted at same pH as soil to maintain target pH
- shoots and roots harvested after 42 d; analyzed for biomass and tissue P
- measured heights and stem widths.
- stats run by ANOVA on SAS, means separation



CONCLUSION

Increases in early season glasshouse grown maize biomass and stem width were observed consistently at the lowest of rates of fertilizer applied across acid, alkaline, and calcareous soils. The effect was less evident at higher rates. Previous studies also showed P concentration, uptake, and efficiency increased at the lower rates.

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