Response of Black Bean, Lentil and Chick Pea to Starter Nitrogen and Phosphorus Fertilizers

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Introduction

- Seed-row placed fertilizers for pulses typically include phosphorus (P), but sometimes nitrogen (N) and sulfur (S) as well, in the form of blends (e.g. MAP + urea or ammonium sulfate) as well as combination NPS fertilizer products (e.g. ammonium phosphate sulfates).
- Knowledge of tolerance and response of pulse crops to seed-row placed multi-element fertilizers is of interest when meeting this years fertilizer nutrient requirements as well as when attempting to maintain fertility over several cycles of a rotation.

Study Objectives

- To evaluate the effect that seed-row placed N, P and S containing fertilizers applied at different N rates have on emergence and growth of pulse crops. This poster covers results on emergence of black bean, lentil and chick pea.

Materials and Methods

- **Study Soil:** Brown Chernozem belonging to Haverhill Soil Association: loam, pH 6.7, O.M. 3%, NO3-N: 8 ppm, MK-P: 11 ppm. SO4-S: 10 ppm.
- **Study Design:** Completely randomized block design, replicated four times. Trays measuring 73.0 cm length x 16.0 cm width x 16.0 cm deep, split into three separate compartments. Seed bed utilization ~10%.
- **Fertilizer Treatments: Applied at rates of:** 0, 10, 20 and 30 kg N ha–1:
  - Monoammonium Phosphate (MAP) (11-52-0-0)
  - 50:50 Blend of MAP (11-52-0-0) + Urea (46-0-0-0) = 28-26-0 blend analysis
  - 50:50 Blend of MAP (11-52-0-0) + Ammonium Sulfate (21-0-0-24) = 16-26-0-12 blend analysis
  - Microessentials-15 (MES 15) (13-33-0-15)
  - Ammonium Phosphate Sulfate (APS1) (12-45-0-5)
  - Ammonium Phosphate Sulfate (APS2) (16-20-0-13)
  - Ammonium Phosphate Sulfate (APS3) (16-20-0-12) with 15% organic matter
  - **Control (No N, P or S fertilizer)**
- **Seeding:** Fertilizer applied in seed-row (Fig. 1a); followed by seeding (10 seeds compartment–1) of black bean (CDC Blackstrap), small red lentil (CDC Maxim) and desi chick pea (CDC Consul) (Fig. 1b). Compartments thinned to 3 plants each after final emergence count, 14 days after seeding. Plants harvested 30 days after seeding (Fig. 1c).
- **Emergence Counts:** Plant emergence counts conducted at 5, 10 and 14 days after seeding.

Results and Discussion

- Black bean could tolerate 10 to 20 kg N ha–1 of most products without significant reduction in emergence (Table 1). Products or blends with lower N analysis and higher analysis of P and S (e.g. 11-52-0, 12-45-0-5) required greater amounts of product to meet the target N rate and therefore had lower safe rate based on N application. Of the three pulse crops, black bean biomass showed the greatest response to fertilization, with 30 day biomass highest in the 30 kg N ha–1 treatments (Table 4).
- Compared to black bean, lentil (Table 2) was less tolerant to seed-row N, P, S fertilizers added at rates above 10 kg N ha–1. Rates of MAP (11-52-0) above 10 kg N ha–1 significantly reduced lentil emergence. MAP+Urea blend produced less injury at a given N rate because of higher N analysis and therefore less total product. MES-15 produced less injury than MAP+AS. APS products also had less injury than MAP+AS. Biomass response to starter placed fertilizer was less in lentil compared to black bean (Table 4).
- Desi chick pea showed similar or slightly less tolerance to the seed-row placed fertilizers (Table 3) compared to lentil when added at equivalent N rate. A similar pattern to lentil was observed for chickpea among the fertilizer forms. The chickpea were quite sensitive to higher rate (20 kg N ha–1 and above). Interestingly, the MAP+AS did not seem to cause as much injury to chick pea as it did to the red lentil. Chickpea had the lowest biomass response to starter fertilizer (Table 4), with few significant differences among rate or fertilizer type. APS-1 produced the greatest 30 day biomass.

Conclusions

- Of the three pulse crops compared, lentil and desi chick pea emergence were quite sensitive to seed-row placed N at rates above 10 kg N ha–1.
- Combination products appeared to produce less injury than product blends.
- Black bean was most responsive in early season biomass growth to fertilization with starter N, P and S.

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