Evaluation of Pop-up/Starter and Foliar Fertilizer Application on Dry bean Production

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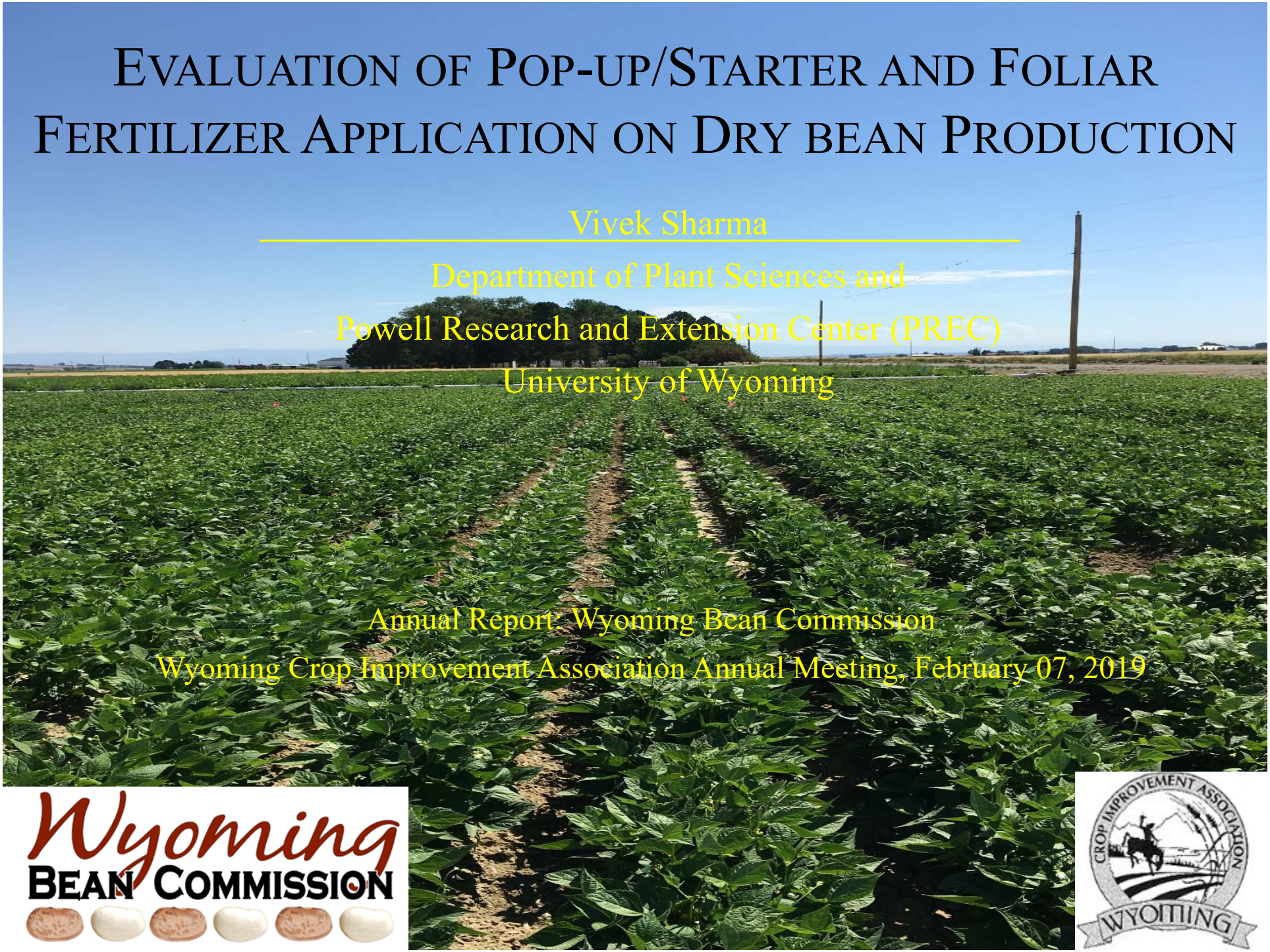

Annual Report: Wyoming Bean Commission

Wyoming Crop Improvement Association Annual Meeting, February 07, 2019

Wyoming Bean Commission

Crop Improvement Association Wyoming

Objective

- To evaluate the effect of start-up fertilizer on plant population.
- To evaluate the effect of different rates of pop-up fertilizer application on dry bean yield.
- Effect of fertilizer pre-fertilizer broadcasting vs fertilizer banding.

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PREC Soil Test

Parameter	Available Nutrient Content
Soil Nitrate-N	7.4 ppm
Soil Phosphorus (P)	9 ppm
Potassium (K)	231 ppm
Zinc	0.7 ppm

Soil test N	Fertilizer N[b]
ppm NO_3-N[a]	pounds/acre
0	90
5	68
10	45
15	23
20	0

≈ 50-60 lb./ac

[a]1 ppm (part per million) equals 1 mg/kg

[b]To adjust N application rate for a different yield goal, add or subtract 3.3 pounds for each cwt that the desired yield goal differs from 30 cwt (3,000 pounds/acre). Fertilizer N application rate should not exceed 120 pounds N/acre.

Soil P[a]	Soil Texture		
	Coarse	Medium	Fine or High Lime[b]
ppm	pounds P_2O_5/acre		
0-6	45	65	90
6-14	0	30	55
14-22	0	0	20
>22	0	0	0

≈ 25-30 lb./ac

[a]P test is by $NaHCO_3$ extraction (Olsen method).

[b]High-lime soils are those with a lime equivalent greater than 2 percent.

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Wkdwp hqw

- Three Pre-plant fertilizer rate (broadcasted) at 40 lbs./ac, 60 lbs./ac and 90 lbs./ac, replicated three times were used in this study.

- In addition 2.5 g/ac, 5 g/ac and 7 g/ac replicated three were used as a pop-up fertilizer at the time of planting along with control plots.

- Pop-up Fertilizer: pht 4-16-16
  - 4% Total Nitrogen (Ammoniacal Nitrogen, 0.6% Urea Nitrogen)
  - 16% Phosphate (P_2O_5)
  - 16% Soluble Potash (K_2O)
  - Weight per Gallon: 11.3 lbs. per gallon @ 68^{o}F.

- Four N banding application rates of 0, 30, 40, and 60 lb/ac was also tested and compared with pre-broadcasting application of N.

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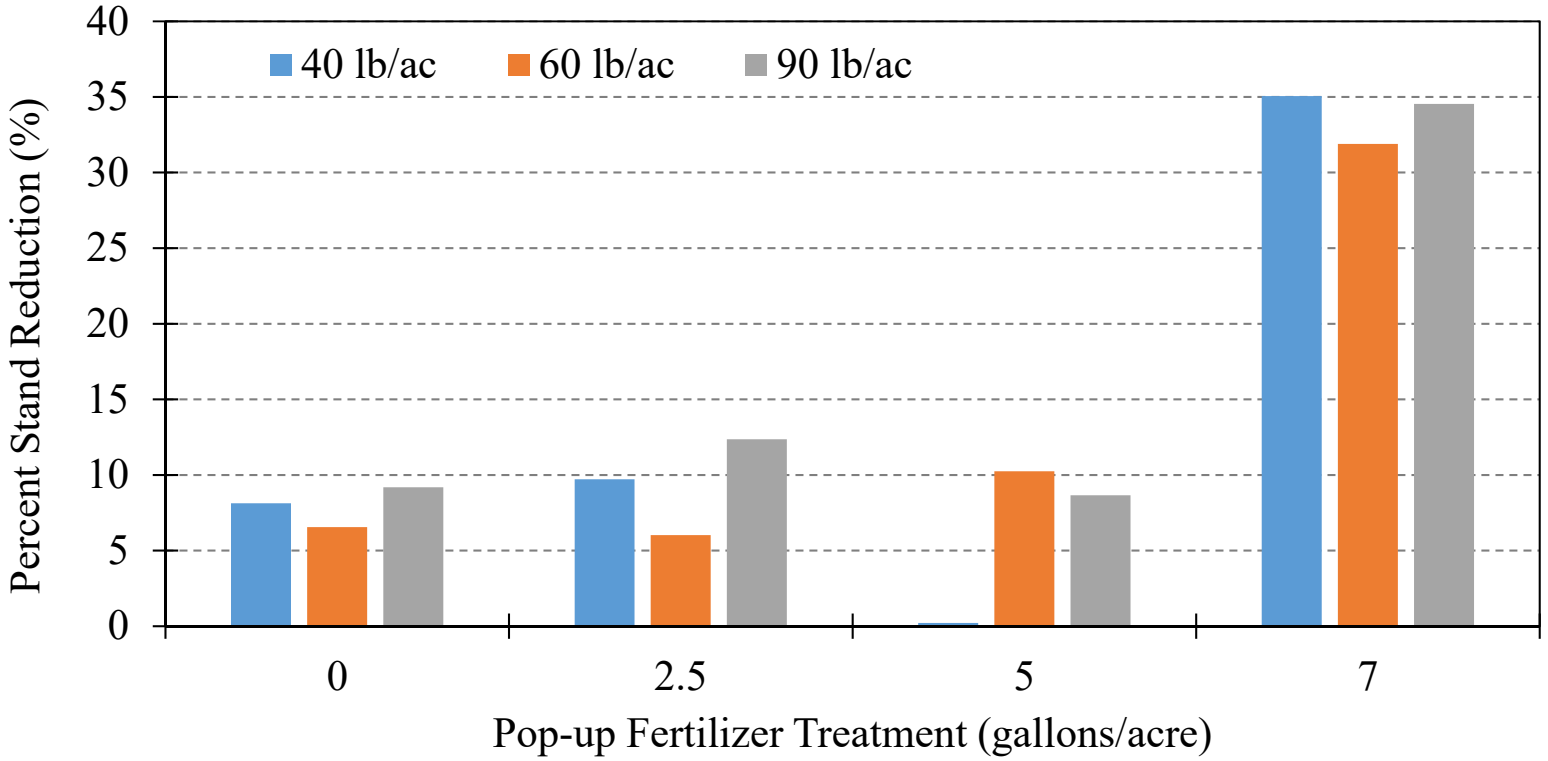
In-furrow Kincaid Voltra planter Planter
Planting: June 04, 2018 @ 75,000 plants per acre.
Variety: Wind Breaker
Soil type: Garland Loam


-In-furrow Planter malfunction

Effect of Start-up Fertilizer on Stand Count - 2018



- Stand counts decreased significantly at the higher start-up fertilizer application. On average, stand was reduced by approximately 30% at 7 gallon/acre of start-up application of 4-16-16.

- Our results are consistent with 2017 year.

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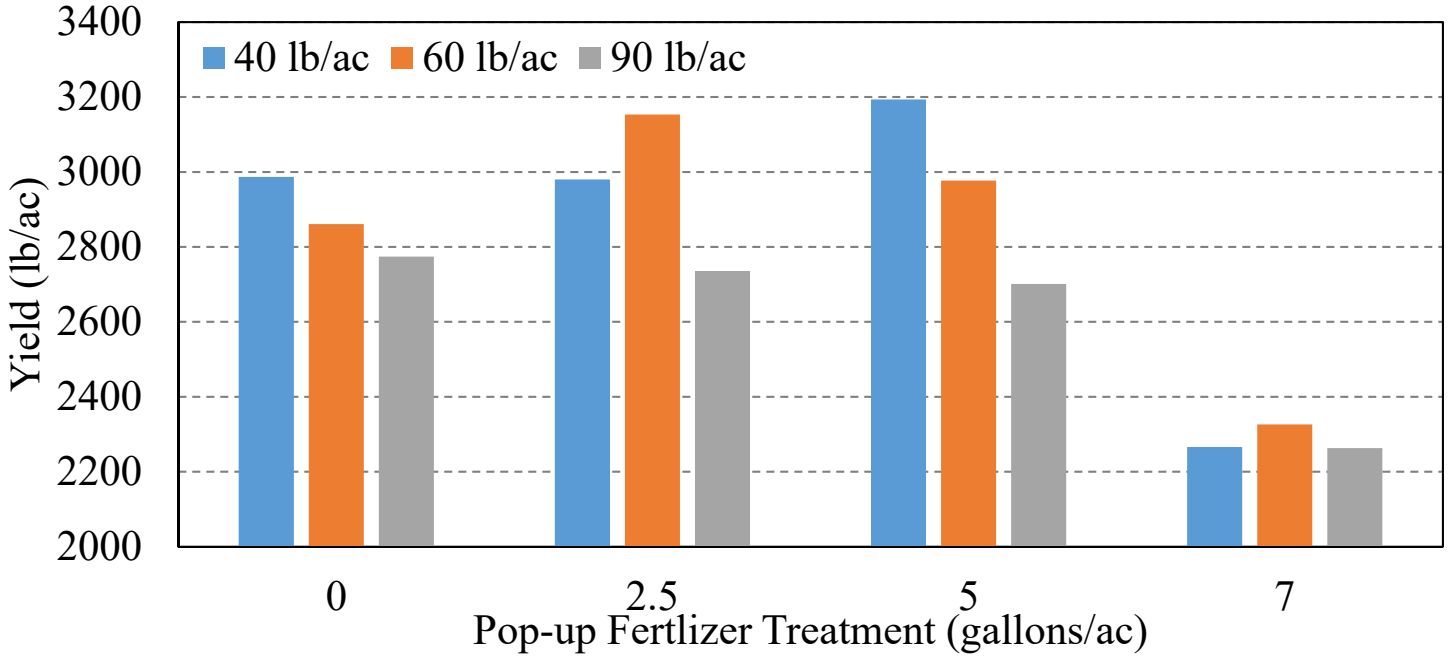
Effect of Start-up Fertilizer on Stand Count - 2018



- Dry bean yield reduced significantly as we increased the pop-up fertilizer application above 5 gallons/acre.
- No significant difference in yield was observed for 0, 2.5, and 5 gallons'/acre application of 4-16-16 pop-up fertilizer on dry beans.
- Average dry bean yield of 2874, 2956, and 2956 was observed at 0, 2.5, and 5 gallons/ac of pop-up fertilizer application compared to 2285 lbs./ac at 7 gallons/acre.

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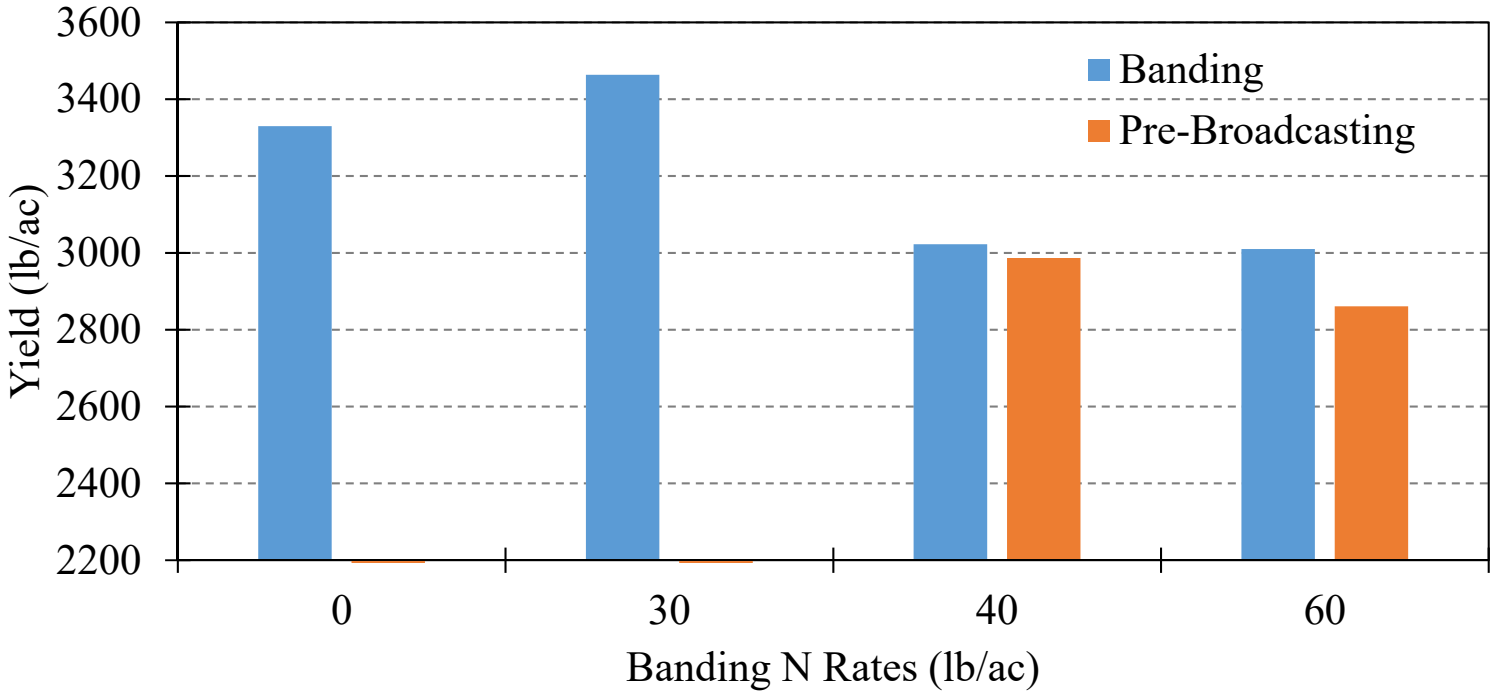
Pre-broadcasting N effect



- No significant difference in dry bean yield was observed when we increased the pre-broadcasting fertilizer application from 40 to 90 lb./ac. With dry wean yield of 2987, 2861, and 2773 lbs./ac, respectively.

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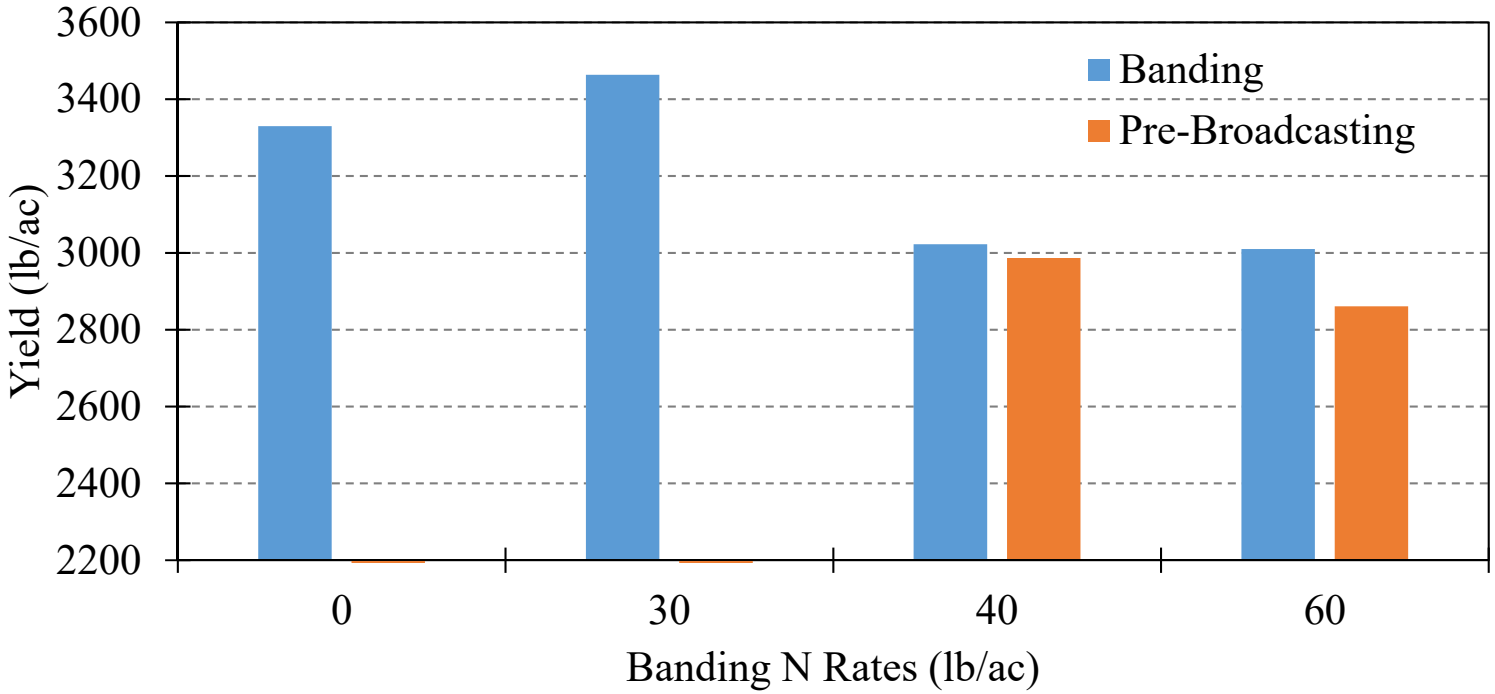
Banding effect



- Within banding treatment, no significant difference in dry bean yield was observed among four banding application rates.

- There was a decreasing trend in yield with increasing level of N. On average, maximum yield of 3463 lbs./ac was observed for 30 lbs./ac of N banding application and minimum yield of 3010 lbs./ac was observed for 60 lbs./ac N banding application.

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Conclusion

- Overall, our study indicated that pop-up fertilizer can improves stand and yield up to certain point (5 gallons/acre of 4-16-16 for dry bean).

- Increasing the pop-up application above 5 gallons per acre reduced stand and yield substantially. This is due to the fact that excessive application on the seed can induce salt burns to the seed, especially in dry and limited moisture conditions.

- Our study also indicated no difference in dry bean yield with excessive application of nitrogen fertilizer for both pre-broadcasting and banding application.

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Conclusion

- Excessive application of nitrogen fertilizer, inhibits nodule formation, stimulates heavy vine growth, delays maturity, provides conditions favorable to insect activity, and enhances white mold and bacterial diseases.

- Comparison between pre-broadcasting vs banding application of nitrogen indicated banding application is more profitable, with more yield at lower nitrogen applications.

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Acknowledgement

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