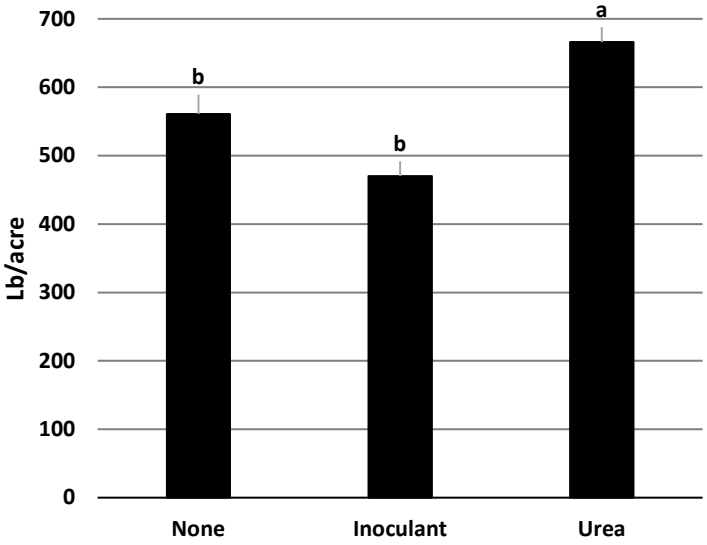
Profitability Impact of Urea Application or Inoculant on Dry Bean Yield at Wishek, ND

Agustin San Pedro Sanchez and Kristin Simons

Dry beans are a significant crop in North Dakota, contributing to both the state's agricultural economy and food production. As one of the top producers of dry beans in the United States, North Dakota's farmers face constant challenges to improve yield and profitability while managing production costs. Fertilization, particularly nitrogen application, plays a crucial role in optimizing crop growth, but the appropriate nitrogen rate for dry beans remains a subject of ongoing research and is producer dependent (Franzen, 2023). Additionally, the use of rhizobium inoculants has been shown to help dry beans fix nitrogen from the atmosphere, potentially reducing the need for synthetic fertilizers.

A demonstration was conducted in Wishek, North Dakota, where the effects of supplemental N and inoculation on dry bean yield were shown using ND Palomino. The demonstration aimed to show crop performance differences under each treatment and their effect on profitability. Three treatments were included in the demonstration: no inoculant or supplemental N (control), inoculant only, and supplemental N (urea at 73 lbs/acre). The demonstration was planted on June 5, 2024, in strips and each treatment was present twice. Urea was hand applied to the treatment area just prior to planting. Seed was inoculated with *Rhizobium leguminosarum biovar phaseoli* the day of planting. Nineteen feet of each treatment strip were hand harvested when the plants were physiologically mature at the end of September to eliminate seed loss due to shattering. After drying, seed was threshed and weighed.

The results from the demonstration trial showed the urea application treatment resulted in the highest yield of 666 lbs/acre (Figure 1) and was significantly higher than either the control or the inoculated yields. No significant differences were observed between the control and inoculated treatment yields. Profitability changes are determined by the urea price and grain market price.



Dry bean yield response to fertilization. Bars with different letters are statistically different at alpha = 0.10.

Dry beans grown under no-till management near Wishek, ND.

A simplified look at change in profitability was calculated based on treatment cost and yield differences. Urea was purchased at $510/ton and inoculant was $14/75 oz bag. Harvested seed was sold at $31/cwt. Based on these input costs and market price, the application of supplemental N would have increased dry bean profitability by $10 per acre (Table 1).

Table 1. Profitability impact of urea application or inoculant on dry bean.

Treatment	Treatment Cost	Gross Income Change	Treatment Profitability Change
	$/a	$/a	$/a
Control	$ -	$ -	$ -
Inoculant: Rhizobium leguminosarum biovar phaseoli	$ 2.00	$ (28.10)	$ (30.10)
Supplemental N: 73 lb/a urea	$ 22.30	$ 32.66	$ 10.36

In conclusion, the supplemental N application treatment proved to offer the highest return on investment during the 2024 environmental conditions at Wishek, ND. For this demonstration, only a limited amount of the trial was harvested. Thus, testing again at Wishek is needed to make recommendations on inoculants and supplemental N. Future studies could explore the long-term effects of these treatments on soil health, investigate optimal nitrogen rates for dry beans in similar soil conditions, and evaluate the potential benefits of combining urea with rhizobium inoculants to further improve both yield and sustainability.

Franzen, D. W. (2023). *Fertilizing Pinto, Navy and Other Dry Edible Bean (SF720).* NDSU Extension.