

Fresh Market Snap Bean Variety and Nitrogen Rate Study

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Introduction

Recommended nitrogen fertilizer rates in green beans and other legumes are lower than most vegetables. The primary reason legumes require less nitrogen from fertilizer is that they fix atmospheric nitrogen. Furthermore, too much nitrogen can lead to aborted flowers and less pod set. Logistically excessive nitrogen rates cause bean plants to lodge, which prevents mechanical harvesting and increases white mold in pods due to soil contact. In Georgia, most bean variety trials are evaluated at standard rates (80-100 lbs./A) of nitrogen for fresh market beans.

Breeders continue to select for a more upright plant habit that resists lodging in fresh market beans. Is it possible to increase fresh market bean yields in these more upright plant habits by increasing nitrogen rates? Increasing yields will allow growers to produce more beans on less land. This increase in efficiency will allow greater productivity, profitability, and sustainability in the industry.

Objective

The purpose of this study was to evaluate fresh market green bean varieties at various nitrogen fertilizer application rates to determine the effect on mechanically harvested marketable yields.

Materials and Methods:

The trial was conducted during the spring of 2024 at the Southwest Research and Education Center, Plains, Georgia, USA. A preplant application of 500lbs using 10-10-10 was applied across the field to supply 50lbs of N-P-K and minor nutrients; therefore, the lowest fertilizer rate received 50lbs of N (half rate). Two additional side dressings of calcium nitrate were applied at 2 and 4 weeks to provide 100 (full rate), 150 (1.5x rate), and 200 (2x rate) lbs./N per Acre. The experiment was arranged in a split block design. Half the field was planted in ‘Caprice’ and half was seeded in ‘PV857’. Each plot of fertilizer rate contained 4 rows. Fertilizer rates were applied randomly across the field. The crop was directly seeded on 36-inch rows at 80,000 seeds/A using a Monosem™ Vacuum Planter. The plots were 20 ft. long. Data collection included field weight, marketable weight, fertility, and lodging ratings. The beans were harvested using a single row Oxbo™ Pixall. Fertility and lodging ratings were done on a scale of 1-9.

Results:

There were differences in yields between varieties regardless of fertilizer rate (Table 1). ‘PV 857’ yielded higher field and marketable pods (lbs.) than ‘Caprice’. There was no statistical difference among different nitrogen rates for field and marketable weight. Fertility ratings (1 to 9

scale with 1= yellow or 9= extremely dark green plant color) expressed significant differences for different rates of nitrogen. The nitrogen rates, 200 (7.5) and 150 (7.3) lbs, resulted in greener plants compared to lower nitrogen rates, i.e., 100 (6.1) and 50 (4.1). The lodging rating did not show any differences for varieties, nitrogen rate, and their interaction.

Variety x nitrogen rate interaction was statistically significant, where the varieties, Caprice and PV 857, had significant fertility rating differences for different rates of nitrogen. The nitrogen rate, 50 lbs., also had a significant fertility rating difference between both varieties (Table 2), with Caprice being more susceptible to low nitrogen, whereas PV 857 was less affected.

Table 1: Field weight, marketable weight, fertility, and lodging ratings for fresh market snap bean variety and fertilizer rate study trial.

Treatment	Field Weight (lbs.)	Marketable Weight (lbs.)	Fertility Rating (1-9)ⁱ	Lodging Rating (1-9)ⁱⁱ
Variety				
Caprice	10.1 b ⁱⁱⁱ	8.4 b	6.1 a	4.9 a
PV 857	12.1 a	10.5 a	6.4 a	5.5 a
Nitrogen Rate				
50 lbs.	10.9 a	9.3 a	4.1 c	6.1 a
100 lbs.	11.7 a	9.9 a	6.1 b	5.8 a
150 lbs.	10.8 a	9.3 a	7.3 a	4.8 a
200 lbs.	11.1 a	9.3 a	7.5 a	4.1 a
Variety (V) x Nitrogen Rate (N)				
Caprice, 50 lbs.	10.1 a	8.5 a	2.8 d	7.0 a
Caprice, 100 lbs.	11.1 a	9.2 a	6.0 bc	5.0 a
Caprice, 150 lbs.	9.8 a	8.1 a	7.8 a	3.8 a
Caprice, 200 lbs.	9.5 a	8.0 a	7.8 a	3.8 a
PV 857, 50 lbs.	11.6 a	10.2 a	5.5 c	5.3 a
PV 857, 100 lbs.	12.4 a	10.6 a	6.3 bc	6.5 a
PV 857, 150 lbs.	11.7 a	10.4 a	6.8 abc	5.8 a
PV 857, 200 lbs.	12.7 a	10.7 a	7.3 ab	4.5 a
Significance				
Variety (V)	0.0021*	0.0008*	0.2448	0.3349
Nitrogen Rate(N)	0.6307	0.8010	<.0001*	0.1320
V x N	0.6389	0.7957	0.0019*	0.1921

ⁱFertility rating: 1= Yellow, 9= Super green

ⁱⁱLodging rating: 1 = laid down, 9=very upright

ⁱⁱⁱMeans followed by the same letter are not significantly different based on the least significant difference test at 95%.

Table 2: Variety x nitrogen rate interaction for fertility rating in fresh market snap bean variety and fertilizer rate study trial.

Nitrogen Rate	Variety		P Value
	Caprice	PV 857	
50 lbs.	2.8 bB ⁱ	5.5 aA	0.0004*
100 lbs.	6.0 aA	6.3 aA	0.6948
150 lbs.	7.8 aA	6.8 aA	0.1282
200 lbs.	7.8 aA	7.3 aA	0.4356
P Value	<.0001*	0.0670*	

ⁱMeans followed by the same letter are not significantly different based on the least significant difference test at 95%.