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Effect of Plant Population and Row Spacing on Soybean Yield

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Abstract
Growing soybeans in narrow rows compared to 30 in. rows has been shown to improve yields in certain studies. Reasons given for this include increased sunlight interception by the crop canopy and increased competition of the soybeans against weed populations. Other studies conducted have resulted in yields where 30 in. rows have been equal to or greater than narrow rows. The first objective in this two-year study was to assess and compare the differences in 30 in. and 10 in. soybean rows for northeast Iowa.

Due to the rising costs of soybean seed, seeding rates are being scrutinized by farmers, agronomists, and agribusinesses that work with them. The goal is to have enough plants per acre to attain 100 percent of the yield potential, while still making it economically viable. Research conducted by Palle Pedersen, former Iowa State University extension soybean specialist from 2003 to 2006, supports that a final plant stand of about 100,000 plants/acre is enough to "maximize yield and economic return." The second objective in the study was to compare and assess several planting populations.

Disciplines
Agricultural Science | Agriculture

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Introduction

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Materials and Methods

The study was conducted in 2012 and 2013. The experimental design was a randomized complete block with four replications in 2012 and three replications in 2013. The experiments for both years were conducted at the ISU Northeast Research Farm, Nashua, Iowa, on Clyde-Kenyon-Floyd soil types. Soybeans were planted following previous year corn with either a Kinze 3000, 6-row planter or a John Deere 750 drill. Plots were harvested with a John Deere 4420 combine with Shivvers grain moisture meter and Avery-WeighTronix weigh scale indicator. Integrated pest management (IPM) practices were followed for both years, which resulted in the need for soybean aphids to be treated in 2013. Stand counts were taken prior to soybean harvest to determine final population. Grain yields were adjusted to 13 percent moisture for both years as well.

In 2012, Asgrow brand 24-31RR was planted May 19 and harvested September 27. The main plot was 10-in. and 30-in. row spacing with 4 subplot populations of 125,000, 150,000, 175,000, and 200,000 seeds/acre.

In 2013, Pioneer 92Y51RR was planted June 17, due to excessive spring rainfall, and was harvested October 24. The main plot was 10-in. and 30-in. row spacing with 3 subplot populations of 120,000, 160,000, and 200,000 seeds/acre.

Results and Discussion

2012 and 2013 were equally challenging growing seasons. In 2012, soybeans were planted in the recommended planting window for northeast Iowa, followed by below normal June and July rainfall. In 2013, the Northeast Research Farm received a surplus of moisture in the spring that delayed planting past the optimum date for northeast Iowa. Precipitation information for the growing season of 2012 and 2013 is provided in Table 1. The results indicated row width and population did not have a significant effect on soybean yield (Table 2). In 2012, there was a slight trend correlating 30-in. rows with lower grain

moisture. Final stand populations at 100,000 or slightly above in relation to optimizing soybean yield potential continue to be supported by previous ISU extension research.

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Table 1. 2012 and 2013 growing season precipitation.

Month	2012	2013	30-yr avg.
April	3.71	6.40	3.58
May	4.97	9.92	4.45
June	1.71	8.22	5.07
July	1.77	2.65	4.7
August	3.19	3.29	4.23
5 Month Total	15.35	30.48	22.03

Table 2. Effect of row width and plant population on soybean grain yield and moisture.

Year	Planting population plants/ac	Final stand plants/ac	Row spacing in.	Yield[a] bu/ac	Grain moisture %
2012	125,000	138,848	10	61.9	9.5
	125,000	138,666	30	61.4	9.4
	150,000	152,460	10	62.1	9.2
	150,000	150,282	30	61.5	9.5
	175,000	182,408	10	61.2	9.6
	175,000	173,151	30	60.9	9.4
	200,000	215,078	10	62.8	9.5
	200,000	210,177	30	61.1	9.3
Average				61.6	9.4
LSD[b] 0.05				2.5	0.2
2013	120,000	123,916	10	46.6	13.7
	120,000	113,740	30	46.3	13.7
	160,000	166,193	10	46.3	13.8
	160,000	155,848	30	47.1	13.6
	200,000	202,639	10	47.9	13.7
	200,000	194,568	30	48.0	13.8
Average				47.0	13.7
LSD[b] 0.05				2.0	0.2

[a]Yields were corrected to 13% moisture for soybeans.
[b]LSD=least significant difference. Yield and moisture differences equal to or greater than the LSD are significantly different with 95% certainty.