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## Corn Population Research

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## **Abstract**

Producers continually question whether they should be increasing corn plant populations based on planting date, soil/weather conditions, and seed company recommendations. Previous high corn yield award winners have claimed that they have used deep tillage and high populations in highly fertile soils to garner their award winning yields. Improvements in genetic traits and seed treatments and in-plant protection from a number of insects have been the main selling points to increase planting populations. Advances in planting equipment (narrow and twin row configurations providing more equidistant plant spacing) have also made increasing plant populations possible. Yield increases for row spacing less than 30 in. (15 in. and twin rows) at Nashua have shown small and inconsistent yield differences with the main yield benefit being from variety selection and to a lesser extent, planting population for increasing grain yields. These trials were designed to collect information to aid in local recommendations.

## **Keywords**

RFR A10112

## **Disciplines**

Agricultural Science | Agriculture

## Corn Population Research

### RFR-A10112

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#### Introduction

Producers continually question whether they should be increasing corn plant populations based on planting date, soil/weather conditions, and seed company recommendations. Previous high corn yield award winners have claimed that they have used deep tillage and high populations in highly fertile soils to garner their award winning yields. Improvements in genetic traits and seed treatments and in-plant protection from a number of insects have been the main selling points to increase planting populations. Advances in planting equipment (narrow and twin row configurations providing more equidistant plant spacing) have also made increasing plant populations possible. Yield increases for row spacing less than 30 in. (15 in. and twin rows) at Nashua have shown small and inconsistent yield differences with the main yield benefit being from variety selection and to a lesser extent, planting population for increasing grain yields. These trials were designed to collect information to aid in local recommendations.

#### Materials and Methods

Corn population studies were conducted in 2009 and 2010. The previous crops are noted in the tables. Soil type for the 2009 and 2010 corn population × crop rotation × tillage studies and 2010 corn variety × population studies were Clyde silty clay loam. Kenyon loam was the soil type for the 2009 corn variety × population study. The trials were replicated three times with four seeding rates, except for the 2009 corn variety × population study, which had three seeding rates. Seeding rates ranged from 26,659 to 43,908 seeds/acre based on planter gear transmission settings for

the planter and depending on the study and year. Each plot was six rows wide by the plot length, which varied from 100 to 165 ft depending on the study. All tillage operations occurred in the previous fall using either a White 588 moldboard plow, Glencoe Soil Saver II chisel plow, and an Orthman or Case DMI strip till bar. Moldboard and chisel plow treatments received a Kent Series V field cultivator pass, prior to planting. Tillage systems, crop rotations, and corn varieties were not randomized or replicated, only the population treatments were randomized and replicated in a strip plot design. Nitrogen rates were applied according to crop rotation requirements, based on optimal levels for maximum grain yield. Soil fertility was in the Optimum to Very High range according to ISU Publication 1688 for all studies. A preemergent grass herbicide was sprayed after planting followed by a postemergent broadleaf herbicide in early June. Final stands were taken in late August and grain yield determined by weigh bin scale on a John Deere 4400 combine.

#### Results and Discussion

Final plant stands from the tillage × crop rotation × planting population studies showed considerable variability when comparing 2009 and 2010 (Tables 1 and 2), which can be attributed to soil and weather conditions following planting. In both years, the plots were planted April 18, followed by an additional 5.26 and 1.97 in. of April rainfall in 2009 and 2010, respectively. Heavy April 2009 precipitation after planting contributed to the increased seed mortality. Grain yields were generally higher in 2009, despite increased seed mortality, due to a longer grain fill period following pollination due to mild 2009 temperatures. In 2009, moldboard plow and no tillage systems had the largest reduction in final plant stands due to soil

crusting conditions and heavy residue interference, respectively. Looking at tillage averages, final stands of 27,937 (cont. corn) and 30,058 (Csb) seemed to have the optimum yields in 2009. There also seemed to be no trend of yield increases when increasing final populations in 2010 (Table 2). This may be attributable to optimum environmental conditions throughout the year. Final results in the corn variety  $\times$  planting population studies in 2009 showed a 13.6 and 4.2 bushel/acre increase when yields were averaged by final stands across varieties for 21,373 to 29,003 and 29,003 to 36,575 plants/acre, respectively (Table 3). In 2010, plant population increases for each variety did not show a trend toward higher yields (Table 4).

In general, (based on four studies conducted in two years), when final stands were between 28,000 to 30,000 plants/acre, corn grain yields

seemed to be maximized. Economic returns from increasing planting populations vary between producers due to differences in seed cost. Many factors need to be considered when making decisions on planting rates, such as economics, planting date/conditions, future weather conditions, soil type/fertility, row spacing, variety selection and subsurface drainage. Based on two years of data, plant populations had little effect on final grain yield, but conditions during and after planting seemed to have a greater effect on final plant stands and grain yield.

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**Table 1. Plant population influence on final plant population and grain yield for 2009.<sup>1</sup>**

2009 tillage	Planting population (plants/acre)	Final population	Grain yield (bu/ac @ 15%)	Planting population (plants/acre)	Final population	Grain yield (bu/ac @ 15%)
			Yield			Yield
	Corn-soybean			Continuous corn		
MB plow	26,659	19,064	190.9	26,659	21,162	203.8
	31,295	23,340	204.2	31,295	25,975	213.1
	36,480	28,018	219.5	36,480	29,793	220.2
	42,340	32,267	<u>225.4</u>	42,340	34,472	<u>221.0</u>
	MB plow avg.		210.0	MB plow avg.		214.5
Chisel plow	26,659	23,582	219.1	26,659	21,377	180.9
	31,295	26,512	230.7	31,295	25,410	188.0
	36,480	30,695	238.4	36,480	28,341	180.8
	42,340	37,214	<u>236.3</u>	42,340	32,159	<u>184.4</u>
	Chisel plow avg.		231.1	Chisel plow avg.		183.5
Strip tillage	26,659	23,555	208.3	26,659	19,333	171.0
	31,295	27,749	230.8	31,295	23,447	178.1
	36,480	31,729	229.6	36,480	27,077	183.6
	42,340	36,488	<u>230.0</u>	42,340	29,927	<u>184.3</u>
	Strip tillage avg.		224.7	Strip tillage avg.		179.3
No till	26,659	21,834	199.3	26,659	20,140	165.8
	31,295	26,055	212.5	31,295	21,000	159.8
	36,480	29,793	209.1	36,480	26,539	168.5
	42,340	34,767	<u>213.4</u>	42,340	30,358	<u>165.6</u>
	No tillage avg.		208.6	No tillage avg.		164.9
Average of all tillage systems	26,659	22,008	204.4	26,659	20,503	180.4
	31,295	25,914	219.6	31,295	23,958	184.8
	36,480	30,058	224.2	36,480	27,937	188.3
	42,340	35,184	<u>226.3</u>	42,340	31,729	<u>188.8</u>
	C-sb avg.		218.6	Cont corn avg.		185.6

<sup>1</sup>LG Seeds 2540VT3 corn variety.

**Table 2. Plant population influence on final plant population and grain yield for 2010.<sup>1</sup>**

2010 tillage	Planting population (plants/acre)	Final population	Grain yield (bu/ac @ 15%)	Planting population (plants/acre)	Final population	Grain yield (bu/ac @ 15%)
			Yield			Yield
			<u>Corn-soybean</u>			<u>Continuous corn</u>
MB plow	26,659	26,391	201.7	26,659	25,612	187.9
	31,295	31,057	202.6	31,295	30,102	198.0
	36,480	35,641	203.2	36,480	34,230	202.2
	42,340	40,965	<u>214.1</u>	42,340	39,392	<u>195.5</u>
	MB plow avg.		205.4	MB plow avg.		195.9
Chisel plow	26,659	26,270	209.7	26,659	26,190	196.3
	31,295	30,680	217.3	31,295	30,586	198.3
	36,480	35,063	213.4	36,480	34,700	196.2
	42,340	39,634	<u>210.1</u>	42,340	38,989	<u>194.8</u>
	Chisel plow avg.		212.6	Chisel plow avg.		196.4
Strip tillage	26,659	26,270	203.3	26,659	26,297	199.3
	31,295	30,936	209.3	31,295	30,317	199.4
	36,480	35,964	213.4	36,480	34,808	202.0
	42,340	40,844	<u>209.0</u>	42,340	39,863	208.9
	Strip tillage avg.		208.7	Strip tillage avg.		202.4
No till	26,659	26,499	207.0	26,659	24,818	178.0
	31,295	31,003	201.9	31,295	29,080	183.1
	36,480	36,219	201.2	36,480	33,813	174.7
	42,340	41,274	<u>189.9</u>	42,340	38,236	<u>179.2</u>
	No tillage avg.		200.0	No tillage avg.		178.7
Average of all tillage systems	26,659	26,357	205.4	26,659	25,729	190.4
	31,295	30,919	207.8	31,295	30,021	194.7
	36,480	35,721	207.8	36,480	34,387	193.8
	42,340	40,679	<u>205.8</u>	42,340	39,120	<u>194.6</u>
	C-sb avg.		206.7	Cont. corn avg.		193.4

<sup>1</sup>LG Seeds 2540VT3 corn variety.

**Table 3. Corn variety and plant population influence on final plant population and grain yield for 2009.**

2009 Hybrid	Planting population (plants/acre)	Final population	Grain yield (bu/ac @ 15%) Yield
<u>Corn-soybean</u>			
Crows	26,659	22,099	185.9
4727VT3	35,077	29,533	193.1
	43,908	38,710	<u>195.6</u>
	Hybrid average		191.5
Agrigold	26,659	20,850	186.6
6309VT3	35,077	29,620	202.4
	43,908	35,196	<u>203.3</u>
	Hybrid average		197.4
Dekalb	26,659	19,834	174.4
61-69VT3	35,077	26,920	193.4
	43,908	33,192	<u>202.2</u>
	Hybrid average		190.0
Pioneer	26,659	22,709	185.3
36V53HX1	35,077	29,940	197.4
	43,908	39,204	<u>202.1</u>
	Hybrid average		194.9
Average of all hybrids	26,659	21,373	183.0
	35,077	29,003	196.6
	43,908	36,575	<u>200.8</u>
	Plot average		193.5

**Table 4. Corn variety and plant population influence on final plant population and grain yield for 2010.**

2010 Hybrid	Planting population (plants per acre)	Final population	Grain yield (bu/ac @ 15%) Yield
<u>Corn-soybean</u>			
	27,818	25,619	195.9
Pioneer	32,271	29,503	201.8
0413XR	36,480	33,796	206.1
	42,340	38,126	<u>208.3</u>
	Hybrid average		203.0
	27,818	24,906	193.0
Pioneer	32,271	28,523	196.1
0448XR	36,480	32,710	200.7
	42,340	37,395	<u>202.8</u>
	Hybrid average		198.1
	27,818	25,904	199.0
Pioneer	32,271	29,913	197.7
0717XR	36,480	33,422	198.9
	42,340	38,322	<u>191.6</u>
	Hybrid average		196.8
	27,818	26,296	189.1
Pioneer	32,271	29,681	200.6
36V53HX1	36,480	33,707	200.8
	42,340	39,177	<u>193.1</u>
	Hybrid average		195.9
	27,818	27,134	191.4
LG Seeds	32,271	30,928	201.5
2532 VT3	36,480	34,688	196.7
	42,340	38,625	<u>184.0</u>
	Hybrid average		193.4
Average of all hybrids	27,818	25,972	193.7
	32,271	29,710	199.6
	36,480	33,665	200.6
	42,340	38,329	<u>195.9</u>
	Plot average		197.4