Crop Management

Planting Rates for Grain Corn

Bill Cox and Phil Atkins,
Department of Crop & Soil Sciences, Cornell University

Assuming soil conditions are conducive to a 90% emergence rate, we currently recommend seeding rates of 30,000 kernels/acre for grain corn on silt loam soils in New York, based on studies at the Aurora Research Farm from 2003 to 2005 (Table 1). Recent hybrid releases, however, have been selected at higher plant populations and lodge less because of the Bt trait so there is a general belief that seeding rates should exceed recommended rates, based on hybrid releases from the early 2000s. On the other hand, most corn seed is now treated with soil-applied insecticide/fungicide, which results in greater stand establishment today than hybrids planted in the early 2000s. Consequently, the higher emergence rate may offset the need to plant the new hybrid releases at higher seeding rates. We have been conducting field-scale studies at the Aurora Research Farm since 2006 on fields following soybean and planted in early May under strip tillage to validate our small plot research. When averaged across years (2006 to 2010), optimum yields occurred at seeding rates of 29,600 kernels/acre (Table 2), close to our recommended seeding rate. We initiated another field-scale study in Cayuga County as well as a small-plot hybrid by seeding rate by N rate study in 2010 to further evaluate seeding rates for grain corn.

Two hybrids were planted at four seeding rates ranging from 30,000 to 38,000 kernels/acre with four replications at

Table 1. Plant populations at the six leaf stage (V6) and grain yield of a DEKALB and a Pioneer hybrid at four seeding rates in 2003, 2004, and 2005 and pooled across years at the Aurora Research Farm in Cayuga Co., NY (bold values represent optimum values based on regression analyses).

RATE	DKC53-34				37F16			
k/acre	2003	2004	2005	Avg.	2003	2004	2005	Avg.
	----------plants/acre----------							
25,000	24700	20310	20870	21960	18420	27700	20000	22040
30,000	28600	25125	26631	26785	21580	33125	25870	26858
35,000	33160	28000	31305	30822	25090	34875	29565	29260
40,000	37020	30440	34457	33972	27370	39000	37066	34479
	----------bu/acre----------							
25,000	**187**	178	148	171	165	186	143	165
30,000	188	**197**	**152**	**179**	171	**189**	**150**	**170**
35,000	187	189	142	173	180	180	134	165
40,000	175	188	142	168	**186**	180	138	168

Table 2. Plant populations at the six leaf stage (V6) and grain yield of a different hybrid at four seeding rates in field-scale studies at the Aurora Research Farm in Cayuga Co., NY from 2006 to 2010 (bold values represent optimum values based on regression analyses).

RATE	GRAIN YIELD					
	2006	2007	2008	2009	2010	Avg.
k/acre		----------bu/acre----------				
27,500	139	130	187	173	158	157
29,600	**150**	**134**	189	**173**	**166**	**163**
32,100	148	132	188	170	**168**	161
34,200	153	133	**197**	172	170	165
	---------- plants/acre----------					
27,500	23874	23700	24820	25055	22445	23979
29,000	25888	25825	26631	26187	26000	26106
32,100	28904	28480	29378	28500	26235	28299
34,200	31691	29830	31698	30500	29330	30610

Table 3. Grain yield and plant populations at the 8th leaf stage (V8) of a DEKALB and Pioneer hybrid planted on the Du Mond Farm (Cayuga Co.) in 2010 (bold values represent optimum values based on regression analyses).

	GRAIN YIELD		PLANTS/ACRE	
RATE	DKC46-40	P9512XR	DKC46-40	P9512XR
kernels/acre	--------bu/acre-------		------plants/acre------	
30,000	**211**	**208**	28,005	27,805
32,500	208	213	30,005	30,200
35,000	213	213	32,000	32,800
38,000	214	211	34,500	34,750

the Du Mond Farm in Cayuga Co. on 18 May. Each subplot averaged 0.9 acres so the entire study represented about 28 acres of research. Plant populations at the 8th leaf stage (V8) in late June ranged from about 28,000 to 34,500 plants/acre (Table 3). Neither hybrid responded to seeding rates in this study, possibly because the mid-May planting date resulted in emergence rates of 92%, so optimum seeding rates at this site was also at the recommended rate.

There is also a general belief that hybrids will not respond to seeding rates unless the N rate is high so we also tested two hybrids at four seeding rates (25,000 to 40,000 kernels/acre) with two N rates (the recommended 125 lbs/acre of total N for corn following soybeans and a high N rate of 175 lbs/acre of total N) in small plot research at the Aurora Research Farm. The planting date was 30 April and the emergence rate was 87% for the DEKALB hybrid and 79% for the Pioneer hybrid. Despite the differences in emergence rates between the hybrids, both showed similar responses to seeding rate, especially at the high N rate (Table 4). As in all previous studies, 30,000 kernels/acre was the optimum seeding rate, regardless of N rates. Such high yields in this study indicate that seeding rates or N rates do not have to be above recommended rates to achieve such high yields.

Conclusion

We have repeatedly seen that seeding rates of about 30,000 kernels/acre result in optimum yields on silt loam soils in Cayuga Co. Nevertheless, there is enough information out there to make us question whether this response is consistent across different soil types and farming operations in NY. Consequently, we will initiate field-scale studies on four to six farms across NY State at different row spacing for the next two years to further validate our current seeding rate recommendations for grain corn in New York.

Table 4. Plant populations at the 6th leaf stage (V6) and grain yield of a DeKalb and a Pioneer hybrid at four seeding rates and two N rates in a field following soybeans at the Aurora Research Farm in Cayuga Co., NY (bold values represent optimum values based on regression analyses).

RATE	**DKC51-84**			**P0125XRR**			
	125N	**175N**	**AVG.**	**125N**	**175N**	**AVG.**	**MEAN**
k/acre	----------plants/acre----------						
25,000	21200	20325	20763	18480	17390	17935	19349
30,000	26090	27065	26578	23260	25000	24130	25354
35,000	31850	33370	32610	28045	29565	28805	28805
40,000	33045	34130	33588	32390	30870	31630	31630
	----------bu/acre----------						
25,000	256	272	264	267	280	274	264
30,000	299	296	**298**	288	296	**293**	**295**
35,000	300	302	301	300	296	**298**	299
40,000	296	303	300	309	300s	304	302
Mean	**288**	**293**		**291**	**293**		
LSD 0.05		**NS**			**NS**		