

# Evaluation of plant populations across 150 years of corn genetics

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## Objective

To determine plant response to increasing corn populations. To evaluate response of older open pollinated corn genetics to modern agricultural practices.

## Background

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Crop Year:	2011	Tillage:	Stale seedbed, early Field cultivator
Location:	South Charleston, OH	Soil Test:	pH 6.7, LTI 6.9, P 221 ppm, K 268, CEC 18.5
County:	Clark	Planting date:	31 May 2011
Soil type:	Crosby silt loam	Fertilizer:	50 lb N at plant, 100 lb N as 28% June 30
Drainage	Pattern tiled	Seeding rate:	varies
Previous crop:	Soybeans	Harvest date:	10 November 2011

## Methods

This study was designed as a randomized complete block arranged in a split-plot layout with plant population as whole plot and variety as subplots. The trial was conducted at the OARDC Western Agricultural Research Station in 15 foot wide by 45 foot long plots for each seeding rate. A John Deere 6-row no-till planter was used to plant both of the two corn types in one pass. Three rows of each were planted and two rows were harvested for yield. Herbicides used in the plot area included an at plant application of Bicep Magnum, Calisto and 2,4-D followed by an application of Impact plus atrazine post.

Variables evaluated:

1. Genetics – a modern hybrid vs. an open pollinated variety
  - Pioneer P33W84 vs. Reid's yellow dent
2. Seeding rates across the trial
  - 5,000, 18,000, 31,000 and 44,000 seeds/A

Two diverse genetic sources were used to compare across populations. A modern quad-stack hybrid, Pioneer 33W84, and the open-pollinated Reid's yellow dent chosen to represent the genetics of 150 years ago. According to A.F. Troyer<sup>1</sup>, Reid yellow dent was the most popular corn grown in the USA after winning the World's Fair corn show in Chicago in 1893. Reid yellow dent was the dominant corn (up to 75% of acreage) in the

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<sup>1</sup> Troyer, A.F., Background of U.S. Hybrid Corn. Crop Sci. 39:601-626 (1999).

U.S. Corn Belt for 50 years; it was still recommended by 21 central states in the 1936 USDA Yearbook. The variety was described as medium relative maturity (115 RM) in the central Corn Belt.

The planter had a lower seeding rate limit of 12,036 seeds per acre. This seeding rate was used for the 5,000 seed/A seeding rate and then plants were thinned to approximately 5,000 plants per acre after emergence. All other rates were set near the planned seeding rate as suggested by the manufacturers manual.

A small plot Massey Ferguson model 8XP combine was used for harvest with grain weighed in a digital scale for on-the-go harvest. Yield was calculated in bushels/acre at 15.5% moisture.

Final stands are estimated by counting all of the plants in the remaining adjoining row after harvest. Root lodging was estimated from the combine at harvest, with a score of 1 equal to no lodging and a score of 10 to indicate all plants were leaning.

## Results

Population and variety effects on yield, final stand and lodging by corn type or variety.

Seeding Rate	Variety	Yield	Final Stand	Root Lodging Score
---seeds/A---		--bu/A--	---plants/A--	
5,000	Pioneer Brand P33W84	101.2	5905	1.0
	Reid Yellow Dent	63.8	4743	1.5
18,000	Pioneer Brand P33W84	161.0	16553	1.0
	Reid Yellow Dent	93.1	11423	2.0
31,000	Pioneer Brand P33W84	193.8	27879	1.0
	Reid Yellow Dent	72.4	16359	4.3
44,000	Pioneer Brand P33W84	191.2	39495	1.0
	Reid Yellow Dent	62.8	23813	5.0
<b>LSD (0.10)</b>				
Seeding Rate (S)		8.3	1425	0.9
Variety (V)		7.8	837	0.5
S x V		15.6	1674	1.0

## Summary

The interaction effects are shown in Table 1. As expected the modern hybrid here did tolerate higher populations than older genetics, and provided more yield.

- Yield of the Reid yellow dent was maximized at 93.1 bu/A in our study at a seeding rate of 18,000 seed/A with a final stand count of 11,400 plants/A
- The Pioneer hybrid 33W84 reached 193.8 bu/A at 31,000 seed/A (28,000 population)

While there was no seeding rate impact on lodging for the Pioneer hybrid, Reid yellow dent had significant lodging problems at the two higher seeding rates.

The combination of modern agronomic practices and modern genetics greatly increase yield (by 100 bu/A) for current grain needs and economics.

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