# History of Corn Genetics

Over the past eighty years, corn yields have steadily increased due to improvements in genetics, agronomic systems, and biotech traits. As these components have improved, there has been a corresponding increase in the optimum planting rates for corn.

Historical information indicates that corn yield did not significantly change from the beginning of record keeping in the 1880s, through the mid-1930s. Yields began to increase in the early 1940s and increased dramatically in the 1960s and 1970s when technological advances in corn breeding and agronomic practices occurred.

## Study Guidelines

A corn demonstration trial was conducted at the Monsanto Learning Center near Monmouth, IL to illustrate the improvements in corn genetics over the years. Three corn products were selected for the demonstration:

- A popular early 1900s product
- A popular 1970s product
- A current 113 relative maturity (RM) Genuity® SmartStax® RIB Complete® Corn Blend product.

Each product was planted at three populations to demonstrate the common planting rate in the early 1900s (16,000 seeds/acre), a planting rate slightly below current averages (28,000 seeds/acre), and a rate to induce a stressed/competitive environment (40,000 seeds/acre). The trial was planted on May 30, 2014.

Other agronomic practices were standard for today's corn production to minimize variation and impact on yield potential:

- Fall chisel plow fb soil finisher in the spring
- 30" rows
- 200 lbs/acre of nitrogen was applied
- Plots were kept weed free

## Results and Observations

The modern genetics product, represented by the Genuity® SmartStax® RIB Complete® Corn Blend product, was much higher in yield, regardless of seeding rate, compared to the other two products in the demonstration (Figures 1 and 2). The ability of modern genetics to perform at this level is likely due to their ability to compete with surrounding

| | Product Yield (bu/acre) | | |
|---|---|---|---|
| Planted seeds/acre | 1900s Product | 1970s Product | Modern Genetics |
| 16,000 | 57.9 | 80.7 | 167.9 |
| 28,000 | 66.8 | 100.9 | 236.4 |
| 40,000 | 59.7 | 58.4 | 270.9 |

Figure 1. Yield Comparison of Historical vs. Modern Genetics

# History of Corn Genetics

plants for sunlight, nutrients, and water, cope with stressful environments, and offer protection from certain below and above ground insects. The size of five consecutive ears at the 16,000 and 40,000 seeding rates shows the product's ability to maintain ear size under stress (Figure 5).

The yield of the 1900s genetic product did not appear to respond dramatically to increased planting rates; however, at 28,000 seeds/acre, it demonstrated an 8.8 and a 7.0 bu/acre increase over 16,000 and 40,000 seeds/acre, respectively (Figures 1 and 2). The size of five consecutive ears at the 16,000 and 40,000 seeding rates shows that the product was able to place grain on all five ears at the lower population, but under the stressed environment of 40,000 seeds/acre, two of the five ears blanked out (Figure 3).

The 1970s product showed a positive response to an increase in the seeding rate from 16,000 to 28,000 seeds/acre with a yield increase of 20.2 bu/acre.

When the seeding rate was increased from 28,000 seeds/acre to 40,000 seeds/acre, yield decreased 42.5 bu/acre, an indication that the product was less able to adapt to a stressed environment (Figures 1 and 2). The size of five consecutive ears at the 16,000 and 40,000 seeding rates shows that the product was able to place grain on all five ears at the lower population and have ears that are reasonably the same size; however, under the stressed environment of 40,000 seeds/acre, ear size and kernel set decreased (Figure 4).

Other factors that may contribute to the increased yield potential of modern genetics include:

- Narrower rows
- Weed control systems
- Fertility management
- Pest control

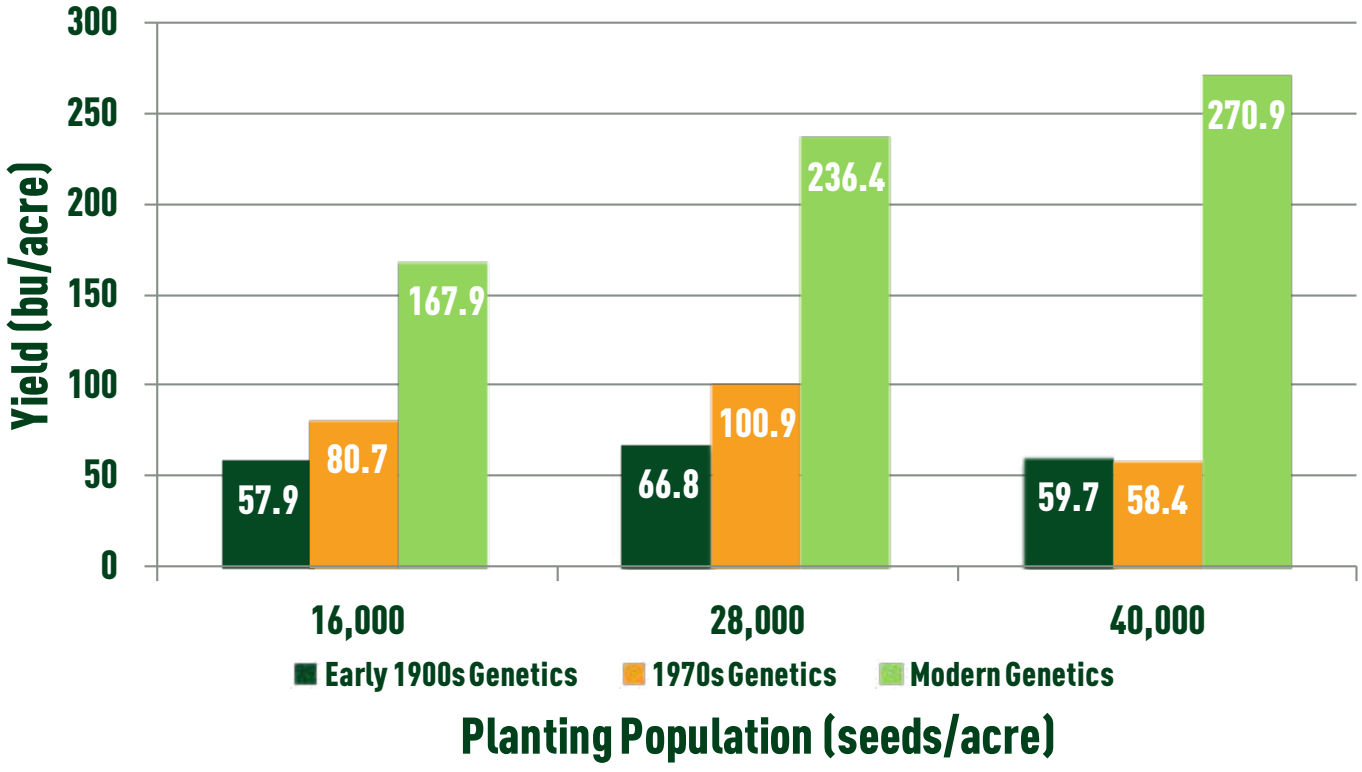


Figure 2. Yields of Historical vs. Modern Genetics

Technology Development & Agronomy by MONSANTO

# History of Corn Genetics


Figure 3. Ear Comparison of Early 1900s Genetics Product at 16,000 and 40,000 seeds/acre.


Figure 4. Ear Comparison of Common 1970s Genetics Product at 16,000 and 40,000 seeds/acre.


Figure 5. Ear Comparison of Genuity® SmartStax® RIB Complete® Corn Blend Product at 16,000 and 40,000 seeds/acre.

## Sources

Porter, P.M., Hicks, D.R. Lueschen, W.E., Ford, J.H., Warnes, D.D., and Hoverstad, T.R. 1998. Row width/plant population affect corn response. University of Minnesota. Fluid Fertilizer Foundation Journal. Issue 20, Vol. 6. http://fluidfertilizer.com.

Gibson, L. and Benson, G., 2002. Origin, history, and uses of corn (Zea mays). Iowa State University.

http://agron-www.agron.iastate.edu/Courses/agron212/Readings/Corn_history.htm

Web sites verified 11/13/14.

## Legals

*The information discussed in this report is from a single site, non-replicated demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.*

**Monsanto Company is a member of Excellence Through Stewardship® (ETS).** Monsanto products are commercialized in accordance with ETS Product Launch Stewardship Guidance, and in compliance with Monsanto's Policy for Commercialization of Biotechnology-Derived Plant Products in Commodity Crops. Commercialized products have been approved for import into key export markets with functioning regulatory systems. Any crop or material produced from this product can only be exported to, or used, processed or sold in countries where all necessary regulatory approvals have been granted. It is a violation of national and international law to move material containing biotech traits across boundaries into nations where import is not permitted. Growers should talk to their grain handler or product purchaser to confirm their buying position for this product.

***B.t.* products may not yet be registered in all states.** Check with your Monsanto representative for the registration status in your state.

**IMPORTANT IRM INFORMATION:** Genuity® RIB Complete® corn blend products do not require the planting of a structured refuge except in the Cotton-Growing Area where corn earworm is a significant pest. See the IRM/Grower Guide for additional information. Always read and follow IRM requirements.

**Individual results may vary,** and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

**ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS.** Roundup Ready® crops contain genes that confer tolerance to glyphosate, the active ingredient in Roundup® brand agricultural herbicides. Roundup® brand agricultural herbicides will kill crops that are not tolerant to glyphosate. Genuity®, RIB Complete®, Roundup Ready 2 Technology and Design®, Roundup Ready®, Roundup® and SmartStax® are trademarks of Monsanto Technology LLC. Leaf Design® is a registered trademark of Monsanto Company. LibertyLink and the Water Droplet Design® are registered trademarks of Bayer. Respect the Refuge and Corn Design® and Respect the Refuge® are registered trademarks of National Corn Growers Association. All other trademarks are the property of their respective owners. 
141107100639 111114LGM

Technology Development & Agronomy by MONSANTO