

Corn Leaf Angle Response to Plant Density

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Background and Objectives

- Previous research has shown that corn plants can alter their leaf angle in response to their environment.
- At greater densities, plant leaf angle tends to be more upright in order to optimize capture of sunlight.
- Plasticity of leaf angle in response to plant density has been shown to differ among hybrids.
- A research study was conducted in 2015 to evaluate leaf angle response to plant density with 2 Pioneer® brand corn products.

Study Description

Location:	Johnston, Iowa
Replicates:	4
Plot Layout:	Small plots (10 x 17.4 ft), RCBD
Row Width:	30 inches
Planting Date:	May 19, 2015
Factors - Pioneer® brand corn products:	
Hybrid/Brand ¹ :	P1151AM™ (AM, LL, RR2) P1311AMXT™ (AMXT, LL, RR2)
Population:	30,000, 40,000, and 50,000 plants/acre

Hybrids were selected to represent contrasting leaf types: Pioneer® P1151AM™ brand corn had more upright leaves than Pioneer® P1311AMXT™ brand corn in 2014 research.

Leaf Angle Measurements

- Leaf angle measurements were taken on the 10th and 14th leaf of 10 plants in each plot (Figure 1).
- Angle of the leaf relative to the stalk (smaller number = more upright leaf angle)
- Measured at the base of the leaf using a clinometer smartphone app (Figure 2).

Figure 1. Leaf angle measurements on leaf 10 and leaf 14.

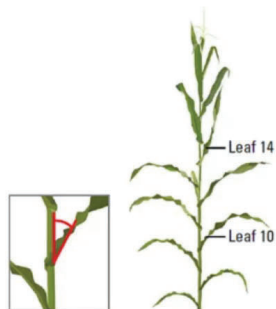


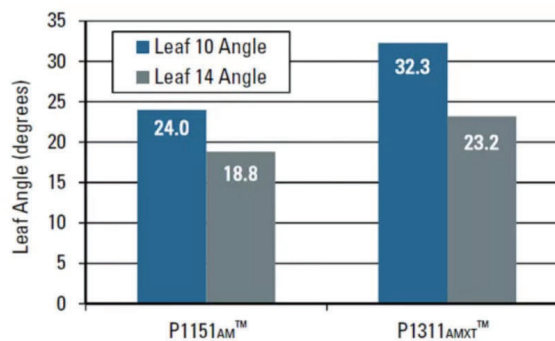
Figure 2. Leaf angle measurements were taken using a clinometer smartphone app.



Results

- Upper leaves tended to be substantially more upright for both corn products across all population densities (Figure 3).

Figure 3. Average angle of leaf 10 and leaf 14 for Pioneer P1151AM™ brand corn and Pioneer P1311AMXT™ brand corn.



- Angle of leaf 10 was significantly influenced by both plant density and corn product.
 - Average leaf angle was significantly more upright with greater population density (Figure 4).
 - The average angle of leaf 10 was significantly more upright for P1151AM™ than P1311AMXT™ (Figure 5)

Figure 4. Average angle of the 10 leaf (degrees from vertical) as affected by plant density.

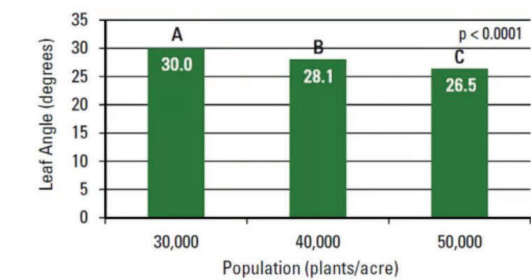
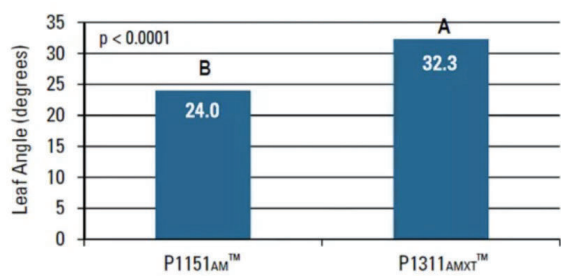


Figure 5. Average angle of the 10th leaf (degrees from vertical) by corn product.



- There was a significant interaction between corn product and population density in their effects on angle of leaf 14.
- P1311AMXT™ had a greater response to density than P1151AM.

Figure 6. Average angle of the 14th leaf (degrees from vertical) by corn product and plant density.

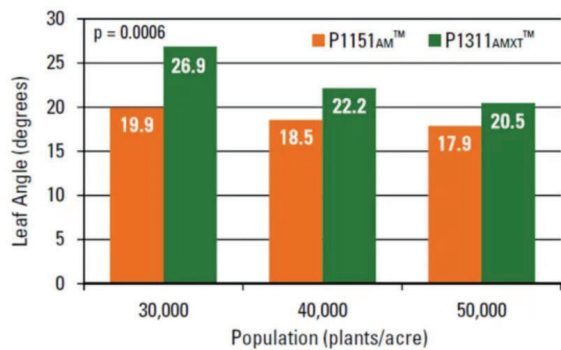
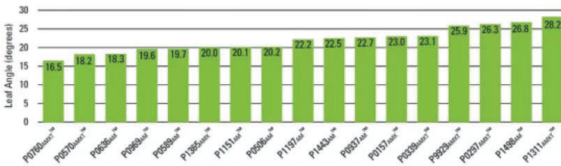


Figure 7. Average angle of the 12th leaf of several Pioneer® brand corn products at 35,000 plants/acre in Johnston, Iowa plots in 2015.



Conclusions

- The results of this study demonstrate the ability of corn plants to adjust their leaf angle in response to their environment.
- Future efforts to optimize the crop canopy for maximum light utilization and yield need to take this effect into account.
- Results suggest that attempts to optimize crop canopy through management may have limited benefit due to the inherent ability for plants to adjust themselves in response to their environment.

Authors: Mark Jeschke and Adelyn Uppena

¹All Pioneer products are hybrids unless designated with AM1, AM, AMRW, AMX, AMT and AMXT, in which case they are brands. 2015 data are based on average of all comparisons made in one location through August 17, 2015. Multiyear and multi-location is a better predictor of future performance. Do not use these or any other data from a limited number of trials as a significant factor in product selection. Product responses are variable and subject to a variety of environmental, disease, and pest pressures. Individual results may vary. PIONEER® brand products are provided subject to the terms and conditions of purchase which are part of the labeling and purchase documents.



HX1 – Contains the Herculex® I Insect Protection gene which provides protection against European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, and sugarcane borer; and suppresses corn earworm. Herculex® I Insect Protection technology by Dow AgroSciences and Pioneer Hi-Bred. Herculex® and the HX logo are registered trademarks of Dow AgroSciences LLC.



AM - Optimum® AcreMax® Insect Protection system with YGCB, HX1, LL, RR2. Contains a single-bag integrated refuge solution for above-ground insects. In EPA-designated cotton growing counties, a 20% separate refuge must be planted with Optimum AcreMax products.



AMX - Optimum® AcreMax® Xtra Insect Protection system with YGCB, HXX, LL, RR2. Contains a single-bag integrated refuge solution for above- and below-ground insects. In EPA-designated cotton growing counties, a 20% separate corn borer refuge must be planted with Optimum AcreMax Xtra products.



AMXT (Optimum® AcreMax® XTreme) - Contains a single-bag integrated refuge solution for above- and below-ground insects. The major component contains the Agrisure® RW trait, the YieldGard® Corn Borer gene, and the Herculex® XTRA genes. In EPA-designated cotton growing counties, a 20% separate corn borer refuge must be planted with Optimum AcreMax XTreme products. **HXX** - Herculex® XTRA contains the Herculex I and Herculex RW genes. **YGCB** - The YieldGard® Corn Borer gene offers a high level of resistance to European corn borer, southwestern corn borer and southern cornstalk borer; moderate resistance to corn earworm and common stalk borer; and above average resistance to fall armyworm. **LL** - Contains the LibertyLink® gene for resistance to Liberty® herbicide. **RR2** - Contains the Roundup Ready® Corn 2 trait that provides crop safety for over-the-top applications of labeled glyphosate herbicides when applied according to label directions. Liberty®, LibertyLink® and the Water Droplet Design are registered trademarks of Bayer. YieldGard®, the YieldGard Corn Borer design and Roundup Ready® are registered trademarks used under license from Monsanto Company. Herculex® Insect Protection technology by Dow AgroSciences and Pioneer Hi-Bred. Herculex® and the HX logo are registered trademarks of Dow AgroSciences LLC. Agrisure® is a registered trademark of, and used under license from, a Syngenta Group Company. Agrisure® technology incorporated into these seeds is commercialized under a license from Syngenta Crop Protection AG.



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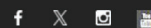
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