The Impact of Planting Speed on Corn Seed Distribution and Yield

Study Guidelines

A corn demonstration trial was conducted at the Monsanto Learning Center at Scott, MS. DEKALB® Genuity® VT Triple PRO® DKC67-57 brand corn was planted on April 16, 2013. The trial was designed to provide growers information on how planting speed can effect the corn population and yield potential. It was also designed to evaluate differences in planter meters and what impact they may have on corn yield potential.

The trial consisted of four replications, evaluating two planter meters (Precision Planting® eSet® and John Deere® 30 cell meters) at five planting speeds (2, 3, 4, 5, and 6 MPH). The established population of corn plants after emergence was measured using a barcoded ruler system developed at the Learning Center at Scott, MS (Figure 1). A 1-centimeter resolution barcode ruler and a Motorola Symbol reader was used to count the corn plants that emerged and their placement in the row. The corn was harvested to determine grain yield.

Bivariate fit statistical analyses were conducted on the data. A bivariate fit is an analysis in statistics to determine if two sets of paired data are correlated. The data is plotted on a graph to make a linear regression line between the data points. An R-square (R^2) analysis was used to measure the likelihood that the paired data is dependent on one another. If R^2 is equal to 1, all observations would fall on the regression line, indicating it is a good linear model. If R^2 is equal to 0, this would indicate the absence of any linear relationship between the sets of data. R^2 adjusted is a value that corrects to more closely reflect how good the linear model fits the data population.

Figure 1. Barcode ruler and Motorola Symbol reader used to record corn plants that emerge and their distribution in the row.

Results and Conclusions

Corn was planted targeting a population of 36,000 plants per acre on 38-inch rows, with an ideal plant spacing at 4.59 inches apart. The plot mean yield in this demonstration trial was 202 bushels per acre.

When analyzing the data across planter meter types, there was a relatively good correlation of established corn plants to yield. The linear regression of the data showed that a 1,000 plant reduction in corn stand would cost about 3 bushels per acre across the trial (Figure 2). The R^2 value of 0.5 means that the variation in plant population explains roughly 50% of the variation in yield in this trial.

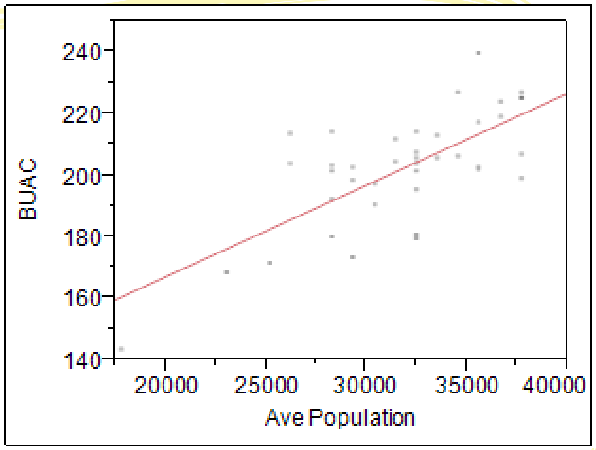

Figure 2. Bivariate fit of corn yield (BUAC) by average (Ave) population when analyzed across planter meter types and planting speeds [Linear Fit: BUAC = 107.33702 + (0.0029793 x Ave Population); Summary of Fit: R^2 = 0.495906, R^2 adjusted = 0.48264].

The data showed that as planting speed increased, the average plant population decreased. There was a relatively good correlation of planting speed to corn stand in this testing when analyzing the data across planter meter types (Figure 3). The linear regression of the data showed that the population decreased by 1,738 plants per acre for each 1 MPH increase in planting speed. Although the correlation of planting speed to yield was not as good (R^2 = 0.2), the data indicates that each 1 MPH increase in planting speed resulted in a 4.3 bushel per acre decrease in yield under the conditions of this testing (Figure 4).

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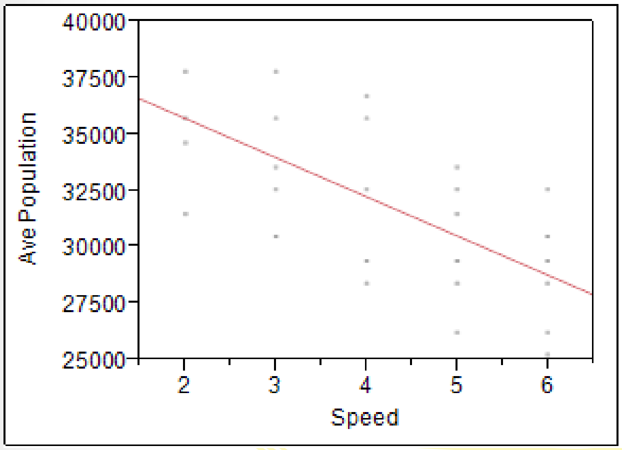

Figure 3. Bivariate fit of average (Ave) plant population by planting speed (MPH) when analyzed across planter meter types [Linear Fit: Ave Population = 39177.534 – (1738.1107 x Speed); Summary of Fit: R^2 = 0.483492, R^2 adjusted = 0.468734].

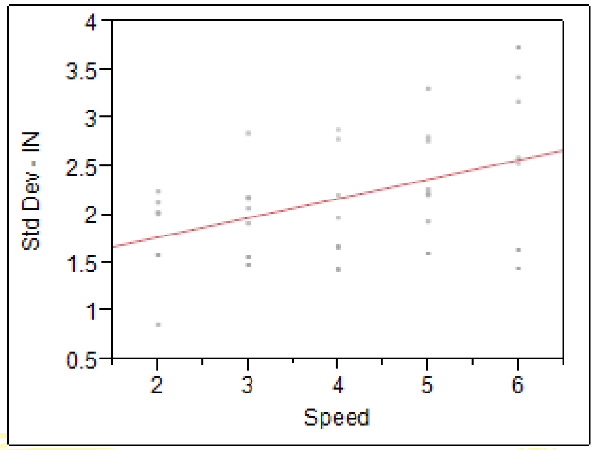

Figure 5. Bivariate fit of standard deviation in inches by planting speed (MPH) when averaged across planter meter types [Linear Fit: Std Dev – IN = 1.3689439 + (0.1994928 x Speed); Summary of Fit: R^2 = 0.192392, R^2 adjusted = 0.169318].

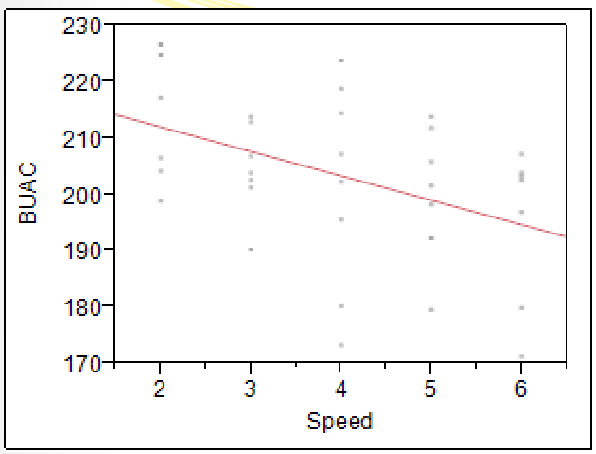

Figure 4. Bivariate fit of corn yield (BUAC) by planting speed (MPH) when averaged across planter meter types [Linear Fit: BUAC = 220.65484 – (4.3405704 x Speed); Summary of Fit: R^2 = 0.189582, R^2 adjusted = 0.166427].

The regression of planting speed to standard deviation in inches indicates that a 1 MPH increase in speed gives a standard deviation increase of 0.2 inches (Figure 5). Standard deviation represents a variability measurement that encompasses 68.2% of the population. A standard deviation of 2 means that 68.2% of the population is ±2 inches from where it should be from the mean distance (plant spacing) in the testing.

There were differences when analyzing the data by planter meter type. The regression of speed to population was highly correlated with eSet meters, but not as well correlated with the John Deere 30 cell meters (Figures 6 and 7). For each 1 MPH increase in planting speed, the corn population decreased by 2,044 plants per acre with eSet meters, and 1,335 plants per acre with John Deere 30 cell meters. The data showed that as planting speed increased, plant population decreased with both planting meters. However, the John Deere meter units started out planting less corn seed and were less predictable than the eSet meter units.

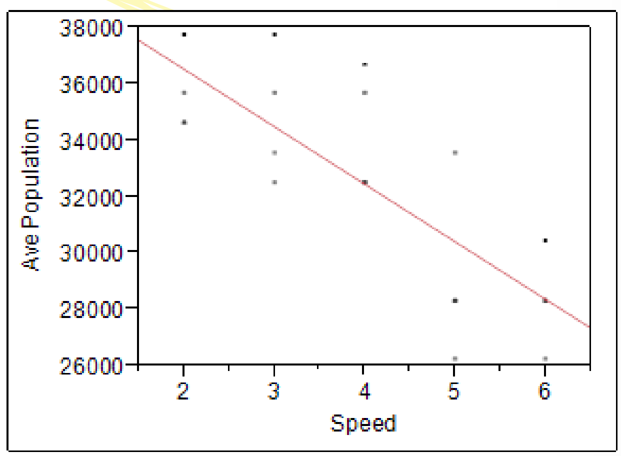

Figure 6. Bivariate fit of average (Ave) corn population by planting speed (MPH) with the Precision Planting® eSet® meters [Linear Fit: Ave Population = 40612.123 – (2043.7069 x Speed); Summary of Fit: R^2 = 0.626055, R^2 adjusted = 0.60528].

The Impact of Planting Speed on Corn Seed Distribution and Yield

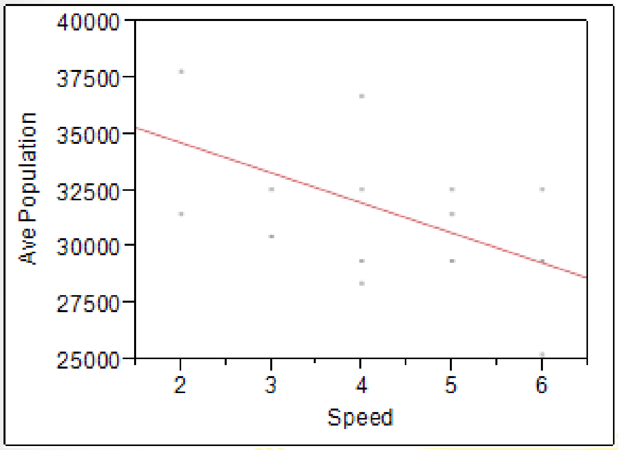

Figure 7. Bivariate fit of average (Ave) corn population by planting speed (MPH) with the John Deere® 30 Cell meters [Linear Fit: Ave Population = 37291.623 – (1334.9747 x Speed); Summary of Fit: R^2 = 0.317493, R^2 adjusted = 0.271993].

The regression of planting speed to corn yield was not as strong a correlation with either planting meter types (Figures 8 and 9). However, the data provided some indication of the impact of planting speed on corn yield. For each 1 MPH increase in planting speed, there was a yield decrease of 3.6 bushels per acre with eSet meters, and 5.4 bushels per acre with John Deere 30 cell meters.

The regression of speed to standard deviation in inches was also not a strong correlation with both planting meters (Figures 10 and 11). However, the data indicated that eSet meter units were somewhat more predictable in how they planted at a variety of speeds.

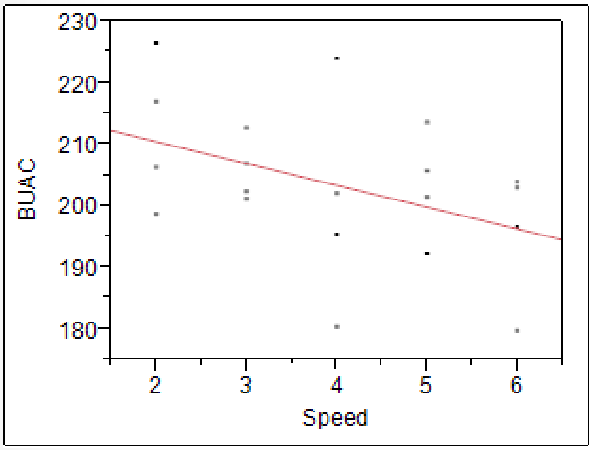

Figure 8. Bivariate fit of corn yield (BUAC) by planting speed (MPH) with the Precision Planting® eSet® meters [Linear Fit: BUAC = 217.53049 – (3.5445584 x Speed); Summary of Fit: R^2 = 0.183607, R^2 adjusted = 0.138252].

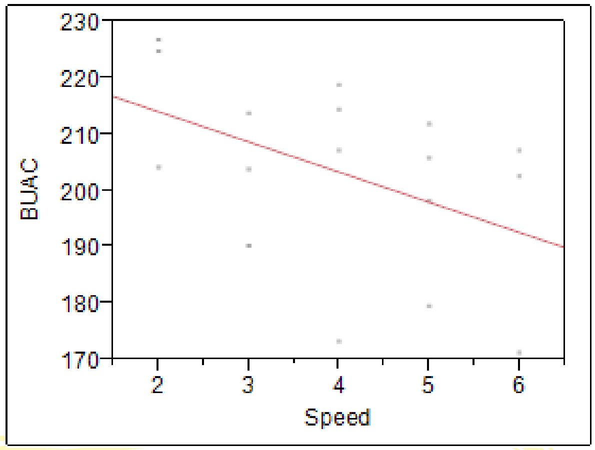

Figure 9. Bivariate fit of corn yield (BUAC) by planting speed with the John Deere® 30 Cell meters [Linear Fit: BUAC = 224.75218 – (5.3673654 x Speed); Summary of Fit: R^2 = 0.206587, R^2 adjusted = 0.153693].

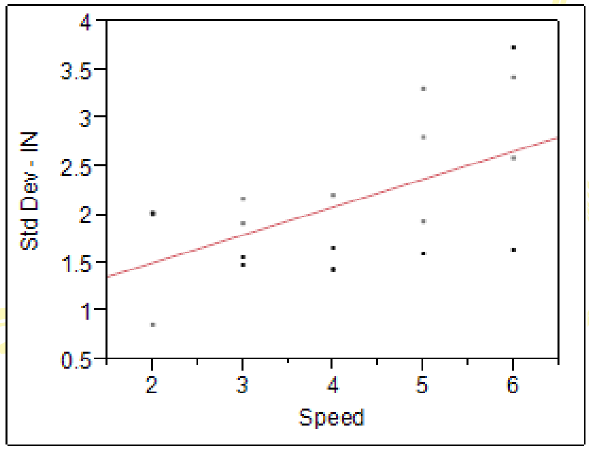

Figure 10. Bivariate fit of standard deviation in inches by planting speed (MPH) with the Precision Planting® eSet® meters [Linear Fit: Std Dev - IN = 0.9225412 + (0.2891693 x Speed); Summary of Fit: R^2 = 0.318155, R^2 adjusted = 0.280275].

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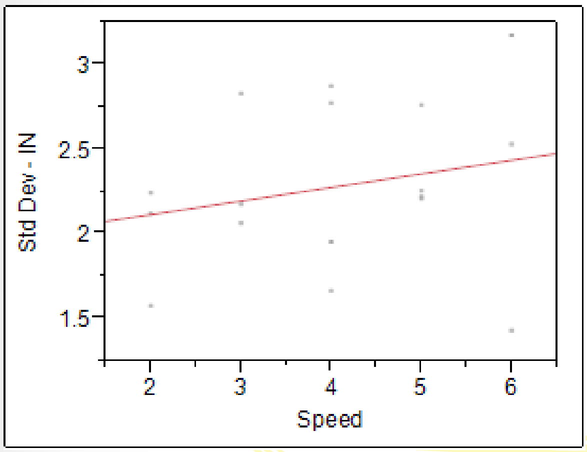

Figure 11. Bivariate fit of standard deviation in inches by planting speed with the John Deere® 30 Cell meters [Linear Fit: Std Dev – IN = 1.9561965 + (0.0802266 x Speed); Summary of Fit: R^2 = 0.052532, R^2 adjusted = -0.01063].

Summary Comments

Data analysis showed that as planting speed increased, the established plant stand decreased with both planter meter units. Across all plant populations, both planter meters yielded similarly. However, more plants were established at all planting speeds with the Precision Planting eSet meter units. This testing indicated that the eSet meter units were less variable than the John Deere 30 cell meter units. Slight decreases in yield, apparently due to increases in variability and seed placement, were observed between 3 and 4 MPH planting speeds. This decrease in yield became more significant somewhere between 4 and 5 MPH planting speeds with both meter types. For this reason, planting speed recommendations between 4 and 5 MPH should be dependent on field conditions. Monitoring tools are available to help in making decisions regarding field conditions that are needed for optimal seed placement. Planting equipment, planting speed, and field conditions can all interact to determine the ultimate variability of a planted corn population and its yield potential.