Effect of Planting Speed on Stand Establishment in Corn

Background
Establishing the optimum spacing between plants to avoid adverse interplant competition is an important consideration when trying to maximize yield potential. Seeding rate and row spacing play a role in determining interplant spacing; however, delivery of the intended in-row spacing at planting is a function of the planter. Spacing anomalies, such as multiples, skips, and misplaced seeds, have been shown to have varying effects on yield based on the severity and the growing season.1,3 As advancements in planter technologies, from plate planters, to finger meters, to vacuum meters, have improved accuracy in plant spacing, the focus has changed to achieving perfect singulation at higher ground speeds.6 Though a properly adjusted planter can singulate and uniformly space seeds to obtain even stands, planter speed has been shown to affect this level of accuracy.2 Studies have shown that seed placement accuracy decreases as planter speeds increase.3,4

During planting, seeds are propelled through the seed tube at a speed of about 3.5 mph. Planter speeds of 3.5 mph or slower are better able to place seeds accurately in the furrow. As planter speed increases, the difference between the speed of the seed traveling out of the tube and the ground speed becomes greater, which causes seeds to bounce and roll in the furrow. New technologies from equipment manufacturers including Precision Planting, Kinze, John Deere, and Horsch feature innovative functionalities that maintain accuracy at higher planter speeds.6

Study Guidelines
A corn demonstration trial was conducted at the Monsanto Learning Center near Huxley, IA to compare the placement accuracies of two seed placement technologies at higher ground speeds. Two different Precision Planting® seed placement technologies (WaveVision® and SpeedTube®) were compared at three different ground speeds (5, 8, and 10 mph). A six-row John Deere planter equipped with Precision Planting hydraulic DeltaForce®, 20/20 SeedSense®, CleanSweep® row cleaners, vSet® meters, and Keeton® seed firmers was used. The planter was divided into two parts as follows: rows 1-3 were fitted with WaveVision® standard seed tubes and rows 4-6 were fitted with SpeedTube® seed tubes. DeltaForce® was set to auto mode for row-by-row down force management.

The plots consisted of 800 foot long strips with six rows per treatment and two replications. The same 110 RM corn product was planted in 30-inch row spacing at 32,000 seeds/acre for all plots. The trial was planted on May 2nd, 2015 and harvested on October 5th, 2015. The harvest population was estimated after the R6 growth stage and yield was adjusted to 15% moisture content. The field had been previously planted to soybeans and was managed with conventional tillage; a chisel plow in the fall followed by a soil finisher in the spring. Standard weed control was performed to maintain weed-free conditions and consisted of pre- and post-emergence herbicide applications.

Results and Discussion
Both seed tube platforms consistently delivered the intended seeding rate at all ground speeds (Table 1). Seeding rate is detected by sensors prior to the seeds leaving the seed tubes. This indicates that any population and spacing differences observed were a function of the seed tubes (as soil and environmental effects were assumed to be uniformly applied).

The good spacing measurement indicates the precision of seed placement for the targeted interplant spacing (Table 1 and Figure 1). SpeedTube® seed tubes maintained a consistent good spacing of >99% across all planter speeds. With WaveVision® seed tubes, placement accuracy decreased as ground speed increased, from >99% at 5 mph to 93% at 10 mph. At 5 mph, good spacing was the same for both technologies. The harvest population was consistently higher with SpeedTube® seed tubes than with WaveVision® seed tubes at all planter speeds. With WaveVision® seed tubes, placement accuracy decreased as ground speed increased, from >99% at 5 mph to 93% at 10 mph. At 5 mph, good spacing was the same for both technologies.

The harvest population was consistently higher with SpeedTube® seed tubes than with WaveVision® seed tubes at all planter speeds. This could be related to the differences in good spacing between the two technologies. Inaccuracy in seed placement can result in multiples, skips, and misplaced seeds. Depending on the growing conditions, some of the multiples and misplaced plants will not make it to harvest, hence the differences in harvest population (Figure 1).
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Figure 1. Effects of ground speed on the performance of the two seed tube technologies.

**TABLE 1. FIELDVIEW® PLANTER PERFORMANCE REPORTS COMPARING THE TWO SEED TUBE TECHNOLOGIES AT DIFFERENT PLANTER SPEEDS.**

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Acres Planted</th>
<th>Average Population</th>
<th>Singulation %</th>
<th>Good Spacing %</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 mph SpeedTube®</td>
<td>0.5</td>
<td>32,176.4</td>
<td>99.3</td>
<td>99.4</td>
</tr>
<tr>
<td>5 mph WaveVision®</td>
<td>0.5</td>
<td>32,031.0</td>
<td>99.8</td>
<td>99.4</td>
</tr>
<tr>
<td>8 mph SpeedTube®</td>
<td>0.5</td>
<td>32,093.1</td>
<td>99.7</td>
<td>99.4</td>
</tr>
<tr>
<td>8 mph WaveVision®</td>
<td>0.5</td>
<td>31,982.4</td>
<td>98.5</td>
<td>94.7</td>
</tr>
<tr>
<td>10 mph SpeedTube®</td>
<td>0.5</td>
<td>32,057.5</td>
<td>99.6</td>
<td>99.3</td>
</tr>
<tr>
<td>10 mph WaveVision®</td>
<td>0.5</td>
<td>31,989.1</td>
<td>97.9</td>
<td>92.9</td>
</tr>
</tbody>
</table>
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Takeaways

- With the Precision Planting® SpeedTube®, precision placement is achieved by controlling the seed all the way from the meter to the furrow. Seeds are placed in a flighted belt and controlled down to the bottom of the furrow. The system matches the speed of seed travel with ground speed, thereby eliminating bounce and roll and more accurately placing the seed.6

- The window for the optimum planting date is often narrow, especially in large operations. The main value of these high-speed technologies is not about improved yields, but rather to deliver the same expected planter performance in a shorter time frame. These new technologies provide the ability to double a grower’s current planting speed without loss of performance.5

- For information on the effect of planter speed on yield, refer to the 2014 Huxley Learning Center trial, Effects of planter speed on corn seed spacing and yield potential.2 Several studies have shown that even though planter speed affects spacing accuracy, it doesn’t consistently affect grain yields.1,3,4 In the 2014 trial, yields decreased as ground speed increased from 4 to 10 mph. Note that the 2014 trial used the same seed meters and seed tubes.

Sources

2 Effects of planter speed on corn seed spacing and yield potential. 2014 Monsanto Learning Center Summary. 150330130816.
6 Wiles, M. 2015. How fast can we plant? www.farm-equipment.com/articles/11547-how-fast-can-we-plant

Websites verified 12/22/15

Legal

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