

Project Title: Precision Peanut Planter Kit to Improve Seed Metering and Placement

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Summary of Project:

A Precision Planter test stand was used to evaluate the singulation of peanut seed at different tractor speeds and vacuum settings on Monosem (MM), John Deere (JD) and Precision Planter (PP) row-crop meters. Emergence data was also collected after planting with a 2-row Monosem planter at 2 speeds and 2 seeding rates. In addition, seed were hand-planted at 1 ½ depth and 4 and 6 seed per foot. Seed at 4 and 6 seed per foot were run through the meter at 3 and 5 mph to ascertain the contribution of seed, meter and machine dynamics on the reduction of peanut plant emergence.

Accomplishments:

Planter Vacuum Effect on Emergence

Three seed meters were tested on a static test meter test stand with a peanut seed plate utilized by each. Each seed plate had a recommended level of vacuum for peanuts. Using that as a guide, we tested Georgia 06G seed through the three seed meters at 5 speeds, starting at 3 mph and increasing in 0.5 mph increments until reaching 5 mph, and 6 vacuum settings within the recommended ranges. The PP seed meter performed best at singulation over all speeds and vacuum pressures tested. Performance can mainly be attributed to the precision components, such as doubles eliminator and knockout wheel inside the meter. The John Deere seed meter performed better at the recommended vacuum range at 3.0 mph but required increase vacuum pressure at higher speed to provide good performance at higher speed. The MM meter was less sensitive to changes in vacuum pressure due to the vacuum regulation on the meter. The performance above 4.5 mph degraded significantly regardless of vacuum pressure.

John Deere Seed Meter

Target Vacuum (PSI)	Speed (mph)				
	3.0	3.5	4.0	4.5	5.0
6	89.5	89.6	85.9	82.8	80.9
8	91.3	90.6	88.4	88.7	88.1
10	91.7	93.1	91.8	91.5	88.9
12	91.9	92.8	92.5	91.0	90.9
14	89.9	92.1	92.3	93.3	92.0
16	89.5	89.6	93.7	93.1	93.1

Figure 1 Recommended vacuum settings

Monosem Planting:

We planted seed at 1 ½ inch depth at 3 and 5 mph and at 4 and 6 seed per foot using a 2 row Monosem planter. Each treatment was replicated 8 times. We counted emergence of plants daily until new emerging plants were not detected. As the figure shows, full emergence occurred at about 15 days. For all 4 treatments. Highest emergence was 6 seed per foot and 3 mph. The lowest emergence was 4-seed per foot at 5 mph. However, 4 seed per foot at 3 mph had a higher # of emerging plants than 6 seed per foot at 5 mph under these planting conditions.

Comparing Monosem to Hand-planted Peanuts:

We ran a series of tests to compare the changes in emergence when planting with the Monosem machine, hand-planting seed that were run through the seed meter, and hand-planting seed straight from the bag of seed. We were attempting to determine if the meter alone has an effect on emergence and if hand-planted seed were highest emergence. Using 16-foot long plots, we hand-planted seed at 1 ½ inch depth and counted emerging plants daily until new emerging plants were not detected. Percent of plants emerged were about 7% less when increasing seed through the meter at 6 seed per foot from 3 to 3.5 mph. There was only a 3% drop in emergence at 4 seed per foot and increasing from 3 to 5 mph. When comparing to the machine planted peanuts, it appears that at least 10% of the reduction in emergence was due to machine vibration and jerk of the machine in the field, that can cause skips and irregular placement of the seed.

Conclusions:

- JD seed meter was the most sensitive to vacuum with changes in speed.
- MM seed meter was not very sensitive to vacuum pressures at different speeds, largely due to the precision vacuum control at the meter itself.
- PP seed meter was the most consistent among all seed meters tested and exhibited high singulation performance even at increased speeds of 4.0 to 5.0 mph within the manufacturer recommended vacuum range. These data suggest that peanut planting speed can be increased above 3.0 mph by utilizing advanced seed meters and without any reduction in planting performance.
- About 10% of seed emergence reduction was attributed to machine dynamics in the field without adjusting vacuum on the MM planter.