

Seed Size Issues in Corn

Questions arise every year regarding effects of seed size and shape on plantability and yield potential. Following manufacturers' recommendations and considering tools to enhance plantability can help limit the risk of poor plantability. If plantability concerns related to seed size are managed properly, the effect of seed size may not significantly affect yield potential under most conditions.

Corn seed size or shape is not related to genetic yield potential. Research to evaluate the effect of corn seed size on yield potential has been conducted several times. A study from 1937 resulted in the same basic conclusions of several more recent studies: seed size does not affect yield potential under normal planting conditions. There are always exceptions to normal conditions, and to understand the effect seed size may or may not have on yield potential, it is important to understand how seed size is determined, how it might affect emergence and early growth, the importance of proper planter settings, and management techniques that may be used to help improve plantability of various seed sizes with different types of planters.

How is Seed Size Determined: Seed Production

Seed sizes from hybrid production will vary field to field, and year to year due to many factors. These include specific hybrid characteristics, parent tendencies, and growing conditions, especially during the pollination and fill period. Seed from a single ear falls into many size/shape categories. Large rounds usually come from the base of the ear, flats from the center, small flats and small rounds from the tip (Figure 1). Plateless seed usually comes from the base or the tip, but falls outside the weight ranges established by the grading system.

Effect on Emergence and Early Growth

There have been minor differences in emergence noted under adverse planting conditions. Large seed can have slightly decreased emergence rates in dry soil conditions as the amount of moisture needed for germination and emergence is relative to the size of the seed. Small seed can have slight decreased emergence in cool or crusted soils, as the amount of energy needed in those situation may exceed the amount stored in the endosperm. It has also been reported that differences in early growth related to seed size are not apparent by tasseling or soon after. Even with the potential effect on emergence and reduced early vigor, the effect of seed size on yield potential was not significant if harvest populations were similar.

Importance of Planter Settings

This is the area where seed size and shape does matter. Planter settings should be adjusted for accurate seed positioning,



Figure 1. Seed size and shape on a corn ear varies from large rounds (left; cob base), flats, to small rounds (cob tip).

placement, and the intended population. When set properly for the seed size, a planter can more accurately singulate and deliver seed. Planters that are not properly adjusted to seed size can deliver excessive numbers of doubles, triples, or skips, and can reduce grain yield potential by 3 to 10 bushels per acre. Populations that are under the desired stand count increase the risk of not producing maximum yield potential.

Vacuum Planters in General. Depending on if the planter is equipped with cell or flat disks, adjustments can be made to the vacuum pressure, cell size, and seed singulation devices that can affect plantability. Additionally, the use of talc or graphite can help improve seed flow and drop. When planting small seed, consider increasing the talc or graphite rate to account for the increased surface area with small seed. The importance of talc or graphite increases with high rates of seed treatments and/or humid conditions. Mixing the talc or graphite well throughout the hopper or tank can help provide adequate coverage. Another component to examine regardless of disk type is the way the disk is adjusted relative to the meter housing. Having the disk rub the housing with light contact can help improve singulation, reduce seed damage, and help load the planter drives, improving their consistency.

Vacuum Planters with Cell Disks. Historically, cell disks were standard with several vacuum planters. Seed is partially held in place by the cell and partially by the vacuum pressure.

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To aid plantability, different cell sizes and vacuum pressures can be combined to fit a given seed size and shape. Running a disk with cells that are on the larger end of the acceptable range for a given seed size may increase the potential for doubles, even if the vacuum pressure is on the lower side of the acceptable range. Additionally, running low vacuum pressures increases the risk that seed could be shaken off of the disk when planting over rough ground, resulting in increased skips. A preferred tactic is to use a disk with cells that are on the smaller end of the acceptable range and running vacuum pressures on the higher end of the acceptable range. The latter option helps reduce doubles as well as skips.

Vacuum Planters with Flat Disks. Recently, the adoption of the flat disk has increased as they are less sensitive to various seed sizes and shapes, thereby providing more consistent plantability with less need to adjust vacuum pressure (Figure 2). Two examples of flat disks include the John Deere® ProMAX 40 Flat and the eSet® system from Precision Planting. Generally there is an additional component or two that is needed for singulation when using flat disks. The ProMAX 40 Flat disk requires a double eliminator and a knock-out wheel. The eSet system uses non-adjustable singulator. While there are differences between the systems, they both greatly reduce

the need to adjust vacuum pressure to account for seed size and shape variations, thereby improving the plantability of various seed sizes and shapes.

Finger Pick-up Planters. Based on research conducted at the Monsanto Seed Technology Center in Waterman, Illinois, planter test stand indications for John Deere and Kinze® Finger Pickup planters show a tendency to overplant small seed, depending on the seeds per pound, the seed coating, and the seed shape. Singulation averaged around 95% to 96% for small seed and ranged plus or minus two to three percent from the average. Additionally, the Precision Finger Meter from Precision Planting was capable of delivering 98.5% singulation, on average, for small seed.

Planter speed is a major component of calibration and accurate seed placement. Planting at speeds faster than recommended in the owner's manual, may result in poor seed singulation and placement, which can adversely affect yield potential. Likewise, planting at speeds lower than the recommended range may result in a lower than intended population.

Keeping a finger pickup planter well maintained is a good way to help minimize planting errors. Some items to evaluate and adjust to manufacturer's specifications include:

- Proper tension on the fingers
- Meter brushes in good condition
- Carrier plate condition
- Seed delivery belt pliability
- Seed baffle cleaned
- Proper lubrication (graphite) rate
- Good alignment with meter drive and the lugs on the unit drive sprocket
- Well maintained and lubricated drive chains

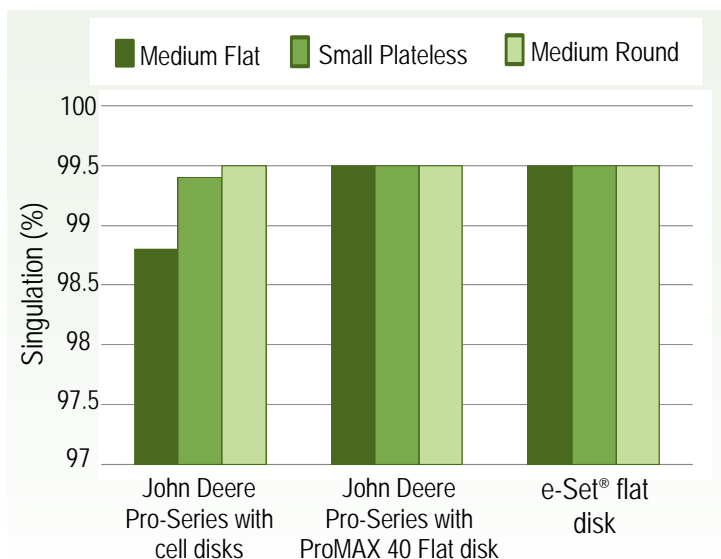


Figure 2. Singulation data from the Monsanto Seed Technology Center in Waterman, Illinois for various vacuum planter set ups and various seed sizes. (Data collected using seed harvested in 2004 through 2009 for planting seasons in 2005 through 2010 respectively.)

Summary

Overall seed size does not affect genetic yield potential. Having a planter set properly can improve your opportunity to achieve an optimal stand by minimizing skips, doubles and triples. Focusing on genetic yield potential, seed quality, increasing populations, and identifying planter settings that optimize plantability is helpful in increasing yield potential.

Sources: Elmore, R. and L. Abendroth. April 8, 2005. Do corn kernel size and shape really matter? Crop Watch Newsletter. University of Nebraska-Lincoln.

Nielsen, R. 1996. Seed size, seed quality, and planter adjustments.

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Monsanto data. 2010. Brian Urban, Waterman, IL. Seed Technology Center.

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