The Impact of Corn Seed Size on Yield Potential

- The size and shape of a corn seed does not affect its genetic yield potential.
- Corn yield potential is determined by the product’s genetics and can be dramatically affected by management practices and environmental conditions during the growing season.
- All seed, regardless of seed size, shape, or product, is subject to the same quality standards.

Does Seed Size Affect Yield Potential or Seed Quality?

Decades of research have aimed to evaluate the effect of corn seed size on yield potential. Conclusions from these studies have been consistent; corn seed size or shape is not related to genetic yield potential under normal growing conditions. However, seed quality, emergence, and early growth can be impacted by seed size and shape when certain environmental and management conditions are unfavorable, which may impact yield potential.

A variety of seed sizes and shapes can come from the same corn product. Large rounds typically come from the base of the ear, flats from the center, and small flats and small rounds from the tip (Figure 1). Plateless seed usually comes from the base or the tip.

The size and shape of a corn seed does not affect its genetic yield potential. All seeds from the same ear, regardless of size or shape, have the same genetic material, and thus the same genetic yield potential. Corn yield potential is determined by the product’s genetics and can be dramatically affected by management practices, such as planting into a well-prepared seedbed at the correct planting depth and under optimal conditions and ensuring proper soil fertility, and by environmental conditions throughout the growing season.

Seed quality is influenced by genetics, growing conditions in the seed production field, and handling after harvest, not by seed size or production location. Seed quality can vary relative to the placement of the seed on the ear if the growing conditions of the seed production field were not ideal. Stress often affects kernels at the ear tip more severely because they are often the last to be pollinated. Since small rounds come from the ear tip, this type of seed can have lower quality if the seed field experienced severe stress during the grain fill period. Large rounds may be more vulnerable to physical damage during the seed conditioning process because the embryo is more exposed than it is in other seed types. Growing areas are selected that provide the best environmental conditions for seed production and facilities are carefully managed to assure that quality is maintained through conditioning and handling. Externally validated quality management programs help to assure that all production activities deliver consistent products and quality to customers.

Effect of Seed Size and Shape on Emergence and Early Growth

There can be differences in germination related to seed size when conditions during and immediately after planting are not ideal. Large seed may not germinate as well in dry soil conditions because large seed requires more moisture to germinate compared to small seed. Small seed may not germinate as well in cool or crusted soils because the energy needed for emergence may be greater than the amount stored in the seed. After tasseling, differences in germination related to seed size are usually no longer apparent. Regardless of seed size and shape, similar silking dates and yield potential are expected when established stands are the same.

Understanding Quality Control

All seed lots are tested to ensure that the seed adheres to industry-leading quality standards. Seed lots are tested prior to processing to determine their initial quality and then again once packaging is complete to ensure they pass specifications. Some of these tests are needed to meet legal requirements and some are to meet industry or internal quality standards. Before any seed is sold, it goes through cleaning, processing, and a rigorous quality control process as outlined below:

**Germination (Warm) Testing** (warm germination test, viability test, tag test, date test). The germination test measures the germination potential of the seed lot by planting seeds under ideal temperature and moisture conditions. The percent germination that is listed on the seed tag (Figure 2) is determined by the germination test. This test is standardized across the industry and can provide a consistent measure of quality for customers when they purchase seed.

**Vigor (Cold) Testing** (cold test, saturated cold test, soak test). The vigor test measures the ability of the seed to emerge rapidly and uniformly under stressful cool and wet soil conditions in order to identify seed lots with lower performance. This test is not standardized across the industry and vigor test scores should not be compared between different seed testing laboratories and across different seed companies. Internally developed...
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vigor tests expose seeds to high-stress conditions in order to ensure that standards of germination percentages and emergence rates are met by each seed lot and to help identify and position the top performing seed lots in the marketplace.

- **The emergence rating** is a separate rating found in the seed guide which reflects a combination of the warm and cold germination test results as well as the plant’s genetic predisposition for responses to environmental factors like soil conditions, seedling diseases, and other factors that can affect germination and emergence.
- Germination and vigor tests do not predict actual field performance. The germination test indicates the potential of the seed to germinate under ideal conditions and the vigor test indicates the probability of seed germination under stressful conditions. Many environmental conditions that are not part of these tests, such as soil type, soil compaction, planting depth, and seed-to-soil contact, can have a direct impact on actual field performance.

**Physical Purity Testing** (batch purity, seed purity, label purity). The physical purity test is conducted to ensure that there are no contaminants in the seed lot. Physical purity tests often address the following components: percentage of pure seed, weed seed, noxious weeds, and inert matter (Figure 2). This test is standardized across the industry to provide a consistent measure of quality for customers when they purchase seed.

**Genetic Purity Testing** uses molecular analyses to ensure that the product contains the labeled traits (herbicide tolerance, B.t. traits) in the correct germplasm.

**Storage Considerations.** The two most important factors that affect seed viability are moisture and temperature. After cleaning, processing, and quality control, all corn seed is stored in moisture resistant packages and temperatures are carefully monitored during storage to ensure the best environment for maximum seed viability. Though seeds can remain viable for several years when stored properly, germination testing is conducted every six months according to federal seed law requirements to assure that US farmers get viable seed with every purchase. Dealers and customers should also take the necessary steps to prevent their seed from being exposed to moisture, high temperatures, rodents, or other pests.

You can be confident that the seed you purchase is of very high quality. All seed, regardless of seed size, shape, or product, is subject to the same quality standards.

**Management of Different Seed Sizes**

It is becoming more common for seed companies to sell seed based on weight as opposed to size. Farmers often purchase specific seed weights or sizes based on how their planter is configured. When purchasing corn seed by weight, it is important to review the seed bag labels and your planter manufacturer’s recommendations and talk with your seed brand agronomist or representative for information on dealing with different sizes and weights of seed, planter specifications, and proper field placement. When properly managed and properly positioned, corn seed of any size and weight can produce a successful crop.

- Select products based on genetics and seed size if there are concerns about planters or seed placement.
- Planter settings should be adjusted for accurate seed positioning, placement, and seeding rate based on the size of the seed. When adjusted for seed size, a planter can more accurately singulate and deliver seed. Planters can deliver excessive numbers of doubles or skips when improperly adjusted for seed size.
- Plant seed according to soil temperature and moisture conditions. If there are concerns about seed size and germination, consider waiting to plant until conditions are conducive to rapid germination and emergence.
- Understand the soil types in your field and their effect on seedling emergence and early growth.

Sources
Nielsen, R.L. 1996. Seed size, seed quality, and planter adjustments. Purdue University. www.agry.purdue.edu/
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For additional agronomic information, please contact your local seed representative. Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible. ©2016 Monsanto Company. 160126095249 042716CAM