



Handling Low-Germination Soybean Seed

// Seed Size

While seed size is influenced partially by genetics, the environment during seed fill plays a larger role. Small and large seeds of the same soybean product have the same genetic material; therefore, the same yield potential. Seed size does not affect germination or emergence under most conditions. However, in extreme situations, differences may be observed. Large seed may be able to survive a longer period of time prior to emergence under adverse weather conditions, due to a larger energy reserve. However, the size of cotyledons increases with seed size; therefore, large seeds require more energy to emerge from the soil. Larger seeds may also suffer from reduced emergence relative to small seed under extremely dry soil moisture conditions.

// Common Soybean Appearance Problems

Environmental and disease issues from each growing season, combined with a few storage challenges postharvest, can lead to some seed beans with poor appearance. However, poor appearance is not necessarily an indicator of poor quality. Likewise, almost perfect looking seed can have poor germination. Conditions such as drought, aphids, bean leaf beetles, a quick harvest drydown, viruses, and other pathogens may lead to various conditions that can cause poor seed appearance. Low harvest moisture can increase the chances of mechanical damage from handling during conditioning and packaging. Rapid shutdown of soybean plants at harvest can create immature green seeds. Excess moisture in bins can contribute to surface mold on seed.

Germination rate, not appearance, should be the focus as several conditions that cause poor seed appearance and surface mold do NOT affect germination. Seed selection should be based on agronomic characteristics (disease tolerance, standability, maturity) rather than seed appearance or size. Year-to-year variations and individual production

environments can influence seed size within the same product. To help maximize yield potential, proper planter adjustments and maintenance should be addressed to plant the desired seeds at the appropriate rate.

Table 1. Soybean appearance problems.

Name	Description
<i>Seed Coat Damage</i>	It can occur during harvest and handling when seed is dry and humidity is extremely low. Seed should be handled gently to reduce mechanical damage.
<i>Growth Marks</i>	Growth Marks usually result when the seed coat does not close completely. The cause is not entirely understood, but is believed to result when the seed embryo develops faster than the seed coat.
<i>Bleeding Hilum</i>	It is also known as seed coat mottling, can be caused by specific genetics, stresses during seed development, or by soybean mosaic virus. Bleeding hilum does not indicate that the virus is present in the seed. Transmission of the soybean mosaic virus from seed to plant may be less than 5 percent. ⁵
<i>Purple Seed Stain</i>	Purple Seed Stain occurs when <i>Cercospora kikuchii</i> causes a purple seed discoloration. In cases with mild seed infection, the coat may be shed before seedling infection can occur. In more severe cases, it can be transmitted from the seed coat to the seedling at germination and the infected seedlings may show a reduction in growth. ⁶ Soybean seed treatments can help prevent transmission of the fungus to the seedling.
<i>Green Coloring</i>	Green Coloring can be found in areas hit by an earlier than normal frost. The green tint occurs because the chlorophyll has not dissipated entirely. The coloring has no effect on quality if the seed is fully mature.



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// General Guidelines for Handling Low Germination and Sensitive Soybean Seed:

- Limit any additional handling of low germination seed as it is especially sensitive to damage.
- DO NOT apply any additional seed treatments to this seed. The compounded effect of more handling will decrease quality.
- DO NOT throw or drop seed bags. This applies to all soybean seed bags as this action can damage seed coats and reduce germination by as much as 10%.
- Operate augers slow and full when handling bulk seed. Avoid the use of steel augers: conveyors or brush augers are preferred. This will help lessen seed bounce and excessive damage.
- Limit seed drop as much as possible to avoid damaging fragile seed coats.
- Consider installing some type of soft surface for beans to land on in a tender, drill, etc. rather than a hard, steel surface.

// Low-Germination Soybean Seed and Seeding Rate

Both historically and currently, a healthy, consistent, and uniform stand of 100,000 plants per acre (ppa) is generally considered the threshold for replant situations.¹ Often 100,000 to 125,000 ppa at harvest has been shown to allow optimum profitability and maximum yield potential.¹ While the threshold for replant situations may be around 100,000 ppa, the seeding rate recommendations to help attain maximum profitability and/or yield potential vary by geography and local conditions. Follow local university recommendations for desired plant populations.

Since germination in some seed lots may be below the normal 90 percent, seed tags should be checked for each seed lot planted to determine the germination percentage and seed size. Drills and planters should be adjusted for each seed lot to help provide an adequate plant population. A general formula to determine seeding rate is:²

Desired Plant Population

$$\text{Percent Germination} \times \text{Percent Pure Seed} \times \text{Percent Live Seed Emergence}$$

The percent live seed emergence estimate is not provided on the seed tag and is an arbitrary number determined prior to planting. The estimate should be determined on a field by field basis and is dependent on variables such as the type of planter or drill, field conditions, planting depth, etc. Typically 90 percent is a good rule of thumb, but should not be used in all situations. When managing low-germination soybean seed, it is important to achieve a good stand the first time and avoid situations where it becomes necessary to replant. It is also important to reduce the stresses when planting low germination soybean seed, particularly in cold and/or wet soils. Seed lots with higher germination percentages should be planted first leaving low germination seed lots for later in the planting season when conditions are more ideal.

// Soybean Seed Treatments

Soybean seedling diseases may result in reduced plant stands, poor plant vigor, and lower yield potential. A fungicide treatment product, such as Acceleron® Seed Applied Solutions for soybean, can be effective at protecting seeds and young seedlings from many seedborne and soilborne pathogens. Fungicide treatments will not improve germination of seed that has reduced quality, but may protect the seed from soil pathogens



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if the seed is planted into cold and/or wet soils. Acceleron Seed Applied Solutions contains advancements in seed treatment technology, including multiple modes of action, broad-spectrum of control of insects and diseases with increased length of protection. Acceleron Seed Applied Solutions provides control for the diseases Pythium, Phytophthora, Fusarium, and Rhizoctonia, and protection from key insects, such as bean leaf beetle, soybean aphid, seed corn maggot, wireworm, and white grub. The protection provided by Acceleron Seed Applied Solutions can last for up to 30 days. Acceleron Seed Applied Solutions Insecticide/Fungicide for soybeans will contain the fungicides pyraclostrobin for Fusarium and Rhizoctonia control, metalaxyl for Pythium and Phytophthora control, fluxapyroxad for control of Fusarium and Rhizoctonia, as well as the insecticide imidacloprid which provides both above- and below-ground insect protection.

// Summary

Seed size and seed appearance is largely influenced by environmental conditions and handling. However, seeds of the same soybean product have the same genetic yield potential. It is important to read the seed tag for each bag or unit and adjust seeding rates as necessary for low germination seed lots. Plant soybeans when soil conditions are suitable and consider a seed treatment to help protect soybeans from seedborne and soilborne pathogens.



Figure 1. Soybean emergence. (Top - left, right) Soybean seeds began to imbibe water; however, dry conditions arrested germination. Soybeans need to imbibe 50 percent of their weight in water before germination.³ (Bottom - left, right) Cotyledons must have enough energy reserve to get the first true leaves to the surface where photosynthesis can take over. Soil conditions such as crusting can sometimes hinder emergence.

Sources

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- 4 Ranathunges, K., Shao, S., Qutob, D., Gijzen, M., Peterson, C.A, and Bernards, M.A. 2010. Properties of the soybean seed coat cuticle change during development. *Planta*. Vol. 231:1171-1188.
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Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields.

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