



Handling Low Germination Soybean Seed

Appearance May be Deceiving

Environmental and disease issues from each growing season, combined with potential storage challenges postharvest, can lead to seed beans with poor appearance. However, poor appearance is not necessarily an indicator of poor quality. Likewise, unblemished 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. 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. Soybean seed appearance problems that can occur include:

Seed coat damage can occur during harvest and handling when seed is dry and humidity is extremely low. Seed should be handled gently to reduce mechanical damage.

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.

Bleeding hilum, 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 five percent.¹

Purple seed stain occurs when the fungus *Cercospora kikuchii* causes a purple seed discoloration (Figure 1). 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. Soybean seed treatments can help prevent transmission of the fungus to the seedling.²



Figure 1. Seeds with purple seed stain can be treated with fungicide treatments to help prevent the infection from passing to seedlings.

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 does not affect quality if seed is fully mature.

Seed size is influenced partially by genetics, but the environment during seed fill plays a larger role. Small and large seeds of the same soybean products have the same genetic material; therefore, the same yield potential. Seed size does not affect germination or emergence under most conditions. However, in adverse conditions large seed (with a larger reserve) may be able to survive a longer period prior to emergence.

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Seed Treatments

Germination tests and a sense of the incidence of fungal infection are helpful pieces of information when determining seeding rates and if a fungicide seed treatment would be beneficial. Even with seed treatment products, severely infected or moldy seed do not germinate.³ According to Iowa State University, poor quality seed could have a 10 to 15 percent improved germination rate when treated with the appropriate seed treatments.⁴ Seed treatment selections should be based on diseases present on the seed and the history of seedling diseases in the field.

Low-Germination Soybean Seed and Seeding Rate

A healthy, consistent, and uniform stand of 100,000 plants per acre (ppa) is generally considered a healthy stand.⁵ 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. Proper planter adjustments and maintenance should be addressed to plant the desired seeds at the appropriate rate. A general formula to determine seeding rate is:⁶

$$\frac{\text{Desired Plant Population}}{\text{Percent Germination} \times \text{Percent Pure Seed} \times \text{Percent Live Seed Emergence}}$$

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 stress 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.

Handling Low Germination or Sensitive Soybean Seed

The general guidelines for handling low germination or sensitive soybean seed:

- Limit any additional handling of low germination seed as it is especially sensitive to damage.
- 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% (Table 1).
- Consider installing some type of soft surface for beans to land on in a tender, drill, etc. rather than a hard steel or plastic surface.



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Table 1. Seed moisture and the effect of drop height on germinability of soybean seed dropped onto a hard surface.

Moisture Content (%)	Height of drop (ft)				
	0	5	10	10 (dropped twice)	20
	% germination				
8	98	88	78	65	70
10	98	90	82	73	73
12	98	97	94	88	87
14	98	97	97	96	97

Source: Delouche, J.C. Maintaining soybean seed quality. Soybean, Production, Marketing and Use. Mississippi State University. Bulletin Y-69.

Bulk Soybean Seed Handling

The efficiency of handling soybean seed in bulk has led to increased productivity with less down time associated with refilling planters, drills, and air seeders. Augers transfer 10 to 15 bushels of seed per minute. A risk of up to five percent seed germination loss can occur as conveyors and augers transfer 10 to 15 bushels of seed per minute.⁷ Equipment should be in good condition; worn augers, especially those made of steel, can cause even greater grain damage. Worn bearings or motor mounts can cause augers to wobble within the tube. Consequently, the increased grain contact with flighting edges increases damage to seed.

Belt conveyers can run five to eight feet per second and should have padding at the nose of the conveyor.⁷ This padding cushions the impact of high velocity seed deflection during conveyor exit. Without padding, seed transferred by a conveyor belt had notably lower germination compared to seed not handled through any bulk methods in an experiment at The Ohio State University.

Keeping the auger well supplied with seed while slowing down the speed minimizes seed damage. Augers can make 500 to 700 revolutions per minute (rpm). Auger speeds reduced from 800 rpm to 370 rpm led to improved germination rates of five and seven percent for steel and brush augers, respectively (Table 2).

Table 2. Average percent soybean germination with different auger speeds and types.

Auger Type	Speed (rpm)		
	370	525	800
Brush	85.5	80.8	78.5
Steel	85.5	80.8	80.5
Plastic Cupped	84.0	86.0	82.0

Source: Darr, M., Rethmel, B., and Reeder, R. Impact of bulk seed handling on soybean germination rate. The Ohio State University.

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 handle soybeans gently throughout the bulk handling process and adjust seeding rates and seed treatment products on a field by field basis.

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Sources

¹Giesler, L.J. Soybean mosaic virus. University of Nebraska-Lincoln. <https://cropwatch.unl.edu/plantdisease/soybean/mosaic-virus>.

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⁴Bradley, C., Mueller, D., Smith, D., Conley, S., and Wise, K. 2019. Soybean seed quality considerations for 2019. Crop Protection Network. <https://cropprotectionnetwork.org/>.

⁵Anderson, M., Vittetoe, R., Licht, M., and Rieck-Hinz, A. Stand assessments – soybean. Iowa State University Extension and Outreach.

⁶Robinson, A.P. and Conley, S.P. 2007. Plant populations and seeding rates for soybeans. AY-217-W. Purdue University Extension. <http://www.extension.purdue.edu>.

⁷Darr, M., Rethmel, B., and Reeder, R. Impact of bulk seed handling on soybean germination rate. The Ohio State University.

Sources verified 8/10/2020

Legal Statement

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. 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. ©2020 Bayer Group. All rights reserved. 2003_S2

