

Conditions that Impact Soybean Germination and Emergence



Depending on many factors from the previous fall, soybean seed quality may be impacted, which may result in lower germination rates.

After focusing on bringing your seed from hopper to soil, now is the time to evaluate soybean stands. Several issues can impair germination and emergence; however, not all of them affect yield potential. In some cases, action can be taken in the spring to make soybean stands the best they can be.

This article features several common issues related to soybean emergence and germination. The text is organized to help you identify the problem (What You See) and the possible solutions (What You Do).

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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Conditions that Impact Soybean Germination and Emergence:

HERBICIDE INJURY



Figures 1 and 2: Soybean seedlings with flumioxazin damage and atrazine or metribuzin carryover. Photo on left taken by Travis Legleiter, Purdue University.

WHAT YOU SEE

- Sulfentrazone and flumioxazin herbicides are PPO inhibitors (Group 14).
 - Necrotic lesions on cotyledons and the hypocotyl, malformed leaves, and occasionally death of the primary stem.
 - More severe in poorly drained, low spots in fields.
- Acetochlor, metolachlor, dimethenamid, and pyroxasulfone herbicides are long-chain fatty acid inhibitors (Group 15).
 - Heart-shaped leaflets
 - Less likely to cause soybean injury than the Group 14 herbicides.
- Metribuzin herbicide is a photosystem II inhibitor (Group 5).
 - Interveinal chlorosis and necrosis on emerged leaves.
 - Symptoms occur on unifoliate and first trifoliate leaves, not later-emerging leaves.
 - Risk increases in fields with high pH soils due to greater availability of the herbicide.
- Pendimethalin and trifluralin herbicides are mitotic inhibitors (Group 3).
 - Swelling of the hypocotyl, reduced root growth, delayed emergence.
 - More likely in cool, wet soils where emergence is slowed and more herbicide is absorbed by the emerging seedling.

WHAT YOU DO

- Soybeans are more sensitive than corn to herbicide carryover.
- Pre-emergence herbicides used in soybeans are either contact or xylem-mobile and the growing point is usually not affected.
- Stand counts can be taken and recovery documented over the next few weeks.
- Plants that are girdled or have a damaged apical bud are more severely damaged and may not have full recovery.
- Avoid field operations that could place additional stress on the crop.
- Avoid tank mixes with flumioxazin + pyroxasulfone prior to heavy rains.

Source: Hartzler, B. 2017. Evaluating herbicide injury on soybean. Iowa State University.
<https://crops.extension.iastate.edu/>

Conditions that Impact Soybean Germination and Emergence: COLD TEMPERATURES

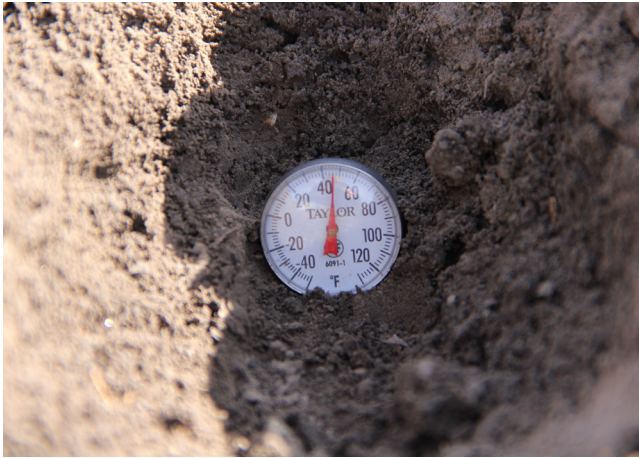


Figure 3: Image of soil thermometer.



Figures 4 (left) and 5 (above): Water-soaked cotyledons may be visible about a day after plants are exposed to temperatures between 28 to 32°F.

WHAT YOU SEE

- Cold soil temperatures (less than 40°F) increase the risk of imbibitional chilling, which results in loss of seed vigor or death.
- Symptoms of water-soaked leaves, hypocotyls, or cotyledons 24 to 36 hours after temperatures between 28 and 32°F occur.
- Damaged plants eventually blacken and wither.
- Severely damaged plants may have girdled hypocotyls or dying buds.

WHAT YOU DO

- Wait to plant until soil temperatures are at least 50°F.
- Avoid planting 24 hours before a cold rain is forecasted.
- Assess plant survival 48 to 96 hours after the frost event.
- If significant stand loss occurs from damage, replanting can be considered if the estimated yield potential of the existing stand is greater than the yield potential of a replanted crop.

Source: Licht, M. and McGrath, C. 2014. Imbibitional chilling and frost damage to corn and soybean seedlings. Iowa State University. <https://crops.extension.iastate.edu>.

Conditions that Impact Soybean Germination and Emergence: SOIL CRUSTING

WHAT YOU SEE

- Planting into dry soil with rainfall or irrigation occurring too soon after planting can result in soil crusting and poor emergence.
- Fields with fine-textured soils, low organic matter, and little surface residue can be prone to crusting.
- During emergence, hypocotyls become swollen or break when trying to push through the crust.
- A broken hypocotyl usually results in seedling death.

WHAT YOU DO

- Avoid excessive tillage.
- If irrigation is required for good soil moisture, it should be applied ahead of soybean planting and not immediately after planting.
- A light rotary hoe operation can be done to break up the soil surface. Try to do this during the heat of the day when plants are less brittle, and avoid the vulnerable 'crook stage'.
- Plant smallest-sized soybean seed in fields prone to crusting. Smaller seeds produce smaller cotyledons that may more easily lift out of the soil.
- Plant fields in 28- or 30-inch rows. Seed spacing is usually close enough within the row to help crack the crust and help each other emerge.

Source: Staton, M. 2018. Improving soybean emergence in soils prone to crusting. Michigan Farm News. <https://www.michfb.com>.

Conley, S. and Gaska, J. Delayed soybean emergence and cotyledon loss. University of Wisconsin. http://www.coolbean.info/pdf/soybean_research/early_season/Delayed_soy_emergence.pdf



Figure 6. Occasionally, one or both cotyledons can be pulled off as the hypocotyl struggles to break through the crust. Having no cotyledons means the seedling will likely die; however, negligible yield loss is expected if only one cotyledon breaks off.



Figure 7: Seedlings with broken hypocotyls do not survive. Photo provided by Shawn Conley, University of Wisconsin

Conditions that Impact Soybean Germination and Emergence: DISEASES

WHAT YOU SEE

- Seed rot (pre-emergence damping off).
- Death of seedlings as they emerge (post-emergence damping off).
- Seedlings dying in patches or individually.
- Less vigorous plants or stand loss in areas that are compacted and/or poorly drained.
- Rotted roots make seedlings easy to pull from the ground.

WHAT YOU DO

- Apply seed treatments containing fungicides.
- Plant when soil temperatures are 50°F or greater.
- Longer rotations, preferably to a non-host crop between soybean crops.
- Seedlings may be affected by more than one disease; consider sending injured and diseased seedlings to a diagnostic lab.
- Know which strains of phytophthora are common in fields to determine the type of resistance needed in soybean products.

Source: Wise, K., Bradley, C., et al. 2015. Soybean seedling diseases. Crop Protection Network. CPN-1008.

Smith, D. Phytophthora root and stem rot. University of Wisconsin-Madison.



Figure 8: Early pythium infection; soybean hypocotyls may become girdled or mushy, indicating disease.



Figure 9: Alternatively, pythium may be noticed as a loss in plant stand when a close-up look at soybean stands reveals seedlings died after emergence.

Conditions that Impact Soybean Germination and Emergence: INSECTS

WHAT YOU SEE

- Seedcorn maggot feeding on sprouting seeds and tender seedlings in soils with high organic matter and longer periods of cool, humid weather.
- Overwintering bean leaf beetle feeding on cotyledons, stems, and foliage.
- Early-season soybean aphid damage.

WHAT YOU DO

- Apply seed treatments containing fungicides.
- Plant when soil temperatures are 50°F or greater.
- Longer rotations, preferably to a non-host crop between soybean crops.
- Seedlings may be affected by more than one disease; consider sending injured and diseased seedlings to a diagnostic lab.
- Know which strains of phytophthora are common in fields to determine the type of resistance needed in soybean products.

Source: 2009. Bean leaf beetle. Purdue University. Field Crops IPM. <https://extension.entm.purdue.edu>.



Figure 10: Seed corn maggot is a threat to early stands.



Figure 11: Foliar or cotyledon feeding may indicate the presence of bean leaf beetles or aphids.

Conditions that Impact Soybean Germination and Emergence: PLANTER MALFUNCTION

WHAT YOU SEE

- Planted into wet soils with too much down pressure on gauge wheels.
- Planting deeper than 1.5 inches.
- Restricted lateral root growth, slower nodulation, seed slot opens and exposes seed.
- Slow emergence, long hypocotyls, cotyledon energy is spent by the time of emergence

WHAT YOU DO

- Squeeze a ball of soil in your hand. If it crumbles after being squeezed, this indicates that the field is dry enough for machinery.
- Set your planting depth anywhere between 0.75 and 1.25 inches deep

Source: Conley, S. 2011. Soybean emergence and germination common issues. University of Wisconsin.



Figure 12: A ball of soil that crumbles after being squeezed in your hand indicates a field is dry enough for machinery.



Figure 13: The planting depth for soybean should be 0.75 to 1.25 inches deep.