

# Mechanical Damage in Soybeans

Mechanical damage to soybean seed is an annual issue greatly influenced by field dry down and seed moisture during harvest. Field weathering (wetting and drying) causes cotyledons to expand and contract often stretching the seed coat. As the seed normally dries down the seed coat becomes more “plastic” and less “elastic” so continued wetting and drying can cause seed coat cracking or “checking” which can lead to broken seed coats or “splits”. Other factors that can cause mechanical damage are: improper combine operation, low seed moisture, high-impact handling (augers and grain vacuums) and cold weather handling/conditioning.

## SEED MORPHOLOGY

Soybean seed is predisposed to mechanical damage, since the embryonic axis is an exposed outer surface making it vulnerable to damage from impacts (Figure 1.) and bruising. Low seed moisture, <10%, also makes the seed and seed coat more prone to cracking, while high seed moisture may result in bruising that reduces germination by accelerating deterioration. Large-seeded varieties are often more susceptible because the seed coat is often thinner, or under more stress, and are often pinched between moving parts, resulting in more damage. Handling seed at low temperatures, <20°F will often result in more mechanical damage and reduced quality.

## SEED COAT INTEGRITY

A strong and intact seed coat is fundamental in reducing mechanical damage. Impacts and field weathering can greatly decrease coat integrity and facilitate damage to the embryonic axis. The protein-packed cotyledons have a high affinity for moisture uptake and will expand and contract dramatically, putting pressure on the seed coat which stretches and weakens the coat. When the cotyledons dry and shrink the seed coat also shrinks, but is now more prone to damage, which can lead to embryonic axis damage, expressed in laboratory tests as abnormal seedling growth. The hypochlorite soak test, or the hot coffee soak (Figure 2.) detects damage to seed coats.



**FIGURE 1.** Circled seedlings are showing mechanical damage



**FIGURE 2.** Hot coffee soak test, oblong seeds showing seed coat damage

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## REDUCING MECHANICAL DAMAGE

The key to reducing damage (Figure 3.) begins with proper combine operation, especially as it affects susceptible seed lots, thus reducing handling and impact injury. Several steps to help minimize damage are: using belt conveyors and bin ladders, minimizing drops, minimizing conditioning to essential steps only, and reducing returns over gravity tables.

## TESTING

We recommend the sand test (Figure 4. and 5.) as the best test for evaluating seed lots with mechanical damage. Sand allows uniform water uptake and is a medium similar to field conditions for seedling development. If the primary root has been damaged, sand facilitates development of roots and a positive geotropism. When analysts evaluate sand tests they pull on seedlings to determine if sufficient root development has occurred. If the sand test germination is below 85% at seven days, we extend the test two additional days (AOSA Rules do allow this two-day extension). Reevaluating the germination at nine days can improve germination scores by as much as 5% and may more accurately reflect field performance.

## REFERENCES

Iowa State University Seed Science Center, 1992.  
Hypochlorite Test for Soybeans.

Please do not hesitate to contact us if you have questions or quality concerns.

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**FIGURE 3.** Normal (left) and abnormal seedlings (right)



**FIGURE 4.** Sand test for soybeans after 7 days at 25C



**FIGURE 5.** Close up view of seedlings in a sand test after 4 days at 25C