

SETTING COMBINES FOR BEST SOYBEAN SEED QUALITY AT HARVEST

A POCKET GUIDE



Definition of ‘quality’: ‘Seed quality’ and ‘Grain damage’ mean different things to different customers. Three different methods are used to define seed damage.

1. USDA Soybean Grading Standards

These standards are used by elevator operators to grade field beans. The 10/64 x 3/4 in. any matter that passes through an 8/64 in. round-hole sieve and all material other than soybeans remaining on the sieve after sieving.

2. Visible Damage Check

This check is used by seed producers and Iowa State agricultural engineers for combine performance evaluation. A sample is sub-divided with a Boerner Divider to procure a 100 to 200 gram sub-sample. The sub-sample is screened through the 10/64 x 3/4 in. sieve, and then the material on top is examined for visible damage— i.e. damage discernible to the trained eye. Usually we have two people perform separate samples on any given batch from the combine tests, and average the readings. ‘Splits + visible damage’ is the main criterion used for soybean damage assessment in our engineering work.

3. Chemical Solution Tests.

Chemical solutions are used to reveal seed coat damage and other defects. Chemical tests include soaking, dye, and germinability. We do not regularly conduct chemical tests at Iowa State on our engineering soybean samples, simply because of the time each sample involves. The chemical soak or dye tests reveal more visible damage to seed coats than a visual damage check.

Combine settings and seed damage, sample purity:

Seed damage is caused by impact, pinching and shearing. That can take place not only in the thresher but in grain handling equipment as well. Augers for example are not the best way to move soybeans if damage is to be minimized. Where augers are deployed, *they need to be kept full* to reduce damage! Seed damage can even start in the header cross auger. The dominant combine setting affecting soybean seed damage is cylinder or rotor speed, but other settings are relevant, as listed below. Grain damage tends to increase with the thresher speed squared, so the optimal thresher speed is the slowest cylinder or rotor speed that will shell the pods with acceptable loss levels. Damage also increases at lower moisture contents (<10%) as well as at excessive moistures (>14%). USDA recommends harvesting soybeans at approximately 12% moisture.

Assuming that the machine is *run in* (more than 50 separator hours), here’s a systematic procedure to minimize seed damage:

Start with the settings in the operator’s manual first. Make only one adjustment at a time. Bear in mind that an under-loaded machine will increase grain damage.

1. Gathering Head: Use a floating cutterbar for lowest losses at the front !

Check gathering auger and remove sharp edges from the cross auger flighting.

Cross auger clearance: about 5/8 in., or 15 mm above platform floor.
Keeping the machine loaded with crop reduces damage.
Even crop feeding improves quality.

2. Feeder House:

Grind/smooth any sharp leading edges from the feeder chain slats.

3. Thresher:

Remove/smooth down all sharp edges.

Start with the low speed recommendation in the operator's manual.

Tip speed should typically be 3500 ft/minute (range 2400-5000 ft/min peripheral speed, depending on crop conditions). On a 30inch rotor machine, 3500 ft/min would mean running the thresher at 445 rpm.

Do *not* use surface chrome plated wear parts such as thresher bars for vulnerable crops. The reason is that on chrome-plated wear parts, the brittle plating tends to chip and the underlying material wears away, exposing the hard thin sharp chrome edge which will damage grain. Components made of entirely of chrome alloy on the other hand get better with wear, while chrome-plated parts only get worse. Chrome alloy wear parts are desirable for food and seed grade crops, especially if first conditioned in less delicate harvesting conditions - they maintain their rasping ribs.

Removing concave wires may be desirable for earlier escape of seeds through the concave. Round rod concaves bars are gentler than rectangular concave bars, if that is an option.

Open concave clearance in small increments to reduce damage. Typical settings are around 3/4 inch open.

4. Cleaning System etc:

Remove any perforated screens under elevator doors, cross augers, or the unloading auger tube.

Check wear on front grain pan auger bearings, defective bearings cause augers to droop and pinch grain.

Increase the fan speed slightly.

Open the chaffer (upper sieve) wide enough, say 5/8" to prevent grain from getting carried to the returns system. Open lower sieve only slightly eg 1/4 to 3/8" to allow the clean grain to flow to the grain tank instead of entering the tailings returns system.

Typical manufacturer chaffer settings are 5/8 in. and sieve settings 3/8".

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