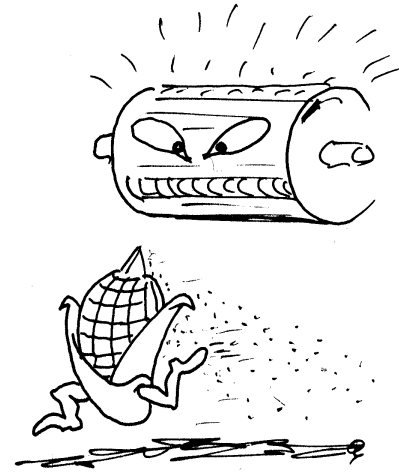


SETTING COMBINES FOR BEST SEED AND FIELD CORN QUALITY AT HARVEST

A POCKET GUIDE



Definition of ‘quality’: ‘Seed quality’ and ‘Grain damage’ mean different things to different customers, particularly for corn. First there are the USDA corn grading standards, which are used by elevator operators to grade regular corn. The 12/64 sieve test is used to identify and measure broken corn and foreign matter (BCFM); at the same time, the elevator operator examines the sample on top of the sieve superficially, looking for any kernel breakages and trash that did not pass through the sieve. Second, there is the visible damage check, used by seed producers, and which we use at Iowa State for combine performance evaluation. This involves carefully sub-dividing the bin sample with a Boerner divider to procure a 100 to 200 gram sub-sample. That sub-sample is screened through the 12/64 round hole sieve for BCFM, then the material on top is examined kernel by kernel for visible damage ie damage discernible to the trained eye. Usually we have two people do separate samples on any given batch from the combine runs, and average the two readings.

Thirdly, there is a green dye test. We do not regularly conduct green dye tests in Agricultural Engineering on our corn samples because of the time each sample involves. Dye tests reveal more visible damage. There is an escalation in scale of damage levels measured from a given sample of corn. For example the ratio of damage at the “normal” combine thresher speed is approximately 1 : 10 : 20 for the BCFM : Visible Damage : Green Dye measurements respectively. Visible damage is main criterion used for corn kernel damage and quality assessment in this document.

Combine settings and grain damage, sample purity:

Damage comes from impact, pinching and shearing of grain. That can take place not only in the thresher but in grain handling equipment as well. Augers are *not* the best way to move grain if damage is to be minimized. Where augers are deployed, they need to be kept full to reduce damage ! The dominant machine setting affecting grain damage is cylinder or rotor speed, but other settings are relevant, as below. Grain damage tends to increase with [thresher speed]², so try to operate at the lowest cylinder or rotor speed that will shell off the most grain with acceptable loss levels. Damage to grain can start right at the head itself. Corn is more susceptible to damage at higher moisture contents, so harvesting at say 15 to 22% kernel moisture level is advantageous.

Assuming that the machine is *run in*, ie with more than fifty hours on the separator, here’s a systematic procedure to minimize damage:

Start with the settings in the operator’s manual first. And make only one adjustment at a time. Bear in mind that an underloaded machine will damage grain more.

1. Corn Head: Slow down stalk roll speeds: match to travel speed
Move snapping plate openings to say 1“front, 1 ¼“ rear for regular corn
Raise cross auger and take sharp edges off the cross auger flighting
Typical cross auger to pan clearance for corn should be 1 inch
Adjust corn head to take in slightly more trash
Keeping the machine loaded with crop will definitely reduce damage.
2. Feeder House: Grind/smooth any sharp leading edges off the feeder chain slats
Raise lower stop to lift the feed elevator drum for corn and raise upper stop to maximum.

3. Thresher: Remove/smooth down all sharp edges
Start with the low end speed recommendation in the operators manual .
Tip speed should typically be 2700 ft/minute (range 2050-4500 ft/min peripheral speed, depending on crop moisture conditions). On a 30inch rotor machine, 2700 ft/min would mean running the thresher at 345 rpm.
Install smooth rasp bars if that option is available (They are available for Case Axial Flow combines)
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.
Do use filler plates on an open drum threshing cylinder
Removing certain concave wires may be desirable for earlier escape of seeds through the concave
Round bar concave elements are gentler than rectangular concave bars, if that is an option.
Open concave clearance in small increments to reduce damage. Typical settings are around ¾ inch open for field corn.
Open concave in small increments only to reduce damage.

4. Cleaning System etc:
Remove any perforated screens under elevator doors, cross augers, or under the unloader tube
Check wear on front grain bed auger bearings, worn bearings cause augers to droop and pinch grain
Increase 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 ¼ to 3/8" to allow the clean grain to flow to the grain tank instead of entering the tailings returns system.

As Jim Minnihan, Case Combines Product Support Specialist and a valuable source for many tips in this document says, "It pays to strive for grain quality".

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