

Combine Safflower Seed Carefully To Avoid Injuring It



CRACKED SEED, at left, and viable seed at right. Proper adjustment of the combine can add dollars to the safflower crop.

By Robert E. Dennis

and

Marshall M. Machado

Arizona could be a leading producer of safflower seed for planting. Climatic conditions in the state are ideally suited to safflower and especially to production of planting seed with a high germination percentage.

For Arizona to become a leading state in the production of safflower seed for planting, problems from mechanical injury to seed must be reduced or eliminated.

Each safflower seed has a tough, pliable hull which surrounds the cotyledons and embryo. It helps to preserve seed quality. Plant breeders have reduced the thickness of the hull to increase the percentage of oil, and to improve the value of meal produced from processed seed. Unless mechanically damaged, during harvest or processing, it does not crack until germination.

Some mechanical injury to safflower seed is easily recognized by observing cracked and broken hulls. Usually for each seed with visible damage in a lot there are four or more that appear normal but have mechanically damaged cotyledons and embryos. Injury to the seed retards or prevents germination and increases the possibility of seedling disease.

Mexico, other foreign countries and other states in this country purchase large quantities of safflower planting seed each year from Arizona growers. Additional income from safflower seed for planting could add materially to the agricultural income of Arizona. If each grower gives attention to avoiding mechanical damage to safflower seed at harvest and if seed is carefully handled after harvest, Ari-

zona's markets for safflower planting seed will be greatly strengthened.

To Reduce Seed Damage

Several factors affect the amount of damage to seed at harvest. They are: 1) cylinder speed; 2) cylinder-concave clearance; 3) seed recirculating in the tailings auger; 4) auger clearances; 5) amount of straw and chaff taken in at the header; 6) seed moisture content.

Harvest safflower for planting seed when moisture content of seed is 8 percent or less. Least seed damage occurs during late evening or early morning harvest since humidity is somewhat higher during these periods.

Density of stand determines the best cutter bar height. By adjusting the cutter bar height it is possible to have a uniform amount of plant material passing through the machine. When stands are dense, set the cutter bar relatively high. For thin stands set the cutter bar lower.

Use of a reel is usually unnecessary in thick stands of safflower. A reel is suggested for thinner stands. When a reel is used, place its axis over or slightly to the rear of the cutter bar. The lowest part of the reel should be set about $\frac{1}{4}$ the distance from the top of the plants to the cutter bar. Peripheral speed of the reel should be 1 to 1.2 times the forward speed of the combine to prevent shattering losses. Use the forward speed of the machine in feet per minute to determine required reel speed in RPM.

$$\text{Reel RPM} = \frac{1.2 \times \text{Forward Speed (ft./min.)}}{3.14 \times \text{Reel Diameter (ft.)}}$$

Spike tooth, rasp bar or angle bar cylinders may be used to thresh safflower. Recommended cylinder peripheral speed is between 2500 and 3000 feet per minute. This will be about 400 to 500 RPM for a 22-inch

diameter cylinder. Use the slower speeds when seed moisture content is below 5 percent. Determine cylinder RPM with the following equation:

$$\text{Cylinder RPM} = \frac{\text{Cylinder peripheral speed (ft./min.)}}{3.14 \times \text{Cylinder Diameter (ft.)}}$$

Spike tooth cylinders require about two rows of teeth in the concave for proper seed separation. Fillers or cover plates used in "open grade" concaves should be removed. Removal of every other wire in wire grate concaves or installation of special grates with larger openings will reduce seed damage.

Cylinder-concave clearances should be $\frac{5}{8}$ " in front and $\frac{3}{8}$ " at the rear of the concave. Raise the rear of the concave slightly when loss of seed over the straw walkers is observed. Before altering the concave make certain the seed loss is not from plugged straw walkers. Lower the front of the concave and decrease cylinder speed if seed is being cracked or broken. However, the front of the concave may have to be raised and cylinder speed increased if many unthreshed heads are found.

Use minimum fan speeds with shutters open sufficiently to keep chaff off the sieves. Excessive fan speeds will blow seed out the rear of the machine or into the tailings auger where damage to the seed may occur. Adjust the windboards to direct air toward the front of the sieves.

Chaffer (upper sieve) lips should be set $\frac{1}{2}$ open and the lower sieve set $\frac{1}{4}$ open. The lower sieve may have to be more than $\frac{1}{4}$ open if clean grain is reaching the tailings auger. Both sieves should be level or tilted slightly forward. Close the chaffer lips to slightly less than $\frac{1}{2}$ open when tilting the chaffer. This will prevent excessive amounts of chaff from falling through the chaffer to the lower sieve.

The clean grain, tailings and grain tank augers should have about $\frac{1}{4}$ " clearance. Dents in auger housings should be removed to prevent possible seed damage.

Combine adjustments for safflower will vary depending upon variety, maturity, weather and crop conditions. The grower must make adjustments to fit his individual conditions.

Check harvested seed frequently for damage during harvest. Remember, for every visible damaged seed there will be four or more normal-appearing seeds with internal embryo damage.

Dr. Dennis is Extension Agronomist and Mr. Machado is an Extension Agricultural Engineer.