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4-1-1967

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#### Recommended Citation

Delouche, J. C., "Mechanical Damage to Seed" (1967). *Proceedings of the Short Course for Seedsmen*. 185.

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## MECHANICAL DAMAGE TO SEED

James C. Delouche <sup>1/</sup>

In their long journey from seed head to seed bed, seed are subjected to many physical and mechanical processes. Many of these processes or operations can and do cause injury. The results are cracked, chipped, scraped, cut broken or internally damaged seed. I suppose that we wouldn't be too alarmed about mechanical damage if only the physical appearance of the seed were affected. The consequences and effects of mechanical damage, however, are much more serious. Mechanically damaged seed are -

- (1) more difficult to clean,
- (2) lost in clean-out,
- (3) lower in germination,
- (4) reduced in vigor,
- (5) more susceptible to chemical treatment injury,
- (6) more susceptible to destructive soil organisms.

The effects of mechanical damage on the viability and vigor of seed can be immediate, seed are immediately rendered incapable of normal germination, or latent, germination is not immediately affected but vigor, storage potential, and field value are reduced.

Seed can be severely injured without any visible evidence or signs such as ruptured seed coats, cracks, chips, etc. Internal, non-visible injuries are especially a problem in edible beans, peanuts, and soybeans.

Injury to seed can be caused by three types of "action":

- (1) Impacts - a moving seed strikes a stationary object, or a moving object strikes a stationary seed, or both seed and object are in motion at the moment of impact.
- (2) Abrasions - rubbing or scraping actions cause injury such as can happen in an auger with a dented housing.
- (3) Cuts - the seed covering is cut or punctured by a sharp object such as a gin saw or some parts of a sheller.

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Three factors influence the extent and severity of mechanical injury to seed: mechanical operations, the operator, and characteristics of the seed.

### Mechanical operations

Combines, augers, elevators, pneumatic conveyors, scarifiers, debearders, processing equipment, drops in bins, etc., are all potential causes of mechanical injury. A single operation might cause only a slight amount of damage. But, since seed are usually subjected to many operations, the cumulative effect of "slight" amounts of damage at each step can be considerable.

### The operator

Machines are operated by people, and it is the latter who most often have the greatest influence on the extent and severity of mechanical damage to seed. Improper selection and adjustments of equipment, faulty timing of operations, incautious operation of conveyors and equipment are the result of human error - not equipment error.

Trained operators with responsible attitudes and an appreciation for the living condition of seed are the best insurance against mechanical damage.

### Characteristics of the seed

The morphological and structural characteristics of a seed determine to a great extent its susceptibility to mechanical injury. The ideal seed would be one with a centrally positioned embryonic axis, surrounded by a "cushion" of storage tissue and enclosed with a mechanically resistant covering. Unfortunately, few seeds - if any - are structured to this ideal arrangement. In the case of the large seeded legume (beans, peas, soybeans, etc.) the embryonic axis is positioned toward one end of the seed and protected only by a thin fragile seed coat. In other important kinds of seed such as sorghum, rye, and wheat, the tip of the embryonic axis protrudes slightly beyond the tip of the seed. In both cases, the embryonic axis is very vulnerable to mechanical injury.

Very little can be done about the structural arrangement of seed. (Perhaps the breeder could "re-engineer" the seed.). Practically, those seed kinds that are structurally weak and susceptible to mechanical damage should be recognized and greater care should be taken in the harvesting, processing, and handling of them.

There is one characteristic of seed, however, that can be controlled to some extent. This characteristic is seed moisture content. Most seedsmen are aware - or should be - that mechanical damage and seed moisture content are closely related. Seed below 12% moisture are much more easily damaged than seed with a moisture content of 12 to 18%. Above 18 to 20% moisture, seed are relatively soft and quite susceptible to bruising, gouging, or scratching. Thus, harvesting, processing and handling operations should be done - insofar as possible - at the time seed moisture content is 12 to 18%.

#### Minimizing Mechanical Damage

Mechanical damage probably cannot be completely prevented. It can, however, be minimized. Seedsmen who have mechanical damage problems should carefully analyze each operation from harvest to bagging to determine the major causes of the damage. After the major causes of mechanical damage are identified, the appropriate actions necessary to alleviate the condition can be planned and implemented.