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Special Tests to Identify Special Problems

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SPECIAL TESTS TO IDENTIFY SPECIAL PROBLEMS

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Factors affecting seed quality are many and varied. Problems can and do occur at any point from the field to the customer. In order to maintain good quality seed it is necessary to test seed from time to time at all of points from the field to the customer.

Every seedsman should employ some type of testing program. The kind of tests, frequency of testing and the overall involvement in a testing program will vary with the particular operation and the degree of quality control desired. It is impossible to design a stereotype quality control program to fit the needs of the entire seed industry. There are numerous tests that can be used. A seedsman must employ those tests that will meet his particular needs.

Mechanical damage, rupture of the seed coat or pericarp is a common occurrence to many seeds and can occur at any step from harvest to sale. The value of seed can be greatly reduced by mechanical damage thus the occurrence should be checked throughout the harvesting-processing flow to determine the frequency and severity of occurrence.

There are several ways of determining mechanical damage.

Frequency and severity of mechanical damage in large seed such as cotton, beans and soybeans can be determined simply by visual inspection of a sample. Cottonseed must be acid delinted. Special treatment of other large seeds may or may not be necessary to detect damaged areas. Some type of magnification is helpful in detection of small damaged areas.

Acid delinting of small samples of cottonseed in the laboratory is quite simple. Materials needed are a quantity of commercial grade sulfuric acid, kitchen strainer, plastic or glass stiring rod, plastic or glass bowl (about two quart size), a plastic or rubberized apron to protect clothing, a pair of safety goggles, small dryer (or seed can be spread on paper to dry), some method of washing seed to neutralize the acid after delinting and a large (five gallon) plastic or glass container for disposal of used acid.

Place a handful of seed in the strainer, put the strainer in the bowl containing the acid and stir seed until all linters are removed. Wash seed thoroughly to remove excess acid and dry. Randomly select a 100 or 200 seed sample and inspect each seed for seed coat damage.

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If desired, the extent of mechanical damage to cottonseed can be classified.

Non-cut: seed with completely intact seed coats.

Pinhole damage: seed with only one or two small punctures in the seed coat.

Minor damage: seed with seed coat cracked or cut but not severely, damage primarily to the chalazal end or sides of the seed.

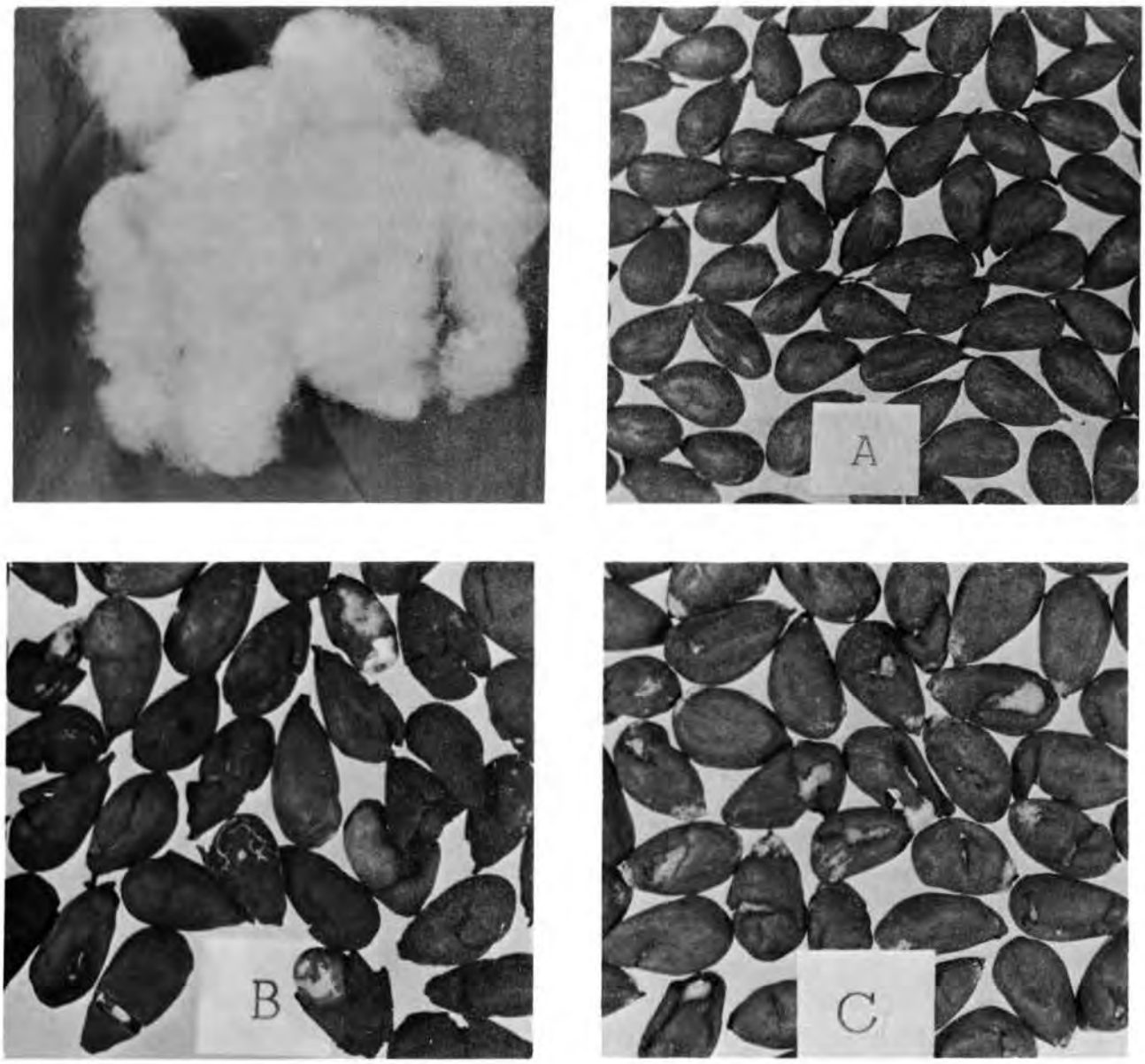
Major damage: seed with large cuts or ruptures in the seed coat, portion of seed coat missing, cotyledons often exposed and damage to the radicle end of the seed.

The use of dyes or stains can be very helpful in detecting damaged areas in seed such as corn, small seeded legumes or soybeans. Stained areas indicate damage to the seed coat and are much easier to see even with the aid of magnification.

Fast green is a dye that has been particularily useful in detecting mechanical damage in corn seed and small seeded legumes. A 0.1 percent solution of fast green can be made by dissolving 1 gram of fast green powder in 1000 ml. of water. Randomly select a 100 or 200 seed sample. Immerse the sample to be examined in the fast green solution for $\frac{1}{2}$ to 4 minutes. The length of time needed for staining will vary with the kind of seed. Remove the sample from the dye solution and rinse thoroughly to remove excess dye and allow seed to dry. The areas of the seed that have damaged seed coats will stain green, undamaged seed will have no stained areas. The point of attachment of the corn seed to the cob may stain but this is easily recognizable from mechanical damage.

Indoxyl acetate is a stain that is useful for detecting mechanical damage in soybeans. Immerse the selected seed sample in a 0.1 percent solution of indoxyl acetate for 20 seconds. A 0.1 percent solution can be made by dissolving 1 gram of indoxyl acetate in 100 ml. of ethyl alcohol. Then add 900 ml. of water to make 1000 ml. of solution. Remove, rinse and dry for four to five minutes at about 110° F. Add ammonia vapor to the drying air. This can be done by placing a piece of cotton saturated with household ammonia in the drying air stream. The ammonia reacts with the indoxyl acetate (which has entered the broken areas in the soybean seed coat) to give a purple color which is easily recognized.

Checking a sample of seed after processing is completed will determine if mechanical damage is a problem. If so, checking samples after each step in harvesting and processing will identify the area or areas where damage is occurring.



The incidence of mechanical damage in cotton seed can be determined by acid delinting a sample of either seed cotton or cotton seed. A, sample of seed before mechanical picking; B, sample of seed after mechanical picking with improperly adjusted picker; C, typical gin saw damage, note inrolled edges of gin cuts.

The tetrazolium test is a test, often overlooked, that can be very effectively used in diagnosing problems. Many seedsmen have avoided using the tetrazolium test because they are of the opinion that the test is too time consuming and too difficult to interpret. Standard germination tests are slow and difficult to interpret until one gains experience. The same is true for the tetrazolium test. With a little practice and experience, tetrazolium testing can reveal much information about a seed lot in a relatively short period of time. With a little experience an analyst can determine such things as frost or freezing damage in corn, heat damage in various seeds and weather damage in seeds such as soybeans. The overall quality of a seed lot can be appraised almost at a glance. One can determine if the lot is good, average or poor without evaluating individual seed. If a detailed analysis of individual seeds is desired this can be made for a more critical evaluation of the seed lot. Details of tetrazolium testing are available in the Tetrazolium Testing Handbook published by the Association of Official Analysts.

Another problem frequently faced by many seedsmen is determining the storage potential of seed lots. From time to time it is necessary to carry over seed for one year or longer. Some seed lots will retain viability in storage, others will not. These differences quite often cannot be detected by a standard germination test.

The relative storability of corn seed lots can be determined by measuring the activity of glutamic acid decarboxylace in the seed (GADA). This test has certain limitations, the greatest of these probably being difference in varietal response and being limited primarily to grain crops. However, it is a very effective method of determining the relative storability particularly corn seed lots. Details for conducting the GADA test are available from the Seed Technology Laboratory.

Another method of predicting the relative storability of seed lots is accelerated aging. This test, pioneered by Dr. Delouche of the Seed Technology Laboratory, appears to have application to any kind of seed. Small samples of a seed lot are subjected to conditions of 100 percent relative humidity and 40 to 45° C for short periods of time (one to five days depending of the seed kind) then seed are germinated and evaluated as in a standard germination test. Seed lots that maintain their initial germination percentage or drop very little in germination will store better than lots where germination drops drastically after aging. Details on accelerated aging are also available from the Seed Technology Laboratory.

The use of some tests to determine which lots of seed would store best could save seedsmen thousands, maybe millions of dollars each year in storage costs and loss of seed.

The accelerated aging test can be used to evaluate the relative storability of seed lots.

The tetrazolium test when properly conducted and interpreted is, perhaps, the most informative of all the seed quality tests. (Above, tetrazolium test of cotton seed.)

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