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Simple Method to Determine When Seed are Sufficiently Dry for Storage

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A SIMPLE METHOD TO DETERMINE WHEN SEED ARE SUFFICIENTLY DRY FOR STORAGE

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Farmers need a simple, inexpensive method for determining when seeds have been sufficiently dried for storage. There are several reliable methods used for determining the moisture content of seed, but generally they are time consuming, complicated or expensive.

A seed has an equilibrium moisture content for each temperature and relative humidity condition of the surrounding air. On the other hand, the air surrounding a sample of seed in a closed container will equilibrate at a particular relative humidity depending upon the moisture content of the seed sample and the temperature.

If a sample of seed is placed in a sealed container and allowed to equilibrate with the surrounding air, the equilibrium relative humidity is an indication of the moisture content of the seed. In order to use this method to determine the moisture content of seed, it is necessary to measure the relative humidity of the surrounding air and to determine the relationship of the equilibrium relative humidity to the moisture content of the particular type of seed.

Indicator strips manufactured by Humidial Company, Colton, California, were used to measure relative humidity. These strips contain several blocks which are blue or pink, depending on whether the relative humidity is less than or greater than a particular percent. They have the ability to change color as the lithium compound absorbs moisture, and the relative humidity at which the color changes depend on the concentration of lithium in the indicator.

Prior to use, these strips were tested in desiccators of known relative humidity obtained by using salt solutions. Relative humidities used were 0, 35, 48, 52, and 75 percent, and the strips indicated 0, 35, 45, 55, and 75 percent, respectively. The strips can be read to the closest 5 percent.

Relative humidity equilibrium curves were run on cracked and whole corn, wheat, soybean, and rice seed. Cracking the seed did not affect the final equilibrium curves. It did decrease the time required for seed and air to reach equilibrium, but not enough to warrant cracking the seed.

The various types of seed were placed in a germinator to increase their moisture content. At 20 percent moisture the seed were removed and allowed to air dry. Periodically, as the seed were dried samples were sealed in airtight bottles.

Moisture in the samples, varying from 10 to 20 percent, was allowed to equilibrate with the moisture in the surrounding air. The relative humidity was determined with indicator strips, and the moisture content of each sample was determined by the oven method.

The curves are not standard equilibrium curves since this method of measuring relative humidity is not sufficiently accurate. Rather they are considered calibration curves for correlating the relative humidity reading of the strips with the moisture content of a particular type seed.

To determine the time required to reach equilibrium the strips were read every fifteen minutes the first hour; every sixty minutes the next three hours and on the twelfth hour after commencing the test. From two to two and one half hours were required for the seed and air to reach an equilibrium.

Temperature variations from 68° F to 86° F did not affect results sufficiently to require a correction factor. Extreme variations would require new curves.

There was some question as to the validity of the curves when the moisture content in the originally dry seed was increased at such a rapid rate in the germinator. Therefore, a curve was run on corn which had been increased in moisture content in desiccators over a period of two weeks, and one on rice which was field harvested and air dried.

Results indicate little variation and thus, we concluded that the germinator provides a suitable method for raising the seed moisture content.

Our results indicate a similarity among the equilibrium curves of cereal type seed tested. Other data indicate that this is also true for oily seed. Figure 1 tends to substantiate this. Note that for the same moisture content in the lower moisture range the relative humidity with which the soybean seed will equilibrate is much higher than that of the corn, wheat or rice seed.

The recommended storage moisture content for soybean seed is from 9 to 10 percent; therefore, when a sample of soybean seed will equilibrate with a relative humidity of approximately 55 percent, they are sufficiently dry for storage. For corn, wheat and rice seed, the recommended level is from 11 to 12 percent; therefore, when a sample of this type seed equilibrates with a relative humidity of approximately 45 percent, the seed are sufficiently dry for storage.

The indicator strip was designed with three squares (1, 2, and 3) which turn from blue to pink as the relative humidity increases past 45%, 55%, and 65% respectively. When square number 3 is blue and 1 and 2 are pink at equilibrium conditions sufficient drying conditions are being approached. When 2 and 3 are blue and 1 is pink at equilibrium for an oily seed the moisture content is sufficiently low for storage. When 1, 2, and 3 are blue the moisture content for cereal type seed is ready for storage. Figure 2

A test was run to evaluate the use of the strips by inexperienced operators. Corn, wheat, soybean and rice seed were raised to 20% moisture content and allowed to dry to 8%. During the drying period eight samples were removed from each type of seed. The moisture content was determined by the oven method for each sample, and the remaining portion of each sample was divided among four

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pint jars containing indicator strips. Two jars of seed were used by an experienced operator and two by an inexperienced operator.

Both operators agreed as to when to store soybeans, wheat and rice seed. The inexperienced operator stored the corn, on the seventh sampling while the experienced operator stored it on the eighth. This disagreement arose in determining if the block was blue or pink in the transition range. For safety, we recommend that until a block is definitely blue it is recorded as pink.

Thus, inexpensive relative humidity indicator strips can be used to determine in a relatively short time when seed are sufficiently dry for satisfactory storage.

Procedures for Using Indicators

1. Store indicator strips at a relative humidity of 35% or less by placing in a sealed container with a desiccant material such as silica gel.
2. Using duplicate samples, place ½ pint of seed in a sealed pint jar with an indicator strip for each sample.
3. Allow 2 hours for the moisture in the seed and surrounding air to equilibrate and determine color of the three squares of the indicators.
4. If squares 2 and 3 are blue, oily seed such as soybeans are sufficiently dry for storage.
5. If square 1, 2, and 3 are blue, other type seed are sufficiently dry for storage.

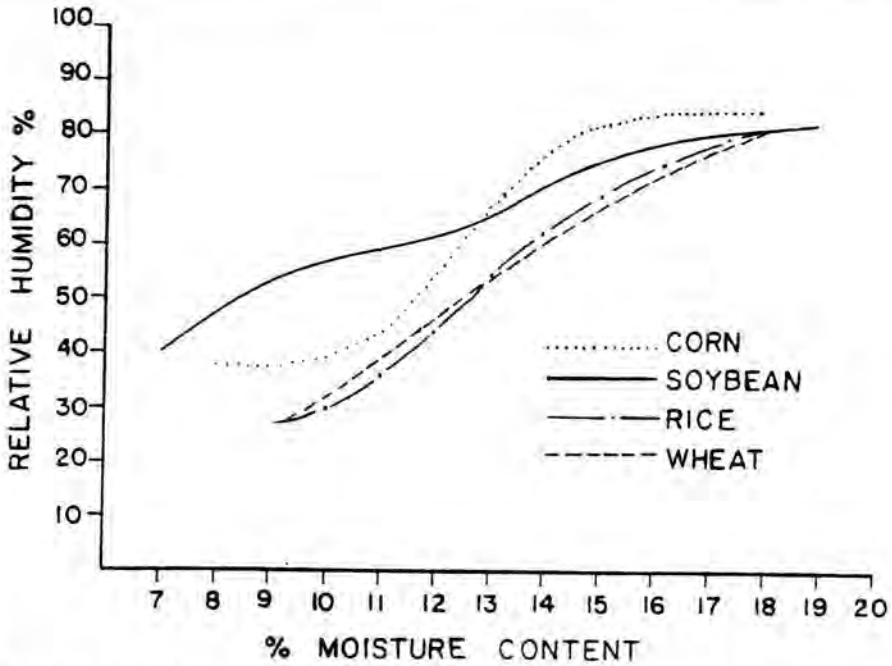

Fig. 1. Moisture content-relative humidity equilibrium curves for corn, soybean, rice and wheat seed determined by moisture indicator strips.

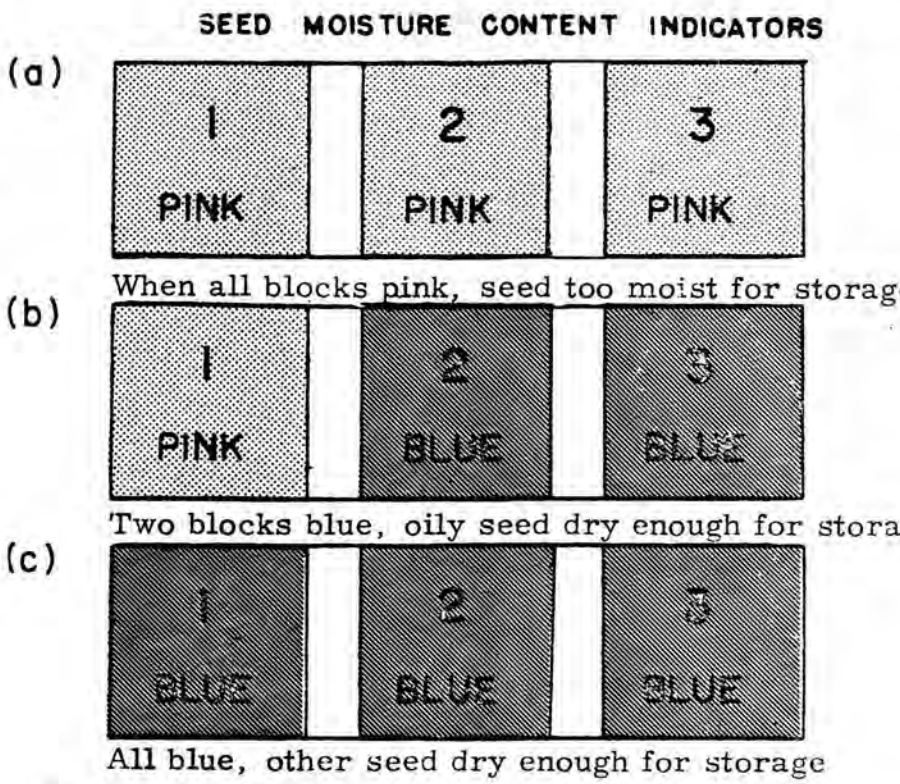

Fig. 2. Color of indicator shows when seed are dry enough for storage.