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E. L. Erickson
South Dakota State University

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Erickson, E. L., "Testing Farm Seeds at Home" (1943). *Agricultural Experiment Station Circulars*. Paper 40.
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Testing Farm Seeds *At Home*

By E. L. Erickson,
Assistant Agronomist, South Dakota Agricultural Experiment Station

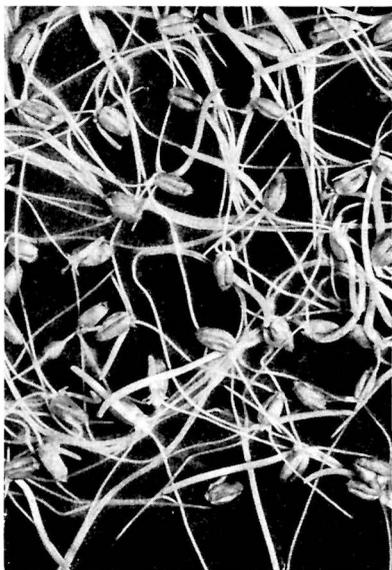


Figure 1
Good and vigorous germination of wheat free from molds and weak sprouts, capable of producing maximum stand in the field.



Figure 2
Low germination of wheat, badly diseased, showing most sprouts are weak and not capable of producing a normal field stand.

Damage to 1942 Seed Production

The delayed season and frequent rains in 1942 damaged all crops, especially as to germination.

Sprout damage, weathering, and heating in the bin have caused most of the damage. The hard freeze of September injured much of the sorghum, corn and soy beans.

Agricultural Experiment Station, South Dakota State College

BROOKINGS, SOUTH DAKOTA

Table 1. Research Studies by the South Dakota Seed Laboratory on the 1942 Seed Production Is Summarized in This Table.

Crop	% of samples which germinate below 80	% of samples which germinate below 70	% of samples which germinate below 50
Corn	41	37	14
Sorghum	90	90	90
Wheat	33	26	7
Barley	26	9	none
Oats	none	none	none
Rye	33	33	33
Flax	18	none	none
Sudan	66	50	33
Soy beans	80	80	50
Brome grass	15	11	4
Crested wheat grass	11	4	none

It is certain that each farmer must prevent the planting of dead or inferior seed if production is to be normal.

Facilities are not available for testing all the samples anywhere, except in each farmer's home.

This circular describes the most important steps in the process of home testing of crop seeds.

Proper Variety Important

It is essential to plant adapted varieties which best serve the purpose of the crop. Late maturity is generally to be avoided. Resistance to drouth, disease, and insects are other important factors. In crops where adaptability is influenced by location, much care should be exercised in seed purchases.

Obtaining the Sample

It is necessary, in testing a lot of seed, to obtain a sample which will most nearly represent the whole lot. If the seed is in a bin, thrust the hand into the bulk and withdraw a handful of seed. Repeat at least seven times in different locations. Since bin heating is prevalent this year, it will be highly desirable to reach as near the center of the bin as possible for at least one of the samples. In case of damage, take a separate sample from the center only.

For seed in bags, take handfuls from each and if there are many bags, take seed from at least seven bags or more. From these quantities withdraw, after mixing, about one quart for testing purposes.

For ear corn pull three or more kernels from different places from each of one hundred or more ears.

Label all samples as to identity and keep for future reference.

The Relative Purity of a Seed Lot

All seed lots are made up of several parts, the pure seed, seeds of other crop plants, weed seed, and the inert material. (chaff, stems, etc.)

By spreading out a quantity, say a handful of seed on a surface, an estimate

of the relative proportion of the various parts can be obtained. Obviously, if the weed seed and chaff are present in considerable degree, the seed can be materially improved by a thorough screening and fanning operation.

It will be rarely possible for farmers to make purity determinations of their own, but the seed can be examined critically and closely under a good light for mixture, noxious weed seed, and damage.

Noxious Weed Seeds

It is especially important when much seed is changing hands and moving about the country to check each lot for noxious weed seed. This can be done while making an estimate of the purity of the sample in general. In the event weed seeds are found and appear to be of noxious nature, consult the county extension agent or send the seed to the State Seed Laboratory, Brookings, for identification.

If possible the noxious weed seeds should be removed from the seed supply and their germination destroyed. In the event these noxious weed seeds can not be removed, the lot should be ground for feed.

Field bindweed (creeping jenny) is widely scattered over a large part of the state. Further spread can be prevented by eliminating it from the seed supply.

The Germination Test

Farmers wish to know to what extent the seed they sow will germinate and produce normal, healthy plants. This factor in crop production is sometimes disregarded with disastrous results.

How much does a given sample germinate? Perhaps a fair assumption would be somewhere between ten percent and ninety percent, with a certain percentage of the lots falling outside this range. The number of lots of seed which are low in germination varies from season to season for that crop, depending on climatic factors during seed setting, care in harvesting, storage conditions, moisture percentage at storage time, and mechanical injury during any part of the operations.

In addition, there are seed-borne diseases which are more prevalent in some lots under certain conditions. It will be seen then that there are many chances for the seed to become damaged or injured with a subsequent loss in germination percentage. The process through which a seed crop passes is a complex one. The end result, however, is simple. The seed is either alive and sound or it is not.

How to Test Seed for Germination

The essentials for seed germination in general are: (1) Moisture, (2) temperature and (3) air. Any means which can provide these conditions, in most cases, will cause live seed to germinate.

There are limitations to the above conditions. (a) The seed should not be flooded or allowed to dry out after sprouting has begun. (b) The test should not be allowed to freeze or be placed so near a stove as to cause complete drying. Details on procedure follow:

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1. Place the seed on a table and take 2×100 seeds at random (those nearest you). Make no attempt at selection or error will result. Take each seed as it comes, discarding seed of other crops and broken grain. (In case of mixtures make separate tests of each crop present.)
2. Prepare germination paper or cloth and distribute the seed uniformly. Place moist layer over the seed and roll, taking care not to roll too tightly.

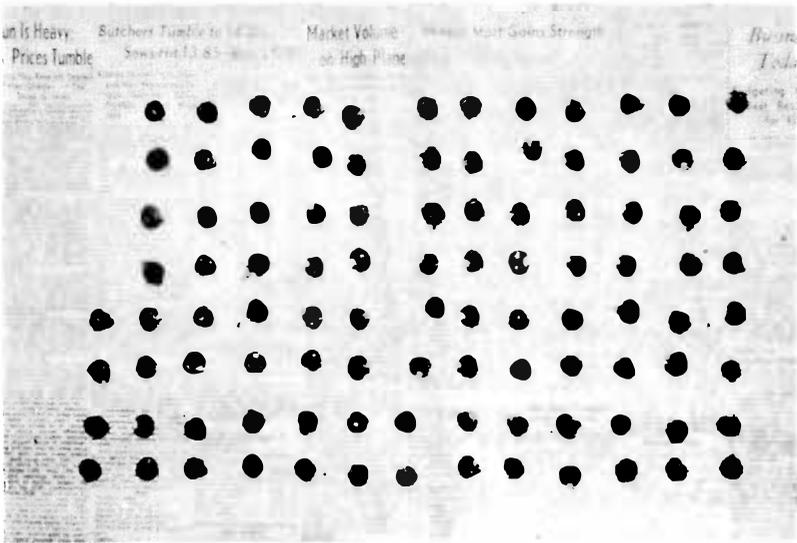
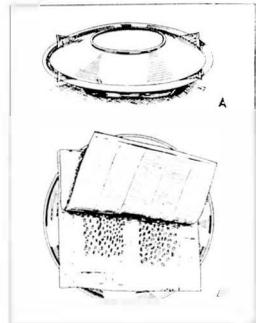


Figure 3

100 kernels of corn distributed on soaked newspaper in preparation for germinating. A second soaked layer is placed on top, the test labeled, and the test then rolled, not tightly but firm. This type of test is all right for most farm seed tests.

Figure 4

The dinner plate or pie tin test as shown is a good way to germinate seed at home. The upper plate as a cover prevents rapid loss of water. See text for precautions in germinating seed at home.



The Germination Material

Thoroughly soaked newspapers are satisfactory. (Two layers, fold single sheet down from top.) Absorbent paper is preferable if available. This moistened paper placed upon a layer of waxed paper and the several layers rolled together will reduce drying. Several such rolls can then be bundled together and covered with other moist paper or cloth for further protection (Figs. 3,

4, and 7). This bundle can then be placed in a bucket in a room (or basement) where freezing or excessive drying can be prevented by covering with several layers of wet cloth or paper. Observe from day to day and moisten as necessary.

If possible, place in each bundle some seed of known high germination to serve as a check on the other tests. Nothing can be done to make a test germinate too high. On the other hand improper tests can cause poor germination. Including a sample of good seed will serve as a check on the results.

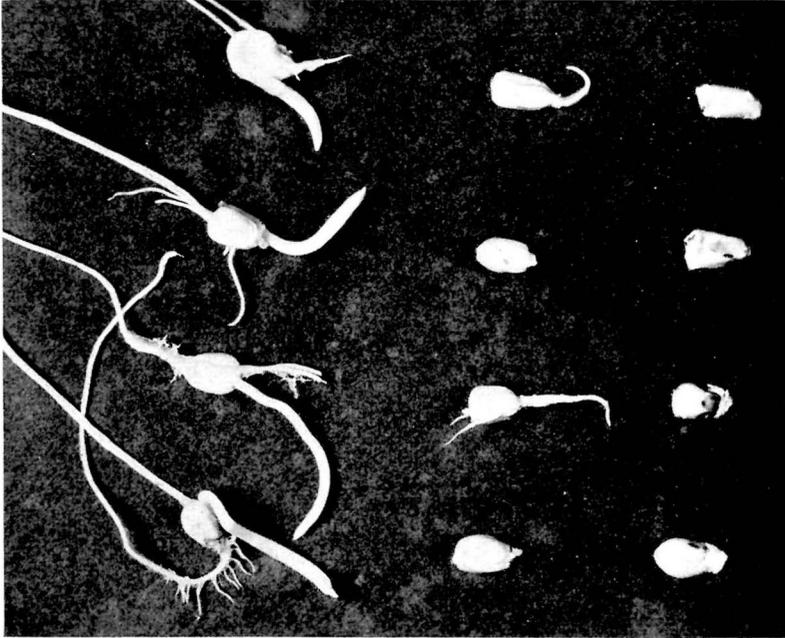


Figure 5

Corn sprouts showing typical strong and weak sprouts and dead seed. The weak or abnormal sprouts generally are worthless. When weak sprouts are caused by seed borne diseases, seed treatment will help to make strong seedlings out of such weak sprouts.

Reading the Germination Test

After seven to ten days, germination may be complete and the tests can be read. Read each hundred seeds separately and average the readings for the percentage germination. (Rarely will the two tests be the same.)

Thorough and accurate classification of the various types of sprouts in the germination test is essential to right information. Generally, germinated seed can be classified into three groups: (1) strong seedlings (2) dead seed (3) abnormal or weak sprouts (Figs. 5 and 6).

Sound and live seed produce strong seedlings. Such strong seedlings grow vigorously, showing a clear, bright shoot (plumule), a well-elongated and bright root (radicle) and the presence of healthy secondary roots.

Dead seeds are those which have absorbed water, are soft, have made no growth, and may be decayed. (In some crops, such as alfalfa, sweet clover and soybeans, certain of the seed remains hard. In other words, they do not absorb moisture but are generally considered live seed.)

Strong sprouts and dead seed of a germination test are relatively easy to classify. Those seed which produce abnormal growth or weak sprouts are those which lack vigor but yet are not dead.

After the strong and dead have been separated correctly any remaining sprouts would automatically fall in the abnormal or weak class. Abnormal or weak sprouts are those which are injured, diseased, stunted, lacking in vigor, are off color, or which for some other reason appear incapable of continued growth under favorable conditions. In many cases abnormal seedlings can be readily recognized because some vital plant part is missing.

Sometimes soybeans, alfalfa, sweet clover, etc., will be damaged in handling (elevating, processing, scarification, etc.) and will produce abnormal sprouts. In the case of alfalfa and sweet clover, the root may actually be separated from the rest of the plant. Careful observation while separating the broken parts in the germination test will show this condition. The root tip will be found inside the seed coat, while the broken end will have been pushed

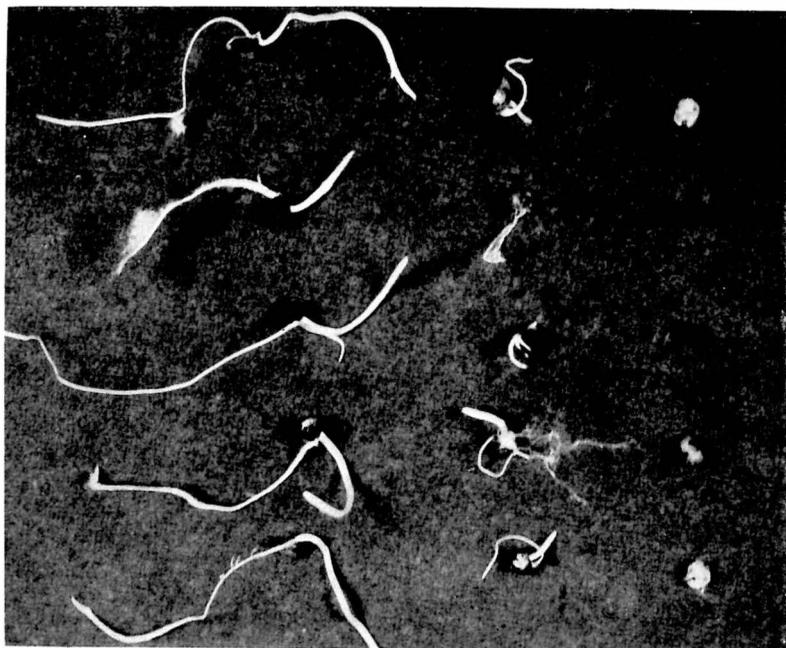


Figure 6

Sorghum germination tests showing the separations of strong and weak sprouts and dead seed. Seed treatment is particularly helpful to such weak sprouts as shown above in the center row.

out. Such damaged seed usually sprout first but stop in a few hours, and in reality, are not in a growing condition at the completion of a test.

Hard Seed in Legumes

Legumes such as sweet clover and alfalfa generally contain seed which do not germinate when placed on test. Such seed are known as hard seed since they remain hard.

Not all hard seed produce plants under field conditions. In the case of sweet clover, red clover and alsike, it is generally believed that one-third to one-half the hard seed percentage will germinate soon enough after planting to produce plants. In alfalfa the hard seed may be as effective plant producers as are the quick germinating seed.

Scarification is a mechanical treatment which renders hard seed permeable (enabling water to be absorbed). While it does reduce the percentage of hard seed, some damage to other seeds may result. In general scarification does not pay where the percentage of hard seed is less than 50. There are, however, exceptions to this rule.

Sweet clover is about the only farm seed which needs scarification if the hard seed percentage is high. The operations of threshing and hulling produce some bumping effects which resemble scarification and therefore, not all lots of sweet clover need scarification.

Moldy and Diseased Grains

Germinating seed often is covered with molds. This has been especially true of some seed produced in 1942. Although a moldy condition in itself is undesirable, some molds are more damaging than others because they can actually blight and kill the young plant. On the germinator, such molds cause a failure of germination or a distinctly brown discoloration of the sprout or its roots. Seed lots heavily contaminated with such disease-producing molds, if the seed is alive can produce a crop of clean white sprouts and healthy young seedlings, provided they are treated with a suitable dust fungicide. To a certain extent, such treatment also protects germinating seeds and very young seedlings from similar disease-producing molds normally occurring in the soil. (Write to the county extension agent for information on seed treatment.)

Cleaning and Treating Seed

Impurities and light, diseased grains can be removed from a seed lot by thorough cleaning over a fanning mill using a strong air blast.

Seed treatment with a mercury or copper dust is recommended for protection from seed and soil borne molds. Injury to the seed and to persons can be avoided by following the directions on the label.

The South Dakota Seed Laboratory

The South Dakota State College carries on seed work along three related lines of endeavor. These are research, teaching and service work. Research and teaching eventually will contribute most to the state's progress in good seed matters.



Since the facilities for seed study and evaluation are at hand for research and teaching, South Dakota State College offers service in official seed tests for citizens of the state when such tests are needed and in special tests as called for.

It is suggested that each farmer test all seed according to the directions in this circular. Help can be had by calling on your county extension agent or the State Seed Laboratory, Brookings, South Dakota.

Figure 7

How to Make a Seed Test at Home

1. This series of pictures shows the various steps in making a seed germination test with the wet newspaper roll. Take one full sheet of newspaper, divide in the center, fold each half once and soak in water ten minutes. Place counted seed on paper and cover as shown.
2. Roll the test firmly enough to hold the seed in place. Rolling too tightly will exclude air and a poor test may result.
3. Place roll in bucket or similar container with other tests as shown at left. At end of first day, the bucket should be tipped to get rid of drainage water from the rolls.
4. Cover the tests with wet newspapers or cloth to reduce drying. Look at the tests from day to day and moisten as necessary. For directions on reading germination tests see page 5.