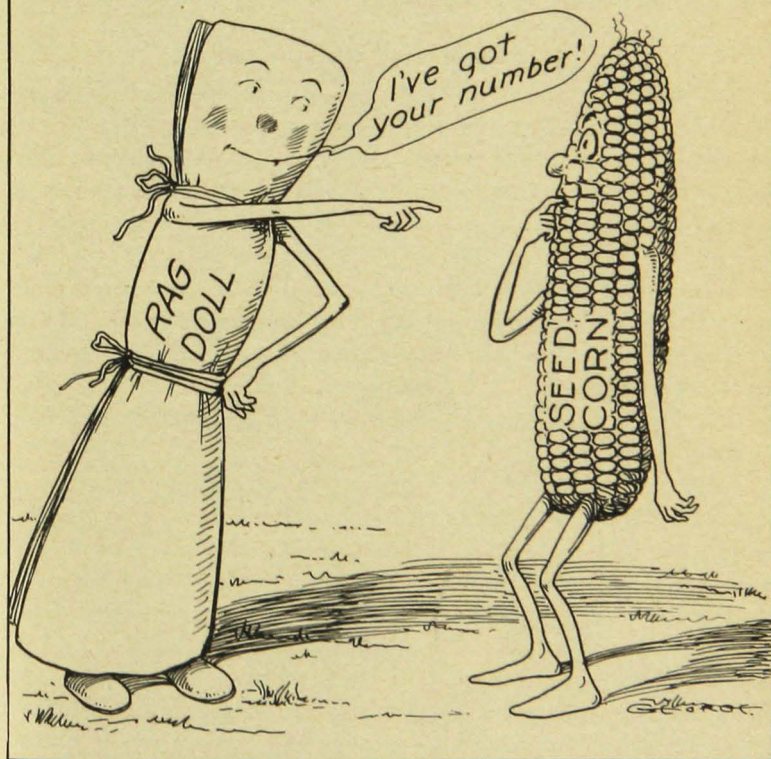


Rag Doll Test for Seed Corn

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THE RAG DOLL TEST FOR SEED CORN

Seed corn shortages occurred in four years out of the eleven years from 1915 to 1925, inclusive—in 1915, 1917, 1924, and 1925. In these four years individual ear-testing was practiced in order to furnish enough seed for the following crop. Early autumn frosts which are severe enough to kill the vegetative part of the corn plant are very infrequently severe enough to kill the kernels on the husk-covered ears, on the stalks in the field. The killing of corn depends very largely on the amount of moisture the corn carries and the degree of cold. The first autumn frosts are severe enough only in exceptional years to injury the germination greatly. Dry corn, corn containing only 10 to 14 per cent of moisture, has been found to withstand, without injury, the lowest temperatures known in Minnesota.

Fall of 1925 Exceptional

The bountiful crop of last fall was in such condition in September and early October as to give assurance of an abundant seed corn supply for the season of 1926. Severe autumn frosts were delayed and corn remained green even during the first part of October in much of the state. Farmers in many cases expressed a wish for a good frost to ripen up the corn before cribbing. Seed corn was safe, for the most part, until after the middle of October. But the very severe and continued freezing weather during the third and fourth weeks of October killed all corn having a high percentage of moisture whether in the fields or otherwise exposed. The chief factors during the fall of 1925 were the very low temperature and the very high percentage of moisture in the standing corn.

Under normal conditions injury is caused when corn matures late or when early freezing weather occurs. Immaturity may result from attempts to grow unadapted varieties or from late planting or peculiar weather and soil conditions. When the moisture content runs to 25 or 30 per cent or more, severe freezing weather is enough to cause a total loss of germination. The injury to seed corn caused by freezing diminishes as the per cent of moisture is reduced. The germ of strong corn kernels is a miniature living plant. Freezing causes some physical and chemical change in the germ when the corn carries a heavy percentage of moisture, and death results. The germ becomes dark-colored and cheesy in appearance.

Some effective and practical plan for testing all available seed corn must be put into effect throughout the state. Vigorous and thoro testing will provide the maximum amount of seed of locally adapted varieties. The present critical situation demands that every bit of germinating seed should be found.

The Germination Test¹

To make certain that the germinating power is satisfactory, a preliminary test of kernels from ears located in different parts of the storage quarters is always advisable before shelling. If the preliminary test indicates that the germinating power is doubtful or that considerable rot and mold are present on the seedlings, an individual ear test is necessary.

Whether an individual ear test should be made especially to detect and discard diseased ears, depends on indications of the presence of disease. Some idea of the extent to which disease is present in a field may be obtained by observing the plants closely throughout the growing season. The chief indications of disease are: (1) marked thinning of stands by plants dying in the seedling stage; (2) very uneven development of the plants between the seedling and tasseling stages; (3) the presence of a considerable number of prematurely ripened plants some of which break over at the ground or farther up, while the majority of the plants in the field are still green; (4) the presence of plants that mature long after most of the plants have reached maturity; (5) diseased shanks which permit the ears to hang straight down; (6) very rough ears with starchy kernels; (7) all or a portion of the kernels discolored or moldy; (8) the cobs at the butts of the ears frayed or colored brown or pink.

When the presence of considerable disease is evident from the appearance of the plants in the field, the individual ear test will disclose diseased ears which might otherwise be used for seed.

Various Testing Methods Used

Various methods are used successfully in testing corn. There are three essential factors in germination: heat, air, and moisture. Any test which does not combine all three factors will result in failure.

The rag doll method is an effective method with a minimum expense, and is simple to operate under average farm conditions. Some operators prefer a larger number of short dolls while others choose to use long dolls with greater capacity. The doll lends itself nicely where space is limited and where the heated area is limited. From a few to a large number of dolls may be placed in a tub, boiler, candy pail, or other suitable container and then placed where there is sufficient heat. One must avoid exposing single wet dolls directly to room temperatures. The warm air coming in direct contact with the damp doll leaves the doll very cold. A collection of dolls placed in a suitable container will permit circulation of air and still retain heat and moisture. Where community or individual testing stations are established

¹ This section, the one on the modified rag doll germinator, on pages 4 and 5, and the one on reading the test, on page 7, are taken from Special Bulletin No. 58, Corn Raising in Minnesota, by A. C. Arny. 1922. This bulletin is out of print and no longer available.

one can easily store a number of dolls representing several hundred ears in a convenient place with a minimum of heated space. The container may be put in a warm basement, hung over the furnace, placed in an ordinary room, or near a stove very satisfactorily.

Inasmuch as seed corn is stored in many different places and arranged in such a variety of ways under farm storage, it is necessary for each individual operator first to work out a system of keeping a record of ears under test. The system must be simple and quite fool-proof, or mistakes will be made in reading the test. It is quite well to number ears in lots of 10, 20, 50, or 100. Often a nail may serve as a division mark on the corn racks. Many marks on the rag dolls are usually unnecessary. An indelible pencil will be very satisfactory for markings on the rag doll.

The Modified Rag Doll Germinator

The use of the rag doll germinator, which may be modified, is a simple and efficient method of testing individual ears for germinating power and disease infection at the same time.

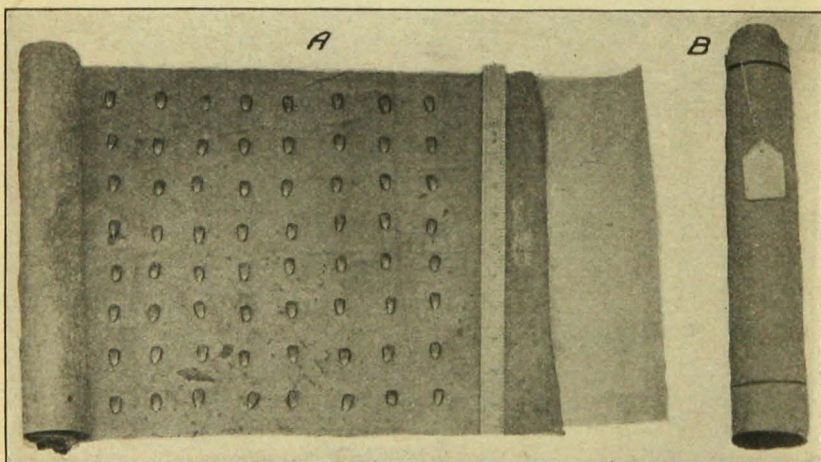


Fig. 1. Improved Rag Roll Germinator

A, Open, showing insulating paper, cloth, and corn kernels in position; B, rolled and labeled

To make a modified rag doll, cut strips of muslin 12 inches wide and 54 inches long and boil thoroly in order to sterilize them. Then lay this cloth on a strip of very heavy hard-finished paper of the same width and 6 inches longer. The purpose of the heavy glazed paper is to keep the molds that may develop on the kernels from one ear from growing through the cloth and affecting kernels from the other ears when the rag doll is rolled up. When the ears to be tested have been laid in order or numbered, from 8 to 10 kernels are taken from each

ear and laid in straight rows, germ side down and tips pointing toward the operator. The kernels from 20 ears are placed on the one rag doll as shown in Figure 1. The cloth is then thoroly wet and all is rolled rather tight, and a label is attached to the upper end giving the date and the numbers of the ears from which the kernels were taken.

The rag dolls as they are made up are put in a box, Figure 2, with double sides 3 or 4 inches deeper than the height of the dolls and of a size suited to the amount of corn to be tested. The inside box is 6 inches shorter and narrower than the outside box. It is from 3 to 4 inches less in depth than the outside box and has no bottom. At the bottom of the outside box is placed 3 or 4 inches of clean sawdust; the inner box is then put in place and the space between the two is filled with wet sawdust. When ready to use, the sawdust is made thoroly wet with hot water which drains through. The box should stand in a warm room. The temperature in the box is maintained at from 75 to 85 degrees F. by pouring twice daily about two pails of hot water over the sawdust at the sides. At the same time the dolls should be sprinkled with warm water. The box should be placed on tarred paper or roofing arranged so that the water will drain into receptacles. An electric bulb may be used to maintain the desired temperature if this is more convenient than using the hot water. If electricity is used for heating, the sawdust must be kept moist by adding hot water as needed.

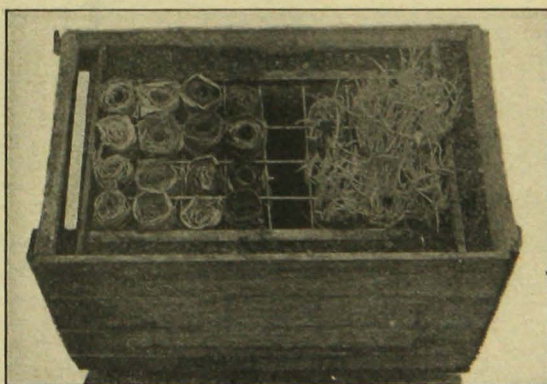


Fig. 2. Modified Rag Doll Seed Germinator, Showing Double Box with Rag Dolls in Position

Doll with Central Wire Screen Cylinder

The simplest form of a rag doll tester consists of a wire core two inches in diameter and a strip of unbleached muslin or old sheeting twelve inches wide and about fifteen feet long. It is best to use galvanized wire screen, Figure 3, as this does not stain the cloth. A strip of glazed paper the same length and width as the muslin assists greatly

in unrolling the rag doll as the sprouts do not grow through the paper as readily as they will through the cloth. Thus it is easier to keep the kernels in place when reading the tester.

A strip of glazed paper is laid on a table and the cloth, which has been wet, is laid on top. The core is started at one end and rolled over three or four times so as to keep the inside of the tester from drying out. Now the kernels are laid on in parallel rows, from three to six kernels being taken from each ear. Butts, tips, and all sides of the ear should be represented in the sample. We have found it best to put the samples from about three ears in each row. Every tenth ear at least should be definitely numbered or marked so that if a mistake is made in reading the test no more than ten ears will be wrongly placed. An indelible pencil serves well for writing the numbers on the cloth. A number may be attached to the ear with a shingle nail. A tester of this size will hold from 100 to 200 ears, depending on the spacing of the samples. It is best not to place them too closely together as they may get mixed.

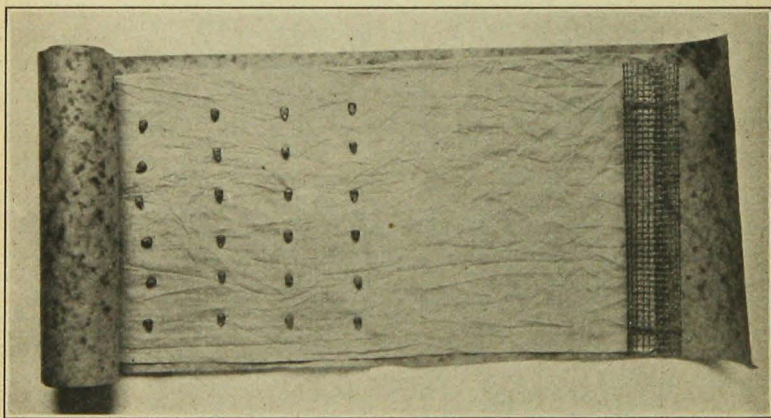


Fig. 3. Wire Screen Doll Tester

As soon as the samples are laid out for some distance the core is rolled over and over and the work continued until within about eighteen inches of the end. This should be wrapped around the doll to keep it from drying out. Four strings are tied so as to keep the kernels in their proper place. The doll is numbered and put to soak in luke warm water for from 20 to 24 hours. It is then drained and set upright in a pail or boiler and kept at room temperature for about a week. If the temperature is rather low it may be kept ten days. If the doll dries out it may be held in a pail of warm water until the bubbles cease to rise. The sprouts are allowed to grow to from two to six inches in length, so that relative degrees of vigor may be determined. A kernel having a

good, strong germination will make a better growth early and usually hold its lead until maturity.

From two to fifteen bushels have been tested every year by this method at the Waseca Experiment Station, and the results have been satisfactory in every way. A tester of this sort capable of holding about two bushels of corn will cost around 25 cents.

Reading the Test

The test may be read when the stems show 2 or 3 inches above the upper ends of the rag dolls and the roots project below. This requires from 7 to 10 days. A rag doll partly unrolled for reading is shown in Figure 4.

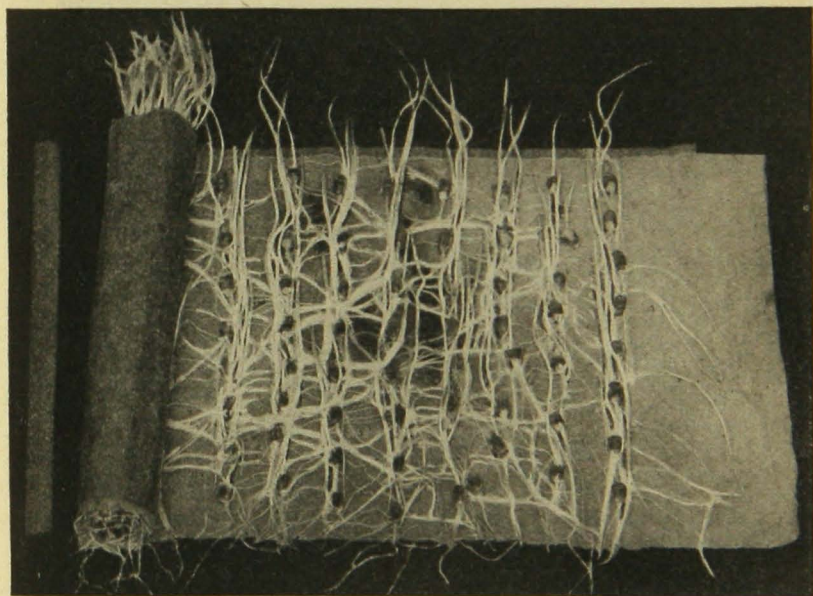


Fig. 4. Rag Doll Germinator Unrolled for Reading of Results

Ears of corn selected for seed may be unfit for this purpose owing to injury of the kernels by frost, improper curing, or faulty storage. Kernels that have been injured in this way show either no germination or slow and weak growth of the seedlings. When the kernels in the germinator show this kind of injury, the ears from which they came should be discarded. Ordinarily, weak or slow germination of the kernels should bring about the discard of ears just as quickly as entire failure to grow.

After the cloths for rag dolls have been used once they must be boiled thoroly before they are used again. New papers must always be used.