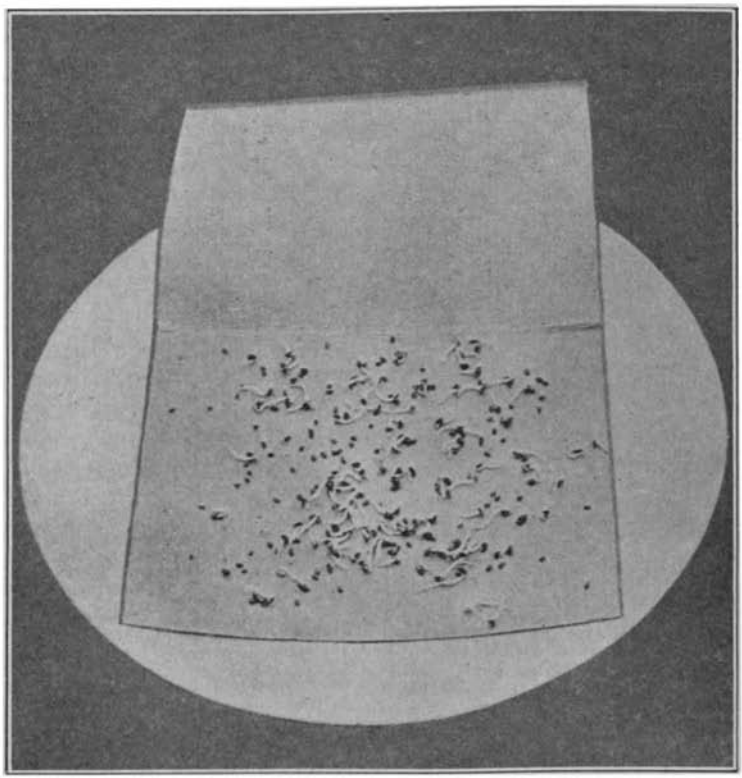
January, 1919 Extension Bulletin Series 1, No. 153-A

Colorado Agricultural College
EXTENSION SERVICE
Fort Collins, Colorado

H. T. FRENCH, Director

SEED TESTING IN THE HOME AND SCHOOL

By
W. W. ROBBINS and G. E. EGGINTON



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SEED TESTING IN THE HOME AND SCHOOL

By W. W. ROBBINS and G. E. EGGINTON

Seed testing is a simple and easy operation which requires very little time to perform. For example, it has been shown that one man, by the use of 10 hours total time, can test enough seed corn for 67 acres, even when he makes a germination test of every ear of corn used for seed. The apparatus required to do efficient seed testing in the home or school need not be expensive or difficult to make. The several methods for germination tests which are described farther on in this bulletin require nothing more than a box, some soil, sand or sawdust, cotton flannel cloth, or Canton flannel, blotters, and several common dinner plates. A home purity test will require the use of a simple tripod lens.

Seed testing should be a part of every farmer's business. He should regard it as one of the necessary farming operations, just as he does his tilling, fertilizing, and other operations.

Every farmer will find time during the year to test well all the seed he plants. It is a precaution against crop failure. One may have seed of excellent germinating power a number of years in succession, and may reason that testing is an idle waste of time, but the value of a test is realized in that year when seed is low in vitality. A seed test is insurance against a possible total or partial loss of a crop.

Untested seed means decreased yields. Every year, a certain percentage of agricultural seed fails to grow because of its low vitality. Although it is true that some years it is difficult to secure seed of high vitality, as a rule the best seed attainable has not been planted, and only the best seed should be planted. Testing eliminates the inferior lots of seed, and, in the case of corn, the inferior ears.

But seed testing not only has for its object the determination of vitality as shown by the germination test. A purity test will detect adulterants and noxious weed seeds. No farmer will knowingly drill noxious weed seeds into his well-prepared seedbed. And yet, just this thing is often done, because his seed "looks good"; he does not know that noxious weed seeds are actually present. As a matter of fact, a number of weed seeds resemble crop seeds, and rather careful observation is required to detect their presence.

Adulterations and weed seeds are, of course, most difficult to detect in such seeds as timothy, blue-grass, alfalfa, clovers, and other small-seeded crops. A purity test of such seeds is every bit as important as a germination test. Tests for adulteration and noxious weed seeds are unnecessary in the case of corn, peas, beans, and a number of other crops with large seeds.

THE COLORADO PURE SEED LAW

In 1917, the Twenty-first General Assembly of Colorado passed an act known as the Colorado Pure Seed Law. This law regulates the sale and importation of seed; it also provides for a state seed-testing laboratory, and makes appropriations of money for carrying on the work of the laboratory. The chief provision of the law is the one which requires that all field seeds sold, offered or exposed for sale, within Colorado, for seeding purposes in the State in lots of 5 pounds or more shall be labeled. This label shall give the following:

1. Kind of seed, and variety.
2. Percentage of purity.
3. Percentage of germination.
4. Date of germination test.
5. Place where seed was grown, and locality, if in Colorado.
6. Name and number per pound of each noxious weed seed in excess of 90 seeds per pound.
7. Name and address of salesman.

The act provides that any citizen of Colorado, or any person shipping seed into Colorado for seeding purposes in the State, may send samples of seeds to the seed laboratory of the Agricultural Experiment Station for test and analysis. *The tests and analyses are made free of charge.* Send a good two handfuls of seed, wrapping them well, and addressing them to Colorado Seed Laboratory, Ft. Collins, Colorado.

THE PURITY ANALYSIS

A purity test is made (1) to detect adulterants in seed, and (2) to find out the character and amount of weed seeds and inert matter present. The purity is expressed in percentage, and based upon weight. Inert matter includes broken seed, chaff and dirt.

Casual inspection of a lot of seed will reveal very few of the weed seeds present, especially when the lot under examination has been milled and the chaff, sticks, and smaller weed seeds removed. A carefully conducted purity test will, because of its thoroughness, result in the detection of all adulterants as well as unmilled weed seeds and inert matter. Take, for example, alfalfa containing a small amount of large-seeded alfalfa dodder. Not one buyer in ten will detect this undesirable seed because of its close resemblance in size and color to the alfalfa seed.

Each farmer before planting should know just what his lot of seed contains of weed seeds and inert matter, such as broken seed, chaff and dirt.

When seed is home-grown there is no particular hurry about having a purity test made, and there is ample time to have tests of such seeds made at the Colorado Seed Laboratory, which is specially equipped to make very accurate analyses. When it is necessary to purchase seed from a seed company it may be advisable to make a purity test at home, for a home test means immediate returns and the farmer is able to take advantage of a choice lot of seed when it appears on the market, whereas a delay of sev-

eral days in securing results from the state laboratory would mean loss of opportunity in securing the best seed before the stock has been entirely exhausted. The prospective buyer should ask for a representative sample of the seed offered for sale and satisfy himself as to the quality before purchasing. The large and reputable seed companies conduct a "buy on sample" business, and a purity test is therefore entirely possible.

Samples from home-threshed seed should be taken in such a way as to secure a representative sample. The ordinary metal seed sampler (Fig. 1) is very commonly used for sampling small seeds such as alfalfa, red clover,

Fig. 1—Seed trier which may be used in taking samples of the smaller seeds from sacks without opening the sacks.

and timothy in bags. The use of this sampler does away with opening each bag. When only one bag is to be sampled, small amounts should be taken from the top, middle and bottom of the sack. If more than five bags, samples should be taken from every fifth bag. The composite sample of one lot in any case should be thoroughly mixed in a receptacle so that there may be even distribution of weeds and dirt throughout the sample. The sample so mixed is known as the test or trial sample. Of course, samples may be taken by hand from open bags, bins, and other containers.

With a knife and with the aid of a tripod lens, the sample is separated into three piles: (1) pure seed (2) weed seeds and other seeds, and (3) inert matter. The percentage of purity can be accurately determined when balances are available or roughly estimated if there are no scales to be had.

Unknown seeds which do not occur in the authentic collection, a sample of which may be secured from the Colorado Seed Laboratory, may be sent to the Colorado Seed Laboratory for identification.

The following is an actual case of a purity analysis of alfalfa which will show the steps in the process and the method of computing the percentage of purity:

1. The sample of alfalfa seed was spread out on a piece of white paper, as shown in Fig. 2.
2. The sample being larger than needed, it was divided and subdivided as shown in Fig. 3, until the desired amount was obtained, approximately one-sixth oz. (5 grams). In this particular case, the portion separated off for analysis weighed 5.4 grams.
3. With a knife and a lens, the sample was carefully worked over (as shown in Fig. 4) and separated into three piles; (a) pure seed, (b) weed seeds, and other seeds, and (c) inert matter (sticks, broken seeds, chaff, and dirt).
4. The pure alfalfa seed was placed on the scales and the weight recorded (in this case 5.1 grams).

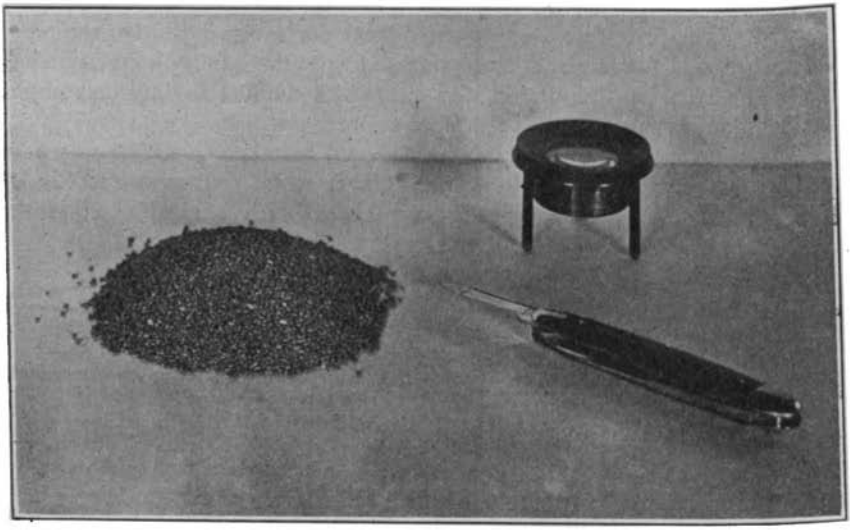

Fig. 2—The seed to be tested as to purity is spread out on a sheet of paper or piece of glass. A knife and simple tripod lens are all the apparatus necessary to separate the seed into (a) **pure seed**, (b) **weed seeds and other seeds**, (c) **inert matter.**

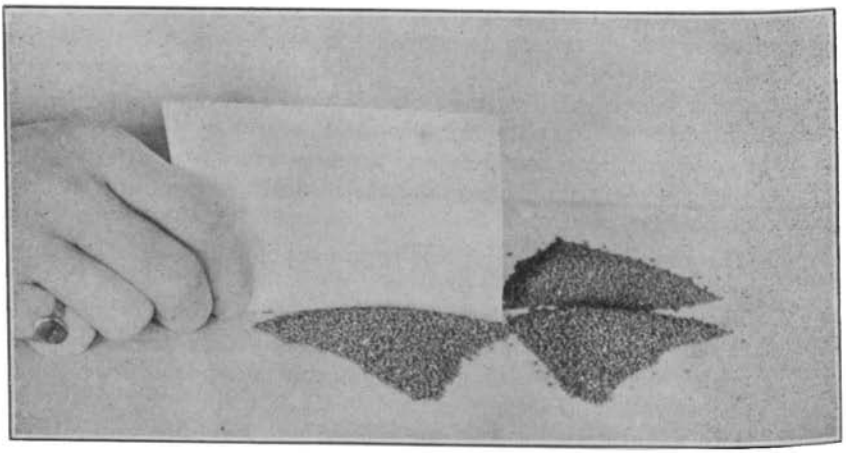

Fig. 3—Showing the method of dividing original purity sample in order to obtain the proper amount for purity analysis. This method of dividing eliminates any tendency of the individual to select either good or bad seed for analysis.

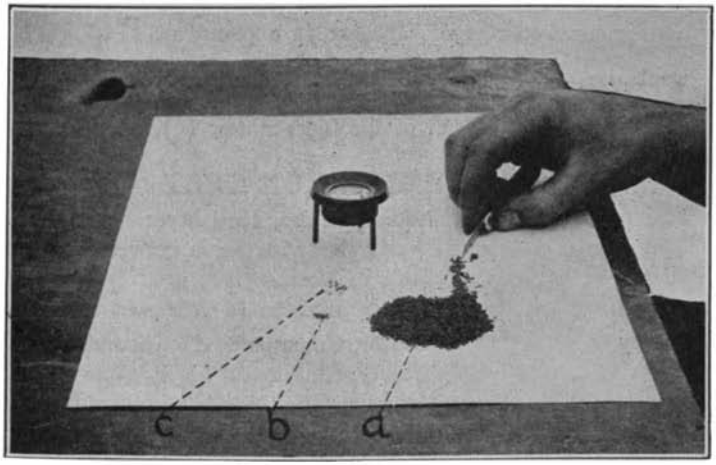

Fig. 4—With a knife and with the aid of the tripod lens, the sample is separated into three piles: (a) pure seed, (b) weed seeds and other seeds, and (c) inert matter.

5. The percentage of pure seed was then computed by dividing the weight of pure seeds, 5.1 grams, by the original weight, 5.4, which gives 94.4 per cent. The remaining 5.6 per cent by weight is composed of the weed seeds and other seeds and inert matter in the two piles (b) and (c). The percentages of (b) and (c) can be computed likewise. In this special case the seeds of pile (b) weighed .24 grams, which gives a percentage of (.24÷5.6) 4.28 per cent. The percentage of inert matter is 1.32 per cent.

Summarizing:

Weight of original sample, 5.4 grams.
Weight of pure seed (a), 5.1 grams.
Percentage of pure seed (a), 94.4 per cent.
Weight of weed seeds and other seeds (b), .24 grams.
Percentage of (b), 4.28 per cent.
Weight of inert matter (c), .06 grams.
Percentage of (c), 1.32 per cent.

6. With tripod lens identify the seeds in pile (b). In this case there were seeds as follows:

Lambs quarters 5
Sweet Clover 3
Dodder 2
Pigweed 4

The number of any one of these impurities per pound of seed may be computed. For example, there were 2 dodder seeds in 5.4 grams

of sample. In one pound there are 454.5 grams. If there were 2 dodder seeds to every 5.4 grams, in a pound or 454.5 grams there would be $\frac{454.5}{5.4} \times 2 = 168$ dodder seeds.

7. Determine the character of the inert matter (c).

THE GERMINATION TEST

Four kinds of home-made testers are described here:

1. *The dinner plate or blotter tester* with seeds between or on top of blotter, or between the folds of cloth.

The following seeds should be germinated (a) *between blotters:*

Barley	Clover, Common Red	Cucumbers
Beets	Clover, Mammoth	Egg-plant
Buckwheat	Johnson Grass	Lettuce
Hemp	Millet	Melons
Oats	Orchard Grass	Onions
Rye	Rape	Parsley
Turnips	Sorghum	Parsnip
Wheat	Sudan Grass	Peppers
Alfalfa	Cabbages	Radishes
Bromegrass	Cauliflower	Spinach
Clover, Crimson	Carrots	Tomatoes

The following seeds should be germinated (b) *on top of blotter* with seeds kept *in dark* by covering with a dinner plate:

Flax	Timothy
Clover, White	Celery
Red Top and Alsike	

The following seeds should be germinated:

(c) *On top of blotter,* with seed kept *in light* by covering germinating dish with a plate of glass:

Bermuda Grass Blue Grass

The following seeds should be germinated:

(d) *Between the folds of cloth*:

Beans	Asparagus
Corn	Pumpkins
Peas	Salsify
Cow Peas	Squashes
Vetch	Sweet Corn

2. *The Soil Flat or Box Tester.* This is recommended for use in testing any of the larger field and garden seed, and in making an individual ear test of corn.
3. *The Rag Doll Tester.* This is a very common form of tester used in making an individual ear-test of corn.
4. *The Soil Tester.* This is an ordinary shallow box filled with soil or sand and is conveniently used in testing the larger seeds.

THE DINNER PLATE SEED TESTER

(a) *Seeds to be tested for germination between blotters* (*Fig.* 5):

1. Secure two ordinary dinner plates.
2. Cut a strip of blue or white blotting paper into a strip about 6 inches by 12 inches.
3. Immerse the blotter in water and after draining, place it unfolded on one of the dinner plates.
4. Count out 100 seeds taking them just as they come, without discrimination and including shriveled as well as plump seeds.
5. Scatter the seeds on one-half of the blotter, so that they do not touch each other.
6. Fold the other half of the blotter over the seeds and cover with another dinner plate, thus making a moist chamber.
7. Place the tester where the temperature will remain at about 70°. Fahrenheit. It may be necessary to moisten the blotter every day or so. Blotters should always be moist but not saturated.
8. Count the sprouts according to length of time given in Table I.

Record of Germination

Kind of Seed.....Variety.....
Owner of Seed.....Tested by.....
Type of Tester .....
Test Begun (Date) .....
Number of sprouts at the end of.....days (preliminary)
Number of sprouts at the end of.....days (final)
Number of hard seeds (in the case of legumes).....

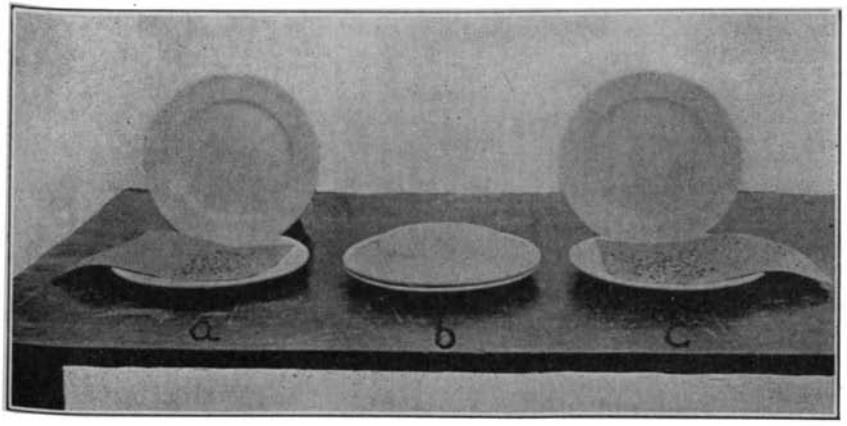

Fig. 5—The dinner plate seed tester. (a) 100 seeds are scattered on one-half of the blotter. The other half of the blotter is folded over the seeds. (b) Cover with another dinner plate, thus making a moist chamber. (c) The seeds have germinated, and the sprouts are ready to be counted.

TABLE I.—SEED BED, TEMPERATURE AND DURATION OF TESTS

(See Note)

Kind of Seed	Seed Bed	Temperature Fahrenheit	Day for Checking Germination Test	
			Preliminary	Final
Field Crops:				
Barley	B	68	3	5
Beans	C	68–75	3	6
Beets b-c	B	68–75	5	10
Buckwheat	B	68–75	3	5
Corn*	C	68–75	3	5
Flax	TB	68–75	2	5
Hemp	B	68–75	3	5
Oats	B	68	3	5
Peas*	C	68–75	4	8
Rye	B	68	3	5
Turnips	B	68	3	5
Wheat	B	68	3	5
Grasses, Clovers, Forage Plants:				
Alfalfa	B	68	3	5
Bermuda grass	BJ	68–75	10	21
Blue grass	BJ	68–75	14	28
Brome grass	B	68–75	5	10
Clover, alsike	TB	68	3	5
Clover, crimson	B	68	2	4
Clover, mammoth red	B	68	3	5
Clover, common red	B	68	3	5
Clover, white	TB	68	3	5
Cow peas*	C	68–75	4	10
Johnson grass	B	68–75	6	10
Meadow fescue	B	68–75	5	10
Millet	B	68–75	3	5
Orchard grass	B	68–75	6	14
Rape	B	68	3	5
Red top	TB	68–75	5	10
Sorghum	B	68–75	3	5
Sudan grass	B	68–75	3	5
Timothy	TB	68–75	5	8
Turnips	B	68	3	5
Vetch	C	68–75	4	14
Vegetables:				
Asparagus	C	68–75	6	14
Beans*	C	68–75	3	6
Beets b-c	B	68–75	4	10
Cabbages	B	68	3	5
Cauliflower	B	68	3	5
Carrots	B	68–75	6	14
Celery	TB	68–75	10	21
Cucumbers x	B	68–75	3	5
Egg plant	B	68–75	8	14
Lettuce b	B	68	2	4
Muskmelons x	B	68–75	3	5
Onions	B	68–75	4	7
Parsley	B	68–75	14	28
Parsnips	B	68–75	6	21
Peas	C	68–75	3	6

TABLE I.—SEED BED, TEMPERATURE AND DURATION OF TESTS—Cont'd.

Kind of Seed	Seed Bed	Temperature Fahnrenheit	Day for Checking Germination Test	
			Preliminary	Final
Vegetables (Continued):				
Peppers	B	68–75	4	10
Pumpkins x	C	68–75	3	6
Radishes	B	68	3	5
Salsify	C	68–75	5	10
Spinach	B	68	5	10
Squashes x	C	68–75	3	6
Sweet corn	C	68–75	3	5
Tomatoes	B	68–75	4	10
Turnips	B	68	3	5
Watermelon x	B	68–75	4	6

NOTE:

B—Between blotting paper.

TB—On top of blotting paper with seeds in dark.

BJ—On top of blotting paper with seeds kept in light by covering germinating dish with plate of glass.

C—Between folds of cloth.

b—Soak six hours in water at room temperature before testing for germination.

c—It is recommended that the germination of beet seed be confined to determining the percentage of balls which give sprouts.

*—Germinate in soil when possible.

x—Germinate in sand when possible.

The question is sometimes asked: "Why make both a preliminary and a final count of the sprouts?" This is to show the energy of germination or the power of the seed to respond quickly to growth conditions. Two lots of seed may have about the same final percentage of live seeds but one lot be more vigorous than another, and this relatively greater vigor is usually indicated in the preliminary count. For example, two lots of wheat (a) and (b) under similar germinating conditions, at the end of three days showed 80 per cent and 92 per cent sprouts respectively; while at the end of 5 days (a) showed 93 per cent and (b) 95 per cent, very nearly the same. But the sprouts of (b) were more vigorous than those of (a), and this fact was readily shown in the difference between the preliminary counts of germination. Preliminary counts are also valuable in that they remove sprouted seeds and prevent crowding in the later stages of germination.

(b) *Seeds to be tested for germination on top of blotters, and in dark*:

Proceed as in the preceding case, but do not cover the seeds with a fold of blotter. Small seeds of the type given in the list on page 9 germinate best on top of the blotter.

(c) *Seeds to be tested for germination on top of blotters, and in the light:*

Proceed as in the preceding case, placing seeds on top of blotter, but cover the dinner plate with a plate of glass so that the germinating seeds will be exposed to the light. (Fig. 6.)

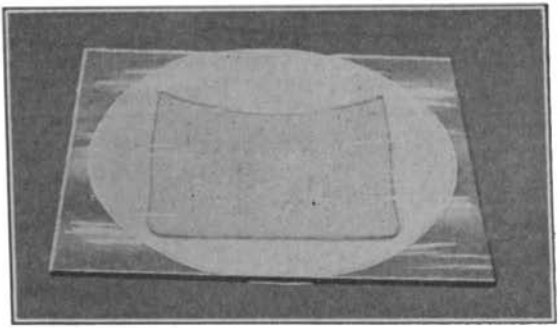

Fig. 6—The seeds of Bermuda grass and blue grass should be germinated on top of a blotter and kept in the light by covering the germinating dish with a plate of glass.

(d) *Seeds to be tested for germination between folds of cloth.* (Fig. 7.)

1. Secure two ordinary dinner plates.
2. Cut a strip of cotton flannel cloth or Canton flannel about 8 inches by 32 inches and fold cross-wise twice.
3. Immerse the flannel in water and after wringing out, place it, unfolded so as to leave two thicknesses of cloth on top and two thicknesses of cloth on the bottom of the seeds.
4. Count out 100 seeds taking them just as they come, without discrimination and including shriveled as well as plump seeds.
5. Scatter the seeds on one-half of the cloth, so that they do not touch each other.
6. Fold the other half of the cloth over the seeds and cover with another dinner plate, thus making a moist chamber.
7. Place the tester where the temperature will remain close to 70° Fahrenheit. It may be necessary to moisten the cloth every day or so. Keep cloth moist but not saturated.
8. Count the sprouts according to length of time given in Table I.

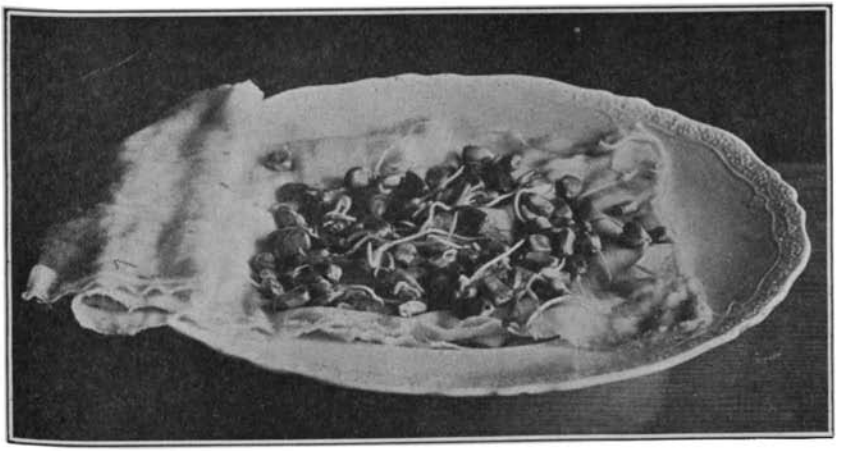

Fig. 7—Germinating seed between the folds of Canton flannel. Use two dinner plates, one inverted over the other. This type of germinator may be used in testing such large seeds as beans, corn, peas, pumpkin, squashes, etc.

The Soil Flat or Box Tester

(Fig. 8.)

Used by many in making individual ear-tests of corn.

1. A small shallow box or soil flat is filled with soil, sand or sawdust to about three-fourths its depth.

2. The soil, sand or sawdust is then thoroughly moistened.

3. Cut a strip of Canton flannel to fit the box top.

4. With pencil, mark off the flannel (smooth side) in two-inch squares.

5. Number each square, 1, 2, 3, etc., to correspond with the numbers on the ears to be tested. (Fig. 8a.)

6. Place the flannel in the box and push down gently until in contact with the sawdust, soil or sand.

7. *Moisten the flannel thoroughly.*

8. Select 10 kernels from different parts of each ear and place on the corresponding square, that is, kernels from ear No. 1 on square No. 1, etc. (Fig. 8b.)

9. Cover the seeds with a second layer of Canton flannel, and moisten well. (Fig. 8c.)

10. A final layer of moist soil or sand over the top layer of flannel will hold the moisture for a greater length of time and will demand less attention than the single layer of moist cloth.

11. Count the sprouts at periods stated in Table I.

12. In removing the top cloth for the purpose of counting sprouts, exercise extreme care or confusion will result, as the sprouts often penetrate both cloth and soil. Roll back the cloth slowly and carefully. (Fig. 8d.)

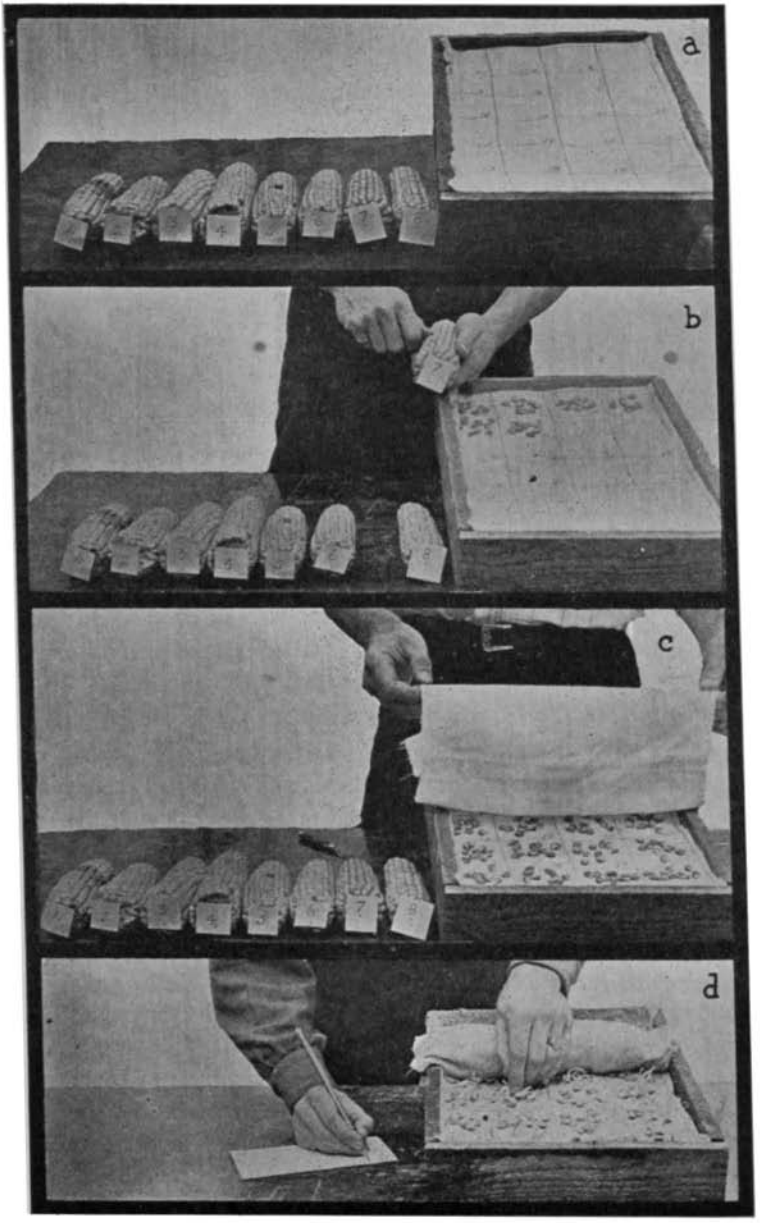

Fig. 8—The soil flat or box tester, used by many in making individual ear tests of corn. (a) Number the squares on the cloth and ears to correspond; (b) Place the kernels from individual ears on the squares; (c) Cover the seeds with a second layer of Canton flannel, moisten ,and cover with moist soil or sand; (d) At the proper time, remove the top cloth carefully, count and record the sprouts.

Rag Doll Tester

(Fig. 9)

Used in making individual ear-tests of corn.

1. In making the rag doll tester, select white muslin, Canton flannel or other white material that is sufficiently porous for holding moisture.

2. Cut in strips 14 to 16 inches and as long as desired, preferably 4 to 6 feet, and depending upon the number of ears to be tested.

3. Draw a line down the center of the strip. (Fig. 9a.)

4. Leave a strip 3 or 4 inches wide at the ends.

5. Mark the strip cross-wise at 3 or 4-inch intervals, making a number of sections either 3x7, 3x8, or 4x7, 4x8.

6. Number the sections 1, 2, 3, etc., to correspond with the numbers on the ears to be tested.

7. Moisten the cloth thoroughly before putting the kernels upon it.

8. Select 10 kernels from different parts of ear No. 1, and place in Section No. 1. Repeat the process with 2, 3, etc. (Fig. 9b.)

9. Place kernels about 2 inches from the dividing line and 1 inch from the cross lines.

10. Fold each side of the cloth over until the edges meet in the middle. (Fig 9c.)

11. Press the cloth down firmly over the kernels to prevent them from rolling or sliding from one section to another.

12. Using either a cob or cylindrical object, roll up the cloth, and fasten with a cord, rubber, or pins. (Fig. 9d and e.)

13. Immerse the rag doll in lukewarm water and allow to soak one or two hours.

14. Remove the doll and allow it to drain.

15. Keep in a warm place between 80°-90° F. during the day and 50°-60° F. at night.

16. Do not allow the doll to dry out. Wrap a wet cloth around it if necessary.

17. Count the sprouts at the end of five days. (Fig 9f.)

18. Before using the doll a second time, it should be sterilized in boiling water.

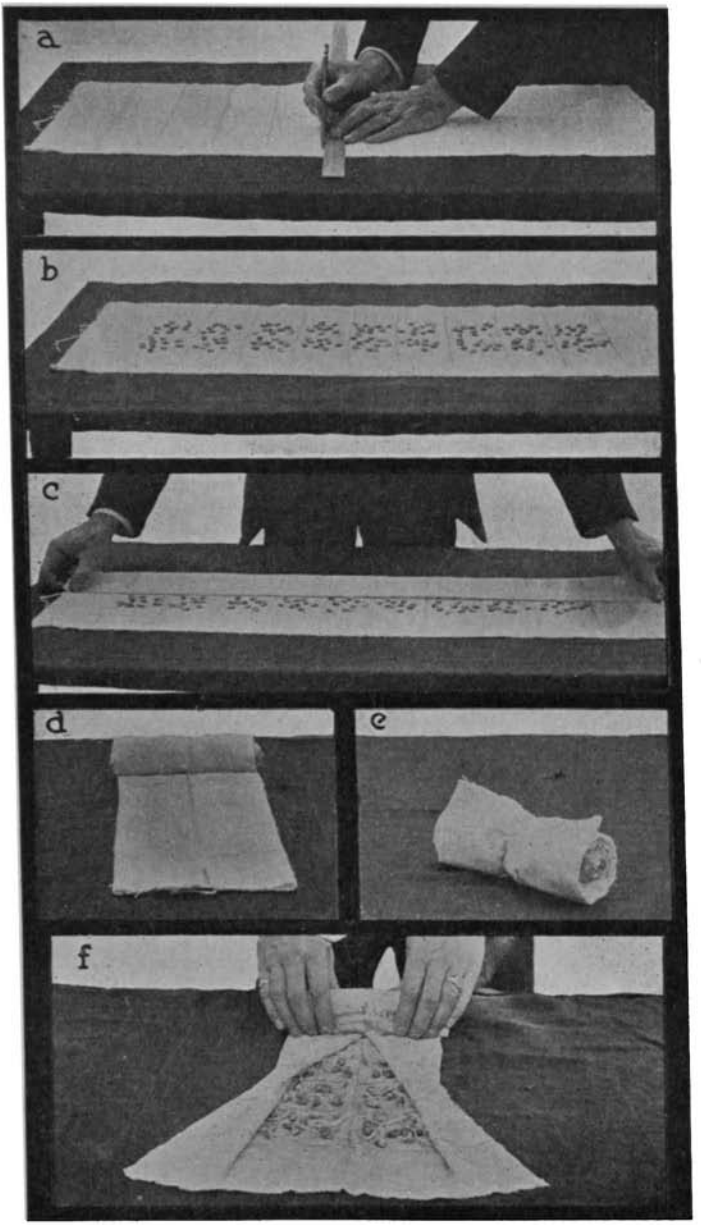

Fig. 9—The rag doll tester, used in making individual ear tests of corn. (a) Lay off the cloth into sections or squares, and number. Leave a strip 3 or 4 inches wide at the ends; (b) 18 ears of corn are here being tested, 10 kernels from each ear; (c) Fold each side of cloth until the edges meet in the middle; (d) Roll up the cloth on a corn cob. (e) Rag doll tied up, ready for immersion in water; (f) Unroll the rag doll carefully, count and record the sprouts on each square. An ear that fails to germinate 7 kernels out of 10 should be discarded and not used for seed.

Soil Tester

(Fig 10)

1. Use a soil flat or shallow box the same as used in making individual ear-tests of corn.

2. Fill with earth or sand.

3. Count out 100 seeds without discrimination as to plumpness and sow in the box.

4. Cover the seeds with one-half inch of soil or sand.

5. Allow double number of days for test mentioned in Table I.

6. In the case of seeds such as melon, cucumber, squash, pumpkin, etc., sand is recommended.

7. If sand is used in the box, care should be taken to avoid direct sunlight, which would bring about rapid evaporation, and consequent injury to the seeds.

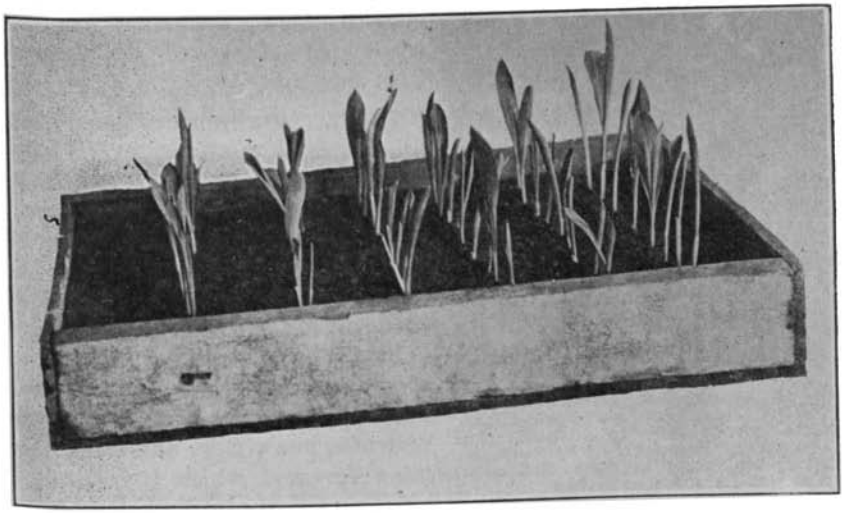

Fig. 10—The soil flat, recommended for testing the germination of corn, beans, peas, and other large seeds. The flat may be laid off into squares by cross wires attached to the sides of the box, and thus made suitable for the individual ear test of corn.

THE INDIVIDUAL EAR TEST OF CORN

The individual ear-test of corn is now almost universally practiced in the heavy corn-producing states. The acreage of corn in Colorado is increasing so rapidly, and the importance of the crop is becoming so great, that the need of more careful methods is being felt. In 1918 there was a serious shortage of first-class seed corn resulting from the freezing weather in the fall of 1917. The large amount of inferior seed planted in the spring of 1918 was strikingly evident in the uneven stands of corn which were observed everywhere in the corn-growing counties. And yet, it is safe to say that there was sufficient vigorous seed in the State to supply the demand, if a widespread practice of making individual ear germination tests had been adopted. The individual ear test would have separated the "sheep" from the "goats".

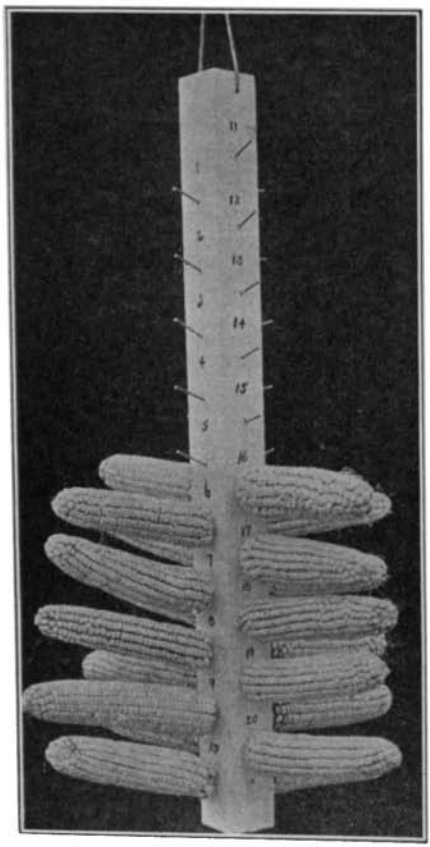

Fig. 11—Convenient seed rack for drying corn, and numbering the ears preparatory to making the individual ear test. The rack is hung up, thus keeping the corn away from mice and rats.

It is not at all impossible and impracticable to test every ear of seed corn planted in Colorado. Although it may not be necessary every season to test the entire supply of seed to be planted, the labor expended to accomplish this is not at all burdensome. In the small flat shown in Fig. 8, 24 ears of corn, enough grain to plant two acres, are being tested. The individual ear-test enables us to discard the ears with low vitality and select only those for seed which have a high vitality.

It will be a comparatively easy matter to test all your seed corn in a few evenings of the winter. Then, when corn planting time comes, you have at hand, ready for planting, only ears of high vitality. Many farmers think it does not pay to make germination tests for they have never been used to any more than a 60 to 80 per cent stand, and do not realize that a 95 per cent stand is possible.

The individual ear test is especially important in Colorado. Not infrequently our falls are early and corn is frosted. There is scarcely a year when some corn in several sections is not frosted. In many localities there is marked variation in the date of the first autumn frost.

SEED TESTING IN THE SCHOOLS

Many rural schools and high schools throughout the country are testing each year, large amounts of seed for the community. Seed testing classes are regularly conducted.

Germination tests of the more common seeds can be made very efficiently by the older pupils in these schools. They can render a service to their parents and the community and gain for themselves skill in testing seed, and much valuable information about seeds and their requirements of growth. Seed testing in the schools should be encouraged in every way possible.

As a rule the farmers of a community will be glad to get the assistance of the schools in testing their seed. Let the school give notice through their newspapers, or through a placard in the window of a local store, that seed will be tested free for the farmers of the community, and there will be a hearty response. Of course, the school must be prepared to make reasonably accurate tests, both for purity and germination; and must render reports in a business-like manner. No school should attempt this community service unless it is prepared to do it satisfactorily, for if it does not, discredit will fall upon it, and upon seed testing.

The pupils may be requested to bring samples of seed from home for test. The teacher should place each sample of seed as soon as received in a cheap manila envelope and give it a number. The teacher enters the number of the sample, the sender's name, and the date received on the following record form. The samples of seed for tests are given out to different pupils under sample number only, and germination reports are made to the teacher by the pupils as to sample number only. The teacher may, of course, give seed of the same sample to different pupils for test, in order to have a check on results. Seed testing may be carried on in the school room if the temperature is kept up at night. If the school room is cold at night, testing will have to be conducted in the homes. The rag-doll tester may be made up at school and easily taken home at night. During cold weather, it should be wrapped up or stuck under the pupil's coat next to his body when it is carried home in order to keep it warm.

It may be impossible in many instances for the pupils to make accurate purity analyses. A rather accurate balance is required. If it is impossible, the teacher may send the sample to the Colorado Seed Laboratory, Ft. Collins, for the purity analysis, using either her accession number and address or the sender's name and address.

TEACHER'S RECORD OF PUPIL'S SEED TESTS

School District No..... **Teacher**.....

No. of Sample	Sender's Name	Date Received	Tested by	Final Per Cent Germination	Per Cent Hard Seeds (Leguminous)	Per Cent Pure Seed	Per Cent Other Seeds	Per Cent Inert Matter	Principal Weed Seeds Present

PUPIL'S RECORD OF GERMINATION

School District No..... **Teacher**.....

Kind of Seed .....Variety.....
Owner of Seed.....
Teacher's Number of Seed.....
Kind of Tester.....
Test Begun (Date).....
Number of sprouts at the end of.....days (preliminary)
Number of sprouts at the end of.....days (final)
Number of hard seeds (in the case of legumes).....

Individual Ear Test of Corn

Ear No. 1..... Ear No. 6.....
Ear No. 2..... Ear No. 7.....
Ear No. 3..... Ear No. 8.....
Ear No. 4..... Ear No. 9.....
Ear No. 5..... Ear No. 10.....

Tested by.....

NOTE: If the school teacher gives out the samples by number, the name of the owner of seed will not, of course, be entered on the Record.

PUPIL'S RECORD OF PURITY

School District No..... **Teacher**.....

Kind of Seed .....Variety.....
Owner of Seed.....
Teacher's Number of Seed.....
Per cent pure seed..... Per cent other seeds.....
Per cent inert matter (sticks, stones, chaff, etc.).....
Foreign seeds in sample.....
.....
.....
.....

Analyzed by.....

NOTE: If the school teacher gives out the samples by number, the name of the owner of seed will not, of course, be entered on the Record.

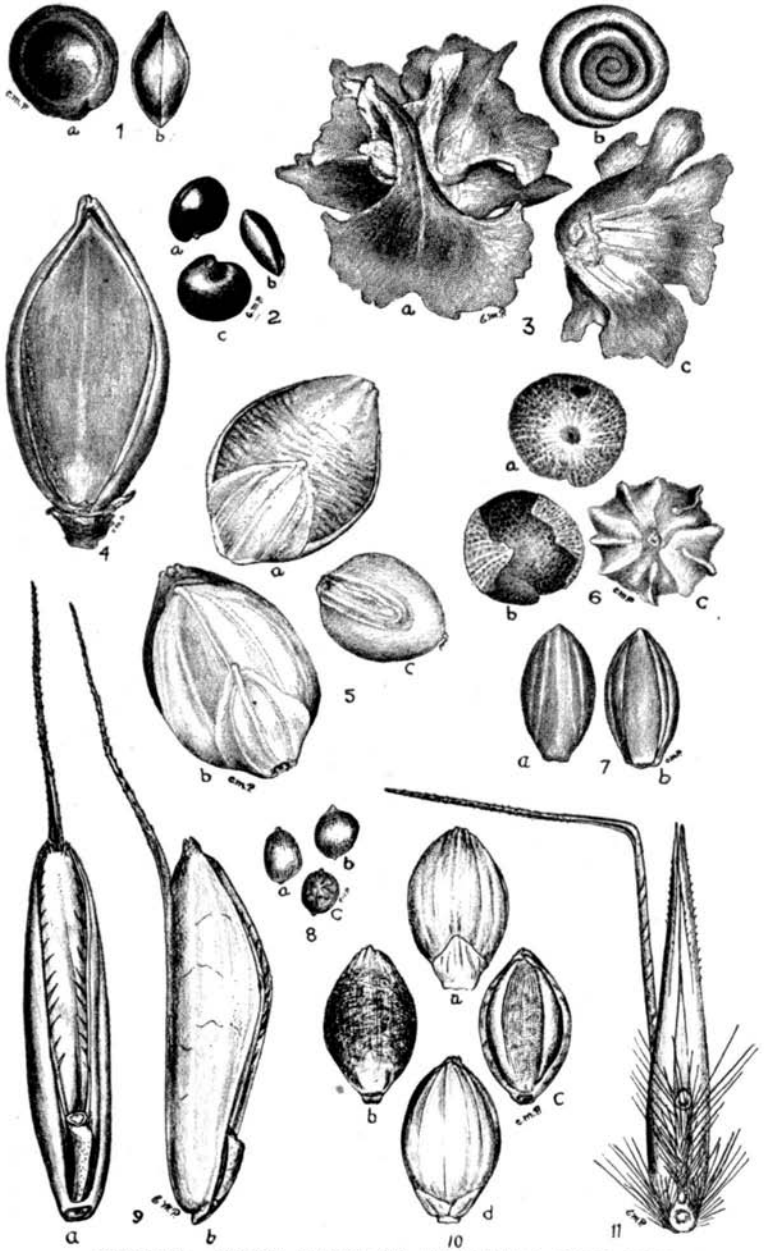

PLATE I.—WEED SEEDS OF COLORADO CROP SEEDS

1. Prostrate Pigweed **(Amaranthus blitoides).** 2. Tall Pigweed or Red-Root **(Amaranthus retroflexus).** 3. Russian Thistle **(Salsola tragus).** 4. Barnyard or Water Grass **(Echinochloa crus-galli).** 5. Yellow Foxtail or Pigeon Grass **(Setaria glauca).** 6. Lamb's Quarters **(Chenopodium album).** 7. Witch Grass **(Panicum capillare).** 8. Stink Grass **(Eragrostis major).** 9 Cheat **(Bromus secalinus).** 10. Green Foxtail **(Setaria viridis).** 11. Wild Oats **(Avena fatua).**

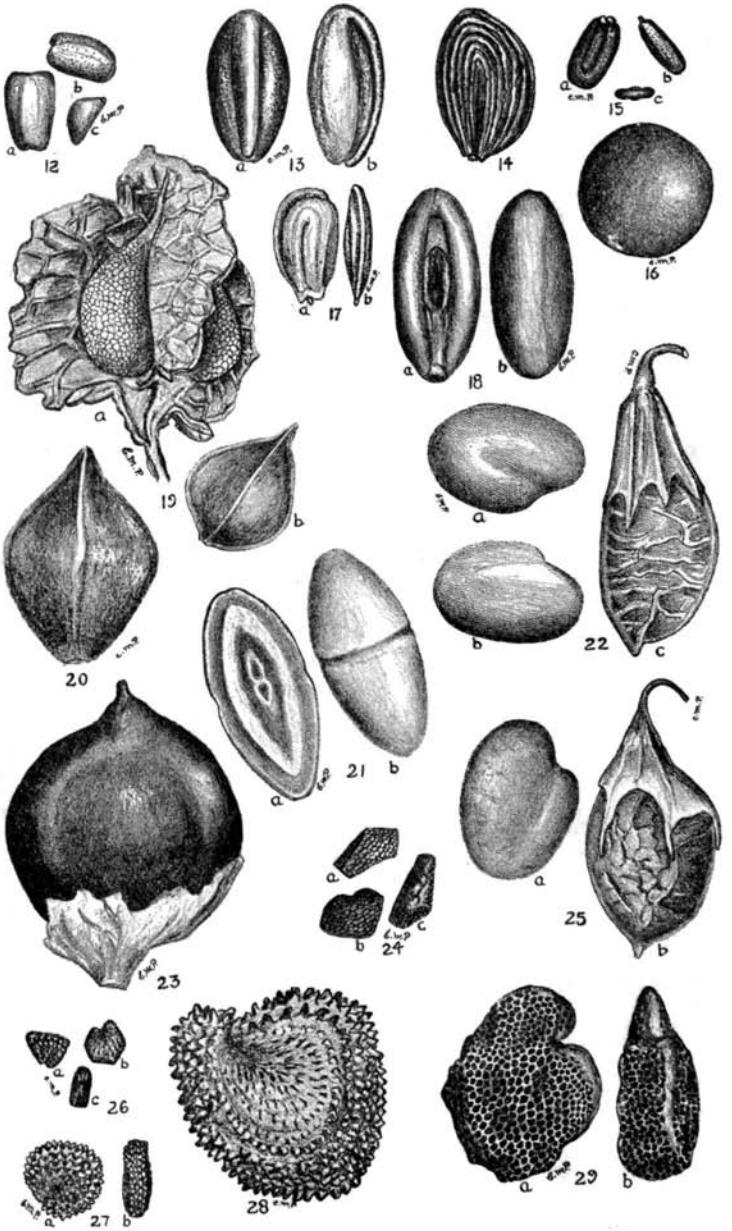

PLATE II.—WEED SEEDS OF COLORADO CROP SEEDS

12. Tumbling Mustard **(Sisymbrium altissimum).** 13. False Flax **(Camelina sativa).** 14. French Weed or Fan Weed **(Thlaspi arvense).** 15. Shepherd's Purse **(Capsella bursa-pastoris).** 16. Wild Mustard **(Brassica arvensis).** 17. Peppergrass **(Lepidium apetalum).** 18. Buckhorn or Narrow-leaved Plantain **(Plantago lanceolata).** 19. Curled Dock **(Rumex crispus).** 20. Black Bindweed **(Polygonum convolvulus).** 21. Bracted Plantain **(Plantago aristata).** 22. Yellow-flowered Sweet Clover **(Melilotus officinalis).** 23. Pennsylvania Smartweed **(Polygonum pennsylvanicum).** 24. Broad-leaved Plantain **(Plantago major).** 25. White-flowered Sweet Clover **(Melilotus alba).** 26. Large Mouse-eared Chickweed **(Cerastium vulgatum).** 27. Chickweed or Starwort **(Alsine media).** 28. Corn Cockle **(Agrostemma githago).** 29. Buffalo Bur **(Solanum rostratum).**

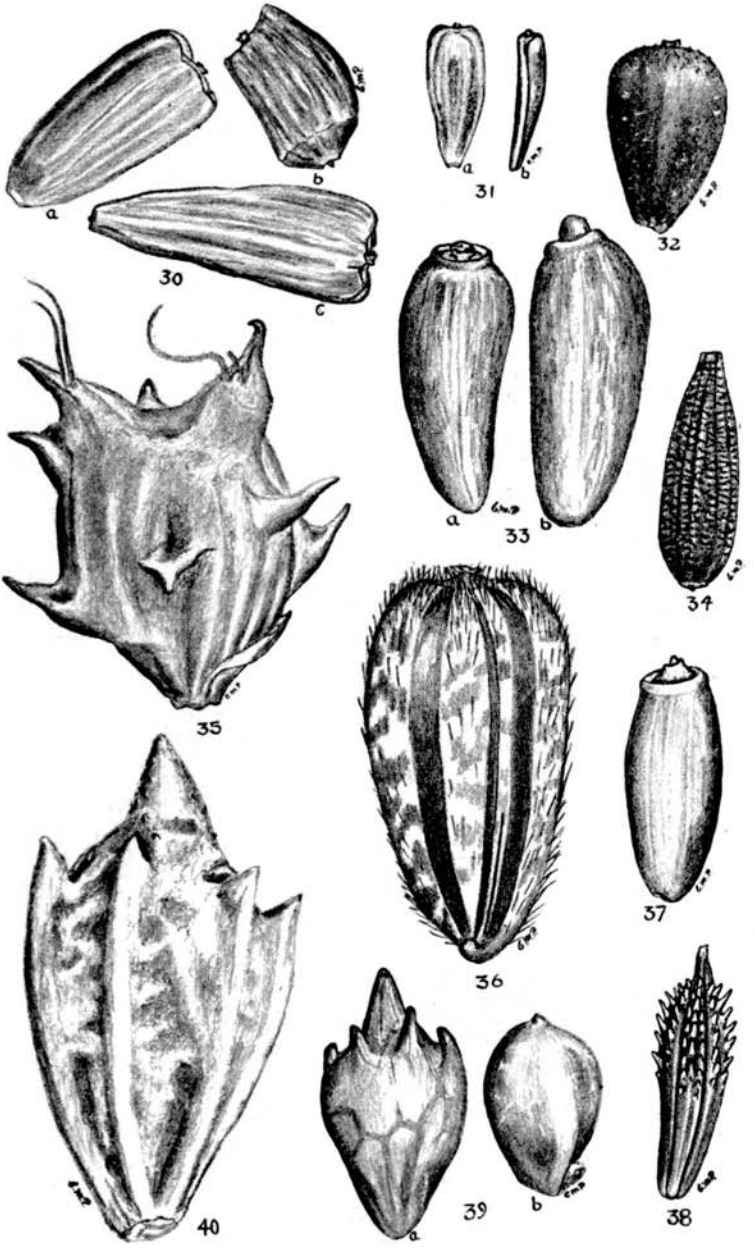

PLATE III.—WEED SEEDS OF COLORADO CROP SEEDS

30. Gumweed **(Grindelia squarrosa).** 31. Yarrow **(Achillea millefolium).** 32. Poverty Weed **(Iva axillaris).** 33. Bull Thistle **(Carduus lanceolatus).** 34. Sow Thistle **(Sonchus oleraceus).** 35. Poverty Weed or Blue Weed **(Franseria tomentosa).** 36. Sunflower **(Helianthus annuus).** 37. Canada Thistle **(Carduus arvensis).** 38. Dandelion **(Taraxacum taraxacum).** 39. Small Ragweed **(Ambrosia artemisiaefolia).** 40. Kinghead **(Ambrosia trifida).**