

# Texas Agricultural Experiment Stations

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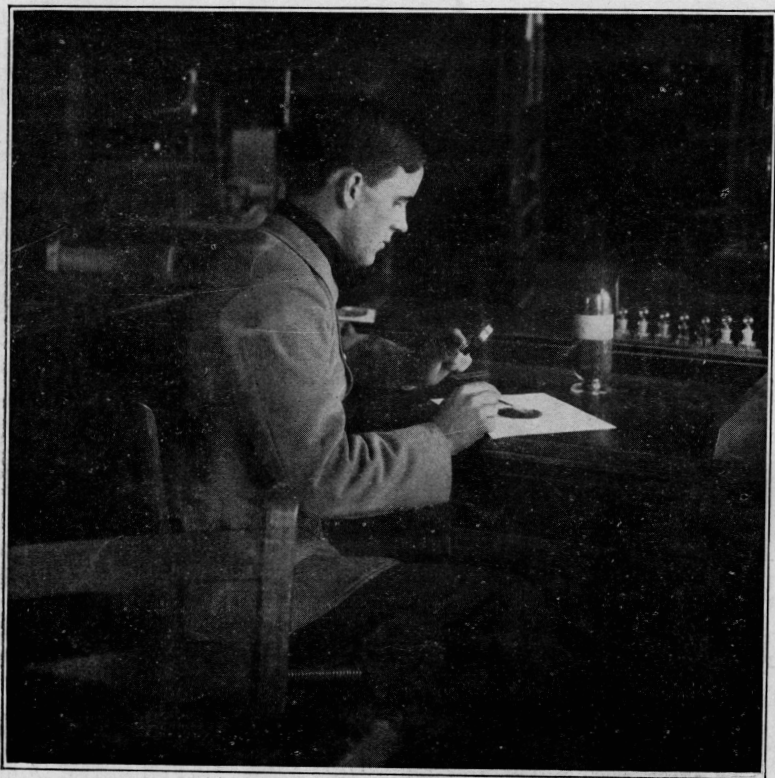
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BOTANICAL SECTION.

DECEMBER, 1905.

## Alfalfa Seed Testing

By O. M. BALL.



Postoffice:

College Station, Brazos County, Texas.

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# Alfalfa Seed Testing

By O. M. BALL.

The rapid development during the past year or two of the use of alfalfa as a forage crop makes the matter of purity of the seed to be sown of peculiar importance to the planter. Alfalfa seed, like those of clover, timothy and other similar forage plants, are very small and are hence particularly liable to become contaminated with small and injurious weed seeds and with the seeds of other leguminous plants, such as bur clover, sweet clover and sanfoin. Indeed, many seedsmen have not been above mixing seeds of the latter with alfalfa as adulterants, since they are in many cases far cheaper and their great similarity to the genuine alfalfa seed makes detection of the adulteration extremely difficult for the average farmer. It must be said, however, that wilful adulteration of seeds is, all things considered, of comparative rare occurrence. It is practiced, however, and hence the planter should learn to distinguish the true seed from the false, a matter which is sometimes of great difficulty.

## I. TESTING THE PURITY.

In the majority of cases, the foul seeds found in any given sample are present only by accident or as the result of imperfect cleaning. When the percentage of such foreign matter is very high, there is, at least, good ground for suspicion. Such seeds should be declined.

Inert matter is also very often present in small seeds, sometimes to an extent which materially affects their value, and is also an indication of carelessness or of willful adulteration. This inert matter is usually and or broken stems and may be readily detected by the purchaser.

Another impurity commonly found is dead, immature, or old seed. These may also be present in large quantity, but may be readily detected by their color, which is always brown or black in the dead and old seed and pea green in the immature. A large admixture of these lowers the value of the seed in the same manner as inert matter.

**Good Alfalfa Seed.** Good, fresh alfalfa seed, (See figures in upper row of Plate I.) are always of a healthy olive or yellowish green and are full and plump, never shriveled nor discolored. There are apparently some exceptions to this, the principal one being the seeds of the foreign alfalfas, after importation, such as Turkestan and German, where the color is a dull, rusty brownish green without the fine lustre of the fresh American grown. We have found, however, that the vitality of such seeds is never as high as that of the fresh homegrown kinds.

In size the seeds are similar to those of red clover. They vary considerably in shape, some being roughly triangular in outline, while others are kidney-shaped, and still others are more or less irregular. A good idea of the various form may be gotten from Plate I. Note



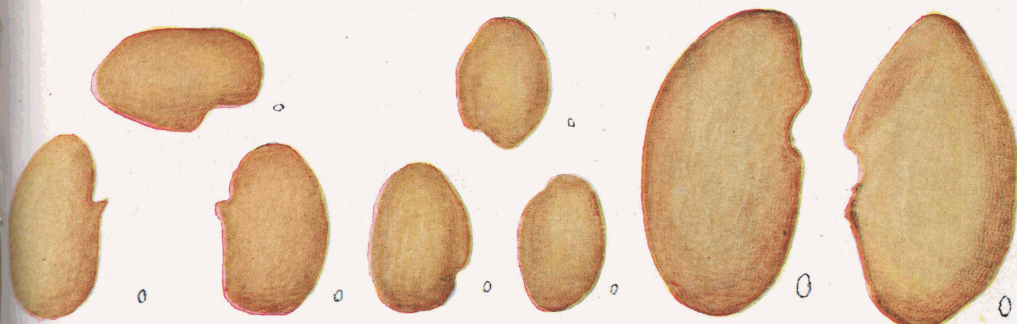
# ADULTERANTS AND WEED SEEDS FOUND IN ALFALFA SEED

VARIOUS FORMS OF ALFALFA SEED OF HEALTHY COLOR.



ALFALFA.  
MEDICAGO SATIVA.

OTHER CLOVER SEEDS SOMETIMES USED AS ADULTERANTS.

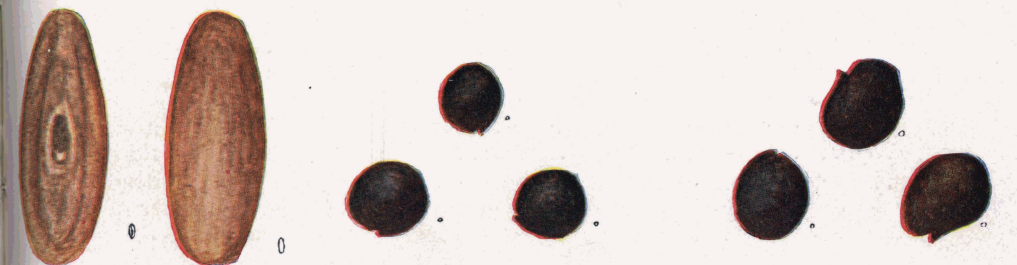


SWEET MELILOT, WHITE.  
MELILOTUS ALBA.

SWEET MELILOT, YELLOW.  
MELILOTUS INDICA.

BURR CLOVER.  
MEDICAGO DENTICULATA.

NOXIOUS WEED SEEDS VERY COMMONLY FOUND IN ALFALFA SEED.



RIB GRASS, PLANTAIN.  
PLANTAGO LANCEOLATA.

TUMBLE WEED.  
AMARANTHUS GRACILARIS.

CARELESS WEED.  
AMARANTHUS HYBRIDUS.

SPECIALLY NOXIOUS WEED SEEDS FREQUENTLY FOUND IN ALFALFA SEED.



RUSSIAN THISTLE.  
SALSOLA KALI TRAGUS.

DODDER.  
CUSCUTA ARVENSIS.

that the "hump" lies generally near the middle of the concave side.

The seed gradually loses its lustre with age and becomes dull brown or quite black, the intensity of the color being a fair indication of the age. This loss of color sometimes depends upon the ripeness of the seed before harvesting, the over-ripe seeds showing more or less of a brownish tinge, although the vitality is not impaired. In selecting stock it is generally safe to follow the rule that all dead seed are brown, though all brown seed are not necessarily dead. Immature seed, on the other hand, are of a livid pea green color and are invariably dead or possess low vitality. If present in large quantity they may change the whole appearance of the sample, which should be rejected. Like other seeds, alfalfa seed sometimes become musty from sweating or heating after harvesting and then have the odor characteristic of such seeds. Aside from the danger of introducing various fungus and bacterial pests into the crop, the vitality of such seeds is markedly lowered.

Good, fresh alfalfa seed should weigh 60 pounds to the bushel.

It is worthy of note that the word "purity" as used by the seedsmen and by writers on seed selection denotes simply freedom from impurities and is not used in the sense of the term "pure-bred" as used by stockmen. Unfortunately, seed selection in the instance of alfalfa has not yet been carried to that point where we can speak of "pure-bred" seed in the same way.

The quantity of any seed which is necessary to be sown to the acre depends obviously upon several factors, the principal of which are the number of plants desired upon the land and the number which will germinate in a given sample. In the first place, alfalfa plants should be rather thickly set. Allowing one plant to every six square inches of surface, there would thus be 174,240 plants upon an acre. A sufficient quantity of seed must be sown to supply this number, after allowing for all that do not germinate and for those which are destroyed by insects, animals and other means. Estimating the number which will be sown in 20 pounds per acre by actual count of several ounce samples, the average is 2,200,000 seed. This number will allow about twelve seed to fall upon every 6-inch square of ground in one acre. This is apparently greatly in excess of the actual need. Now these figures are intended to show solely that the purer the seed and the higher the germinating power, the smaller the quantity necessary per acre will be. If a sample of seed should show a high rate of impurities or of dead seed, just so much more per acre will be required to make up the deficiency. It will thus at once appear that low-priced seed are never really cheap since the lower cost price is due wholly to the quality of the seed and perhaps to adulteration or to the admixture of inert matter for the purpose of weighting. Nevertheless, seedsmen have repeatedly stated to the writer that they are obliged to keep a stock of inferior seed on hand because many farmers demand a lower and cheaper grade. In no other pursuit will the maxim, the best is the cheapest, be found so applicable as in agriculture. Many of the failures which have discouraged farmers even

in planting alfalfa are traceable solely to the mistaken idea that a lower grade will do. Demand the best and freshest seed and sow properly.

Doubtless many planters will in the future begin to grow and plant seed which they have raised. If this becomes the case, every precaution must be observed that the quality of the seed be not impaired by mixing with other and inferior kinds and by becoming contaminated with undesirable weed seeds.

**Method of Examining for Purity.** Having once learned to know a good sample as to freshness and comparative freedom from weed seeds, the planter should further acquaint himself with methods of close inspection. These are exceedingly simple and can be applied by the veriest tyro—at home, in the kitchen or in the barn. Secure a sample as far as possible from several parts of the pile of seeds to be inspected. Altogether, a good handful will do. Mix these thoroughly and then, if a considerable degree of accuracy is desired, weigh out one-sixth of an ounce of this mixture. No seedsman will object to the loss of such a small quantity. The seed are now spread out upon a sheet of white paper and with a case knife are separated into piles containing respectively all the foreign seeds, the good seeds and any sand or other inert matter that may be present. If a small hand lens or reading glass be at hand, so much the better, but is not necessary, provided the operator has fairly good eyes. In cases where seed of dodder are suspected the use of a hand lens is advised since these seed are very small and might otherwise escape detection. The percentage of impurities in the sample may be approximately estimated by the size of the various piles thus sorted out. In almost all cases a larger or smaller amount of trash consisting of broken stems, bits of dirt or sand will be found. This is unavoidable to a great extent, since the size and weight of the particles are about the same as those of the alfalfa seeds and so they pass through the sieves and are not blown out in the fans.

**Weed Seeds Often Found In Alfalfa.** Of far greater importance is the number and character of the weed seeds found. As will appear in the subjoined tables, this number varies, in the samples which have been examined at the Station, from one or two in the one-sixth ounce to fifty or even more. Any plant may become a weed pest if it grows where it is not wanted, but all weed pests are not equally undesirable. Four or five seeds of dodder or of Russian thistle would be far more undesirable than an equal number of seeds say, of rib-grass or of foxtail and one or two of Johnson grass or tumble-weed would soon infect a whole field. Hence, the farmer should learn to detect the nature of the weed seeds found. The writer has before him a letter from a farmer in one of the northern counties of the state, in which he writes, concerning Russian thistle, which he found in his alfalfa: "I only saw a few plants in my alfalfa the first season, perhaps a dozen or two. I could have killed them out very easily then, but now (this season) there seems to be hundreds of them. It is impossible to exterminate them, for the weed



has matured and has been broken up by the stock running on the pasture. \* \* \* I only sowed a small patch, an acre and a half, and think it best to plow up the whole thing. Then next spring I can cultivate closely and destroy all weeds. I see that they have already blown out onto the adjacent land. I would not have had these thistles on my farm for a hundred dollars." The writer also gives the source from which he derived his seed, but previous to the receipt of this letter, seeds of Russian thistle had been found by the writer in alfalfa which had been upon the markets of the state. The dealer promptly withdrew the seed when aware of the circumstances. Sporadic cases of infection by Russian thistle have been reported from widely different sections and may perhaps all be traceable to seed introduced in alfalfa. What is true in this case of Russian thistle may also be true of tumble-weed and Johnson grass. For the benefit of those unfamiliar with the appearance of the seeds usually found in alfalfa, and which are of a highly noxious character, the following brief description, with figures, is given.

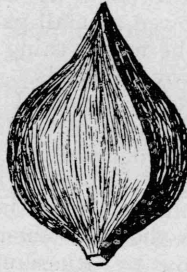
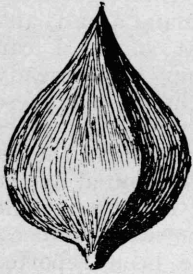
**Russian Thistle.** (*Salsola Kali Tragus L.*) Seed (fruit) top-shaped, small, (Plate I.) about one-eighth inch long; depressed at top; skin rupturing around the middle or irregularly; embryo coiled within the skin in a spiral. The figures give views of the closed "fruit," a partially opened one showing the spiral embryo, and two side views of the embryo with part of the outer covering still attached. At the sides are smaller figures giving natural sizes of the seeds.

**Rib Grass.** (*Plantago lanceolata.*) This is one of the weed seeds almost universally found in alfalfa grown in northern and western states. Of itself, this weed is not undesirable, since stock of all kinds will eat it. In alfalfa, however, it becomes a pest and soon seeds itself over the whole field. Seeds brown, sometimes shining, and longer than broad, flattened on one side, which has a peculiar groove containing a circular or elliptical pit. These characters are so prominent as to make the seed readily identified.

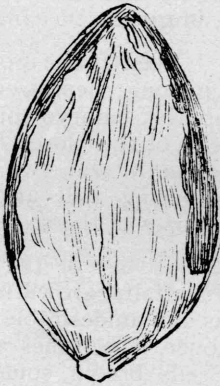
**Tumble-Weed** (*Amaranthus graecizans.*) The seed of this plant are also exceedingly common in alfalfa from northern and western states. The weed is so widely known and its vile character so obvious as to make warnings against it superfluous. The seeds are minute, about one-twelfth to one sixteenth inch broad, black with high lustre (shining), almost circular in outline. They are scarcely to be distinguished from seeds of other plants of the same family, such as careless weed, pigweed, rough pigweed, etc.

**Careless Weed.** (*Amaranthus hybridus.*) Seeds very similar to the foregoing but slightly larger and often not so lustrous. The seeds of the various members of this family are sometimes so abundant in alfalfa that the whole is distinctly colored by them. All are easily detected.

**Dodder** (*Cuscuta Epithymum, Cuscuta arvensis.*) There is no more serious pest appearing in alfalfa fields than dodder. The seeds



CURLED DOCK  
RUMER CRISPUS



YELLOW FOXTAIL  
CHAETOCCHLOA GLAUCA



GREEN FOXTAIL  
CHAETOCCHLOA VIRIDIS

The small drawing represents natural size of the seed, while the larger is magnified fifteen diameters.



are extremely small and usually escape detection, often appearing like minute grains of sand. When young and fresh, they are golden yellow, roundish or slightly granular, sometimes indented on one side, from one-twentieth to one-twenty-fourth of an inch in size. The color graduates into brown in old seed.

**Green Foxtail.** (*Setaria viridas.*) The seeds of this grass are also sometimes very abundant in alfalfa. They are about one-twelfth inch long, bi-convex, oval, blunt at ends. The color is usually light green, when the glumes or "chaff" is absent, when these are present the color is light gray. On the convex side, the grain is minutely cross-striated. See Plate II.

**Yellow Foxtail.** (*Setaria glauca.*) These seeds are larger than the preceding but otherwise closely resemble them. They are roughly marked on the surface with irregular cross striations. Plate II.

**Curled Dock.** (*Rumex crispus.*) Given as an example of docks, which are commonly present in clover and alfalfa. Seeds are triangular in outline, reddish-brown, about one-tenth inch long. When once introduced into alfalfa it is very hard to exterminate this weed. The writer has seen one patch of about two acres of alfalfa which had been completely taken by this weed and which had to be repeatedly ploughed and hoed in order to get rid of the pest. All these plants came from one small patch of weeds which had found lodging in the field. Plate II.

Besides the seeds here described and figured, many others are met with to a greater or less extent in inspecting samples of alfalfa seed. Many samples show a number of different kinds of sunflower seeds or seeds of members of that family. Any weed that is abundant in the place where the alfalfa seed are grown may mingle its seed with the latter and hence weeds that are strange and unknown in a given locality may become rapidly dispersed and because of their unfamiliar aspect may escape observation until they have become a pest. It is often quite easy for the expert to determine accurately just where any sample of alfalfa or other seed was grown by observing the particular weed seeds it contains. Thus, the seeds of Careless Weed and Pig Weed are very characteristic of American grown alfalfa and clover, so that the European can at once distinguish these seeds from the home grown. This fact may be of importance in checking the source given by the seedsman, though this is usually accurately stated. Very many farmers in America are now planting Turkestan and German alfalfa and most of those seeds are quite foul with weed seeds. In this way many new and vile weeds may be introduced from Europe and Asia and may become the source of great annoyance.

**Seeds Sometimes Used as Adulterants.** Some of the other members of the alfalfa and allied families have seeds very similar to those of the alfalfa. In some cases these are used as adulterants, since

they are often cheaper than alfalfa and clover. Of these, Bur Clover, (*Medicago Denticulata*), Sweet Melilot, white, (*Melilotus Alba*) and Sweet Melilot, yellow, (*Melilotus Indica*) sometimes occur to a greater or less extent, but chiefly the first. The plates show figures of these seeds.

**Bur Clover.** (*Medicago denticulata*.) As will appear from a glance at the plate, the seeds of this plant are considerably larger than those of alfalfa, more regular in outline, and have a slightly different shape. They are also of a more brownish yellow and do not show the pleasant olive green of the latter. The weed is annual and is killed by the heat of the long summers of Texas and is also very sensitive to cold, showing black in the cold snaps in the winter. At College Station bur clover was killed almost to the ground during the winter of 1904-05 by a temperature of 20 deg. F. but came up again. It does not possess the food value of alfalfa and must be considered an undesirable weed when present in a field of the latter.

**Sweet Clover.** (*Melilotus alba and Indica*.) White and yellow sweet clover. These seeds are rarely found in alfalfa, yet sometimes are present in large quantity as is shown by the fact that several farmers have sent the plants to the experiment station to enquire whether they were alfalfa or not, and stating that the weeds were abundant in the field lately sown to alfalfa. The seeds of these plants have the characteristic sweet odor of the plants which bear them and when a sample of alfalfa contains them to any large extent they may be detected by the odor. This fact renders them unsuitable for use as adulterants. In appearance they are remarkably like alfalfa and are sometimes very difficult of detection even by the expert. Neither of the plants has the food value of alfalfa or clover.

#### SAMPLES TESTED FOR PURITY.

During 1905 samples of alfalfa were procured from all the wholesale seed houses doing business in the state and were tested in this laboratory. This line of work is new to the people of Texas and many do not yet appreciate its value, but in the main the seedsmen have been very ready to have their seed inspected and are anxious to place only pure goods upon the market. In all, 32 samples have been received and tested. A record of each sample is kept, giving name of seedsmen, origin of seed, price per pound and, when possible, year of growth. It is hoped that many other merchants as well as prospective planters will become interested in the work and will forward samples. A tabulated statement of the purity tests follows. The names of seedsmen are withheld in this list, since in the few cases of high percentages of impurities in the seed, the handler was not to blame and an injustice might be done if the names were published. No case of willful adulteration has as yet been observed.



It will be seen from the table that no less than 30 different weed seeds were found in the samples examined, of course not all of them in the same sample. Some weed seeds were far more abundant than others, and some samples are very much fouler than others. Four of the samples showed no weed seeds in the portion drawn, though if a whole pound had been examined it is probable that some foreign seed would have been found. On the other hand, Nos. 8, 19, 25, 29, 30 and 31 contained more than fifty such seeds in five grams, or one-sixth ounce. No. 8, a seed imported from Germany was very foul, showing 52 weed seeds to the sample, consisting of nine sorts which were determined and three which were not. Multiply this number by six and the result by 320, the number of ounces of alfalfa usually sown to the acre and the product will be 100,000 in round numbers; quite a respectable patch of weeds for each acre. It will also be observed that occasionally a very serious pest will find its way into a lot of seed and may thus be distributed to localities in which it was heretofore unknown. A good example will be found in No. 27 where one seed of Deadly Hemlock appeared.

Many comparatively harmless weeds are widely distributed and their seeds are of common occurrence. Such are rib-grass and the green and yellow foxtails. It is scarcely necessary to point out that a large percentage of the seeds of such weeds is greatly preferable to any per cent at all of noxious weeds such as Russian Thistle and Tumble Weed.

Table II shows the relative frequency of the more important weed seeds found in the samples examined.

TABLE II.—Of the Samples Examined.

41 per cent had Rib-Grass	47 per cent had Green Foxtail
36 " " Red Clover	12.5 " " Yellow Foxtail
6 " " Dodder	16 " " Careless Weed
6 " " Tumble Weed	16 " " Docks.

Much of the impurities found in seed consists of sand and broken seeds and very often there is a high rate of dead and immature seed. Certain samples contained such a high percentage of trash and immature seed as very materially to lower their value and to suggest that cleaning of the seed had been entirely neglected. The percentage of sand, trash and broken seed, all included under the heading, inert matter, was as follows:

TABLE III.

No.	Per Cent.	No.	Per Cent.	No.	Per Cent.	No.	Per Cent.
1	.00	9	.20	17	2.00	25	.05
2	.50	10	.18	18	6.60	26	.02
3	.50	11	.12	19	5.00	27	.03
4	.70	12	.25	20	29.00	28	.01
5	.80	13	6.00	21	.22	29	.02
6	.40	14	1.60	22	.01	30	.13
7	1.00	15	5.00	23	.02	31	.11
8	1.00	16	6.00	24	.01	32	.02



In this table the percentages in numbers 14, 15, 16, 17, 18, 19 and 20 include in addition to the above-mentioned materials designated "inert matter", the amounts, by weight, of dead and immature seeds. These samples contained so much of the latter that it was thought best to reckon the amounts in along with the other waste materials. The actual percentages of sand and trash were about the same in these samples as in the others.

## II.—TESTING THE VITALITY.

The amount of seed usually recommended to be sown per acre is so large that only when the seed are quite old and in consequence have lost vitality, does the latter question become of importance. In cases where the percentage of impurities is high and the vitality of the seed low, it not unfrequently occurs that even twenty pounds to the acre will not be sufficient to obtain a good stand, leaving out of question the matter of the actual value, compared to the market price, of such sample. As already pointed out, dead seed and those of low vitality are usually quite discolored, being yellow, brown or even quite black.

It is worthy of note, that in the warmer regions of the United States, especially in Texas, weevils are very abundant and will quickly destroy alfalfa as well as other seeds. The weevil-eaten seeds are sometimes difficult to detect, if freshly infected. Generally, however, they will hang together in threads and so the extent to which the seed have been damaged may be estimated. The seeds so eaten will, of course, not germinate.

**Method of Home Testing Samples.** To test the vitality is a simple matter. A sufficient number of seeds is taken from the sample which has just been tested for purity and these are planted and the number germinating is counted. The seeds must not be selected, but should be counted at random, so that a sample containing both good and bad seeds in about the same proportion as they occur in the whole will be obtained. To facilitate reckoning of percentages, the seeds are counted out in hundreds, as many of these as is thought necessary being taken. These are now placed in any suitable place for germination. A good and inexpensive apparatus for home testing may be made from two dinner plates and a piece of clean blotting paper or white cotton cloth for the bedding, which is first to be wetted with luke-warm water. Place the seeds upon this, fold over the loose end of the blotting paper or cloth, put into one plate and cover the whole with the other. The apparatus should now be placed in a warm corner where the temperature will be about that of the ordinary living room, and left alone. At the end of the second day the plate may be examined and, if necessary, the seeds again dampened. Germination begins usually in three days; the seeds that have then sprouted are carefully counted by lifting the young sprouts out, leaving the others for a day or two longer. In six days all will sprout that are living. The count of the second lot, added to the first will give the percentage germinating, directly, if one hundred seeds have been taken. For ex-



ample, in testing the vitality of sample No. 1, it was found that 82 seeds had sprouted at the end of the third day, leaving 18 to be accounted for. At the end of the sixth day ten more of these had germinated, leaving 8 which were still hard, and which gave no sign of life. The sum of the two counts gives 92, the percentage germinating.

All such tests should be made at least in duplicate, since some error of counting or of preparation may occur in the first and so give misleading results. We have found that two tests will give very satisfactory and even results. Some precautions of minor importance must be observed. The plates, paper or cloth, and the water used in making the tests should all be scrupulously clean, else various moulds and mildews will make their appearance upon the seeds thus altering very quickly the apparent value of the seed, since the latter will be quickly killed by these pests. Quite frequently, when every precaution possible has been taken with the apparatus, moulds will be found on the germinating seeds, their spores having been on the seeds themselves. This occurs so rarely that it is not a source of serious error, however, and a second test will correct the trouble. Nevertheless, we may learn from this that cleanliness is of great importance in handling seed, because injurious fungus pests may be introduced if proper precautions are not taken, which may be the source of great loss. We need only to refer to the danger incurred by planting smut-infected oats or corn to emphasize this point.

In a laboratory especially fitted up for the purpose, all these tests may be very accurately and expeditiously made; at home anyone may secure quite accurate results with very little care, by following the directions given.

**Samples Tested for Vitality** At the Experiment Station, the tests for purity and vitality are made as soon after receipt of the sample as is possible and the results are tabulated and kept for record.

Table IV gives the vitality, in percentages, of the seeds examined, two tests being averaged.

TABLE IV—VITALITY OF ALFALFA SEED.

No.	Per Cent.	No.	Per Cent.	No.	Per Cent.	No.	Per Cent.
1	80.	9	70.5	17	87.5	25	82.5
2	90.5	10	78.5	18	92.	26	91.
3	89.5	11	49.5	19	81.	27	93.
4	89.	12	79.	20	80.	28	96.5
5	74.	13	95.	21	29.5	29	89.
6	87.5	14	67.	22	80.5	30	90.5
7	94.5	15	85.5	23	94.	31	94.5
8	78.	16	88.5	24	89.5	32	92.5

From these figures it will be seen that the vitality or germinating power of the 32 samples varies between 49.5 and 96.5 per cent, the greater number having vitality of more than 80 per cent. These latter accord very well with germination standards adopted for other seeds by seedsmen.

If, now, the latter percentages be combined with the purity, the actual value of the seed may be derived from the market price. Thus, in number 20, the market price of which was 14 cents per pound, the percentage of pure seed of apparently good vitality, was 71; these seed, when tested, however, showed a germination of only 80 per cent, 14x71x80—7.85 cents, or almost 8 cents per pound for the actual value. The actual value of the various samples is given in the following table, only in percentages, since in many cases the market price was not known to the writer.

TABLE V—ACTUAL VALUES OF SEED IN PERCENTAGES.

No.	Per Cent.	No.	Per Cent.	No.	Per Cent.	No.	Per Cent.
1	80.	9	70.	17	85.75	25	82.5
2	90.	10	—	18	85.8	26	91.
3	88.6	11	39.6	19	81.75	27	93.
4	88.1	12	79.	20	56.6	28	96.
5	73.2	13	89.	21	89.	29	89.8
6	86.8	14	65.25	22	80.5	30	90.3
7	93.5	15	81.2	23	94.	31	94.25
8	74.9	16	85.6	24	89.25	32	92.4

The writer has been informed by some seedsmen that they are obliged to handle inferior grades of seeds to supply the demands of farmers who wish them. Let us reason a little about this. Suppose you buy a seed costing 16 cents a pound and sow fifteen pounds to the acre. If it has the quality indicated in No. 31 of the last table, the cost per acre will be \$2.40 of which you may reasonably look to get \$2.30 worth to germinate, in which case you undoubtedly get a good stand. Now suppose you prefer a cheaper grade and buy No. 11, costing, say, 12 cents a pound, or \$1.80 an acre. From this you can hope to get only 72 cents back in germinated seeds, or a very poor stand. In order to get the same number of plants to the acre from the latter seed as from the former you will have to sow about three and one-half times as many seed to the acre of the poorer quality, costing about \$6.25, of which \$2.50 worth will never come up. In short, if you sow a sixty per cent seed, you can at most hope to get only a sixty per cent stand and a sixty per cent crop, while the labor required to produce it will be the same as if good seed had been sown. In reality, however, you can never get out of poor seed a crop which will correspond in any way to the relative value of the seed, but it will be still poorer. The best is here the cheapest.

**Free Testing by Experiment Station** In order to be of service to the seed sower as well as to the seed seller, the Experiment Station of the Agricultural and Mechanical College will examine and test for purity and vitality, free of charge, all seeds sent. Such samples should fairly represent the entire lot, being taken from different parts of the pile and should amount to an ounce or more. Name of sender, price per pound, date and place of growth, should always accompany the samples, in order to make the records as complete as possible.