# PURITY AND VITALITY OF GRASS, CLOVER, AND ALFALFA SEEDS.

by

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The cheapest and most satisfactory seed of grasses, clover, or alfalfa, is an absolutely pure clean and vital seed. This is the ideal condition, and the planter whose seed is lacking in any of these qualities will be the proportionate loser. The importance of seed tests are very apparent and cannot be profitably overlooked. This is especially true of grass seeds, for the reason that adulterants, weed seed, immature and spoiled seed, is much more difficult to recognize in grasses than in cereals.

The seeds used in the following tests were secured from seed houses that are patronized by Kansas farmers and one object of the experiment was to get some idea of the seeds that are being planted in Kansas at the present time. The seeds were all, as nearly as was possible to secure them, fair samples of what was being sold to the farmers. The seeds were examined and tested with regard to purity, vitality, and possibility of cleaning.

In the purity tests a sample of about three hundred seeds, was counted, the weed seed separated, counted, and the predominating seed recognized. The per cent of weed-seeds given is a per cent of the total number of seeds. The foreign matter includes weed seeds, broken seeds, stems, chaff, adulterants, etc., and the per cent is calculated from the weight of the sample.

The apparatus for testing vitality was a plate partially filled with sand, over which was placed a cloth, on which one variety of seeds was placed, and another cloth on top of this, with another variety of seeds, etc. From six to seven of these layers could be placed on one plate, the cloth and sand being well dampened and a second plate inverted over them. No Artifical heat was necessary, the temperature varying from 65° to 90° F. At the end of one week all seeds germinated were counted and the per cent given is of the

total number of seeds placed in the germinator.

The possibilities of cleaning were determined by running samples through common perforated zinc sieves, and all light material was blown out as the seed passed over the edge of sieve. A constant current of air was produced by a small rotary blower. The work done in cleaning was about such as could be done with any good fanning mill, and the per cent given in table is the per cent of the total foreign material. The price per bushel is the retail price quoted by the different firms, by special request, or prices named in their catalogues. The price per bushel of good seed is the cost of one bushel of pure viable seed.

Table 1.

Alsike Clover.

| No. of sample. | source | per cent foreign material including foreign seeds. | per cent of weed seed. | vitality per cent | per cent foreign matter removed in the cleaning test. | price per cwt. quoted by the dealer | actual cost per bushel of the good seed. |
|---|---|---|---|---|---|---|---|
| 1 | Iowa | 10 | 8 | 75 | 33-1/3 | $14. | $21.53 |
| 2 (choice) | Neb. | 23 | 20 | 60 | 50 | $14. | $37.84 |
| 3 | Kan. | 6 | 3 | 60 | 25 | $15. | $27.77 |
| 4 | Wis. | 28 | 25 | 67 | 33-1/3 | $14. | $35.88 |

Four samples of Alsike clover were received. Samples 1, 2 and 4 contained a large quantity of fine weed seeds, the greater part of them being "pig weed" and"Lamb quarter." No. 3 was cleaner than any of the rest in this class. All four samples were fairly free from chaff and straw. The remaining foreign matter being principally broken seed and small quantities of sand. The vitality was poor in all samples; this evidently being due to immaturity of seed.

Sample No. 1 was the only one giving a fair per cent of germination. Numbers 2 and 4 cleaned well, but so much seed was blown out that the cost of remaining seed would be too great to afford cleaning. The order of this class in regard to desirability for planting is 1, 3, 4, 2.

Table 2.

White Clover.

| No. of sample. | source | per cent foreign material including foreign seeds. | per cent of weed seed. | vitality per cent | per cent foreign matter removed in the cleaning test. | price per cwt. quoted by the dealer | actual cost per bushel of the good seed. |
|---|---|---|---|---|---|---|---|
| 1 | Iowa | 4 | 1 | 68 | 50 | $16. | $25.00 |
| 2 (fancy) | Nebr. | 4 | 3 | 80 | 25 | $16. | $21.05 |
| 3 | Minn. | 3-1/2 | 2 | 85 | 25 | $16.50 | $20.37 |
| 4 | Kan. | 6 | 5 | 92 | 33-1/3 | $16.50 | $19.18 |

Four samples in this class were examined, and were very uniform in the amount of foreign matter and weed seeds they contained, broken seeds and chaff composing the greater part. The principal weed seeds were those of buckwheat and pigeon grass. The vitality was good, with but one exception, and showed slight variation; had good color and was well matured. The cleaning tests gave best results on sample No. 1, there being very few weed seeds in this sample and the foreign material was mostly light chaff. This class cleaned exceptionally well. The order of desirability for planting was No.4, 3, 2, 1.

Table 3.

Mammoth Red Clover.

| No. of sample. | source. | per cent foreign material including foreign seeds. | per cent of weed seed. | vitality per cent | per cent foreign matter removed in the cleaning test. | price per cwt. quoted by the dealer | actual cost per bushel of the good seed. |
|---|---|---|---|---|---|---|---|
| 1 | Iowa | 5 | 2 | 89 | 5 | $13.50 | $16.07 |
| 2 | Neb. | 7 | 3 | 92 | 25 | $13.00 | $15.29 |
| 3 | Iowa | 3 | 2 | 95 | 5 | $13.50 | $13.59 |

Three samples of Mammoth red clover were examined. This class was fairly free from foreign matter. The vitality in all three samples was excellent, and cleaning tests were not made to a profitable advantage, excepting in sample No. 2. Seed in condition of No.'s. 1 and 3 do not have to be cleaned and time is wasted in trying it. The order of desirability for planting is 3, 1, 2.

Table 4.

Medium Red Clover.

| No. of sample | source | per cent foreign material including foreign seeds. | per cent of weed seed. | vitality per cent | per cent foreign matter removed in the cleaning test. | price per cwt. quoted by the dealer | actual cost per bushel of the good seed. |
|---|---|---|---|---|---|---|---|
| 1 | Iowa | 14 | 5 | 85 | 50 | $13.50 | $19.26 |
| 2 (fancy) | Neb. | 6 | 2 | 85 | 15 | $14.25 | $18.03 |
| 3 | Iowa | 10 | 10 | 87 | 25 | $13.75 | $17.87 |

Three samples of this variety were received, and all compare well for purity. No. 1 contained about three per cent of sand and No's. 1, 2 and 3 were very free from weed seeds. All the samples were good bright well matured seed. In price or in vitality there is not much variation, and order of desirability depends mostly upon the amount of foreign material the sample contains. Samples No's. 2 and 3 are of about equal value - the good viable seed is a little cheaper in No. 3, but on account of the larger per cent of weed seeds No. 2 should be preferred. No. 1 is the poorest sample to purchase.

Table 5.

Red Clover.

| No. of sample | source | per cent foreign material including foreign seeds. | per cent of weed seed | vitality per cent | per cent foreign matter removed in the cleaning test. | price per cwt. quoted by the dealer | actual cost per bu. of the good seed. |
|---|---|---|---|---|---|---|---|
| 1 (fair) | Neb. | 18 | 15 | 81 | 50 | $13.50 | $21.42 |
| 2 (choice) | Kan. | 4 | 3 | 92 | 10 | $14.50 | $16.48 |
| 3 | Kan. | 13 | 10 | 91 | 10 | $14.00 | $17.93 |

Three samples of red clover were received. No's. 1 and 3 contained a fairly large amount of weed seed and trash, the prominent weeds being Wild Buckwheat and Fox-tail. No. 2 was a well cleaned sample, in very good condition. The vitality of No. 1 was poor on account of seed being old, otherwise sample was bright and well matured. No's. 2 and 3 show a high per cent germination. No. 3 is a sample that cannot be cleaned, as shown in table, and in this class No. 2 is the only one ready to plant as it comes from the market. No. 3 is about as

cheap but contains too large a per cent of weed seed, and No. 1 is about $1.00 per hundred pounds higher than No. 2 for pure seed. After being well cleaned No. 1 compares well with No. 2 for planting. The order of desirability would be first No. 2, second No. 3, third No.1.

Table 6.

Sweet Clover .

| No. of sample | source | per cent foreign material including foreign seeds. | per cent of weed seed. | vitality per cent | per cent foreign matter removed in the cleaning test. | price per cwt. quoted by the dealer | actual cost per bu. of the good seed. |
|---|---|---|---|---|---|---|---|
| 1 (choice) | Neb. | 10 | 1 | 73 | 50 | $17.50 | $27.77 |
| 2 | Iowa | 21 | 6 | 86 | 75 | $17.00 | $26.15 |
| 3 | Kans. | 15 | 5 | 70 | 33-1/3 | $17.00 | $30.91 |

Three samples of sweet clover were examined, and the foreign material in all samples was in excess of what it should be, No. 1, the best, being only fairly free from chaff and dirt. No. 2 contained about five per cent of adulterants which could not be removed in the cleaning tests. There were not enough weed seeds to injure the quality of the samples to any extent. Sample No's. 1 and 3 were not well matured and No. 2 was the only one showing fairly good vitality. The cleaning test puts No. 2 first for seed, it being easily the better sample. The order of desirability was first No. 2, second No. 1, third No. 3.

Table 7.

Crimson Clover.

| No. of sample | source | per cent foreign material including foreign seeds. | per cent of weed seed | vitality per cent | per cent foreign matter removed in the cleaning test. | price per cwt. quoted by the dealer | actual cost per bu. of the good seed. |
|---|---|---|---|---|---|---|---|
| 1 | Neb. | 2 | 1 | 92 | 10 | $8.50 | $9.04 |
| 2 | Kan. | 3 | 2 | 87 | 10 | $8.50 | $10.12 |
| 3 | Kan. | 3 | 1/2 | 91 | 10 | $8.00 | $9.09 |

Three samples of this class were received. The foreign material and weed seed was of small enough per cent not to be considered. The vitality of all samples was excellent, and in all three cleaning tests could only be a waste of time. There is practically no difference in choice between samples No's. 1 and 3. The order of desirability is first No. 1, second No. 3, third No. 2.

Table 8.

Red Top .

| No. of sample | source | per cent foreign material including foreign seeds. | per cent of weed seed. | vitality per cent | per cent foreign matter removed in the cleaning test. | price per cwt. quoted by the dealer | actual cost per bu. of the good seed. |
|---|---|---|---|---|---|---|---|
| 1 (choice) | Neb. | 70 | 15 | 94 | 30 | $5.00 | $20.83 |
| 2 (fancy) | Neb. | 40 | 3 | 75 | 25 | $6.00 | $17.28 |
| 3 (fancy) | Kan. | 17 | 1-1/2 | 87 | 25 | $6.00 | $ 7.50 |
| 4 (fancy) | Kan. | 10 | 1/2 | 62 | 75 | $10.00 | $20.83 |

Red Top is one of the harder seeds to clean, and about the only method of securing a clean sample is by hulling; and this being an expensive operation adds greatly to the cost. No. 4 is the only sample received which had been hulled. No. 1 contained a large quantity of weed seeds, which should exclude it for seeding purposes. Cleaning tests gave only fair results on No's. 1, 2 and 3, but No. 4 was left in excellent condition. The order of desirability was first No. 3, second No. 2, third No. 4, fourth No. 1.

Table 9.

Johnson Grass .

| No. of sample | source | per cent foreign material including foreign seeds. | per cent of weed seed | vitality per cent | per cent foreign matter removed in the cleaning test. | price per cwt. quoted by the dealer | actual cost per bu. of the good seed. |
|---|---|---|---|---|---|---|---|
| 1 | Neb. | 30 | 2 | 90 | 50 | $7.00 | $11.66 |
| 2 | Kans. | 42 | 17 | 86 | 50 | $7.00 | $15.91 |

Two samples of Johnson grass were examined. The undesirable qualities of Johnson grass has lessened the dealer's interest in sending out seed of first quality. The two samples examined contained large quantities of straw and chaff, much of which could easily have been removed. No. 2 contained a high per cent of weed seeds, wild buckwheat being prominent. The vitality of both samples was good. The cleaning tests were effective on both samples. No. 1 would be the only desirable seed for planting because of high per cent of weed seed in No. 2.

Table 10 .

Orchard Grass.

| No. of sample | source | per cent foreign material including foreign seeds. | per cent of weed seed. | vitality per cent | per cent foreign matter removed in the cleaning test. | price per cwt. quoted by the dealer | actual cost per bu. of the good seed. |
|---|---|---|---|---|---|---|---|
| 1 | Iowa | 15 | 1/2 | 50 | 10 | $12.50 | $35.71 |
| 2 | Nebr. | 30 | 5 | 83 | 10 | $11.00 | $20.75 |
| 3 | Minn. | 20 | 2 | 53 | 15 | $11.00 | $33.33 |
| 4 | Kans. | 25 | 5 | 50 | 15 | $12.00 | $48.00 |
| 5 (choice) | Kans. | 19 | 7-1/2 | 78 | 10 | $12.50 | $18.11 |

Five samples of Orchard grass were tested. If the seed is not well matured and is poorly filled Orchard grass is hard to clean, the immature seed being so light that it is blown away with the chaff. The samples were very uniform in purity, No's. 1 and 5 containing slightly less chaff than the others, and No. 1 was exceptionally free from all weed seeds, none of the samples being at all foul with them. The vitality was not high in any case and No. 1 especially was a very poorly matured sample. In selecting seed No. 2 is perhaps the most desirable sample. The order of desirability is first No. 5, second No. 2, third No. 3, fourth No. 1, fifth No.4.

Table 11.

Meadow fescue.

| No. of sample | source | per cent foreign material including foreign seeds. | per cent of weed seed | vitality per cent | per cent foreign matter removed in the cleaning test | price per cwt. quoted by the dealer | actual cost per bu. of the good seed. |
|---|---|---|---|---|---|---|---|
| 1 | Iowa | 2 | 1 | 87 | 5 | $5.00 | $5.88 |
| 2 (choice) | Neb. | 10 | 3 | 51 | 25 | $ 4.50 | $10.97 |
| 3 | Kans. | 17 | 2-1/2 | 56 | 33-1/3 | $5.00 | $12.82 |
| 4 | Kans. | 15 | 2 | 49 | 33-1/3 | $4.75 | $13.97 |
| 5 (fancy) | Kans. | 8 | 1 | 90 | 25 | $4.75 | $ 5.79 |
| 6 (choice) | Kans. | 16 | 5 | 89 | 10 | $4.75 | $ 6.50 |
| 7 | Kans. | 15 | 10 | 87 | 33-1/3 | $5.00 | $ 6.94 |

Seven samples of Meadow fescue were examined and this class also shows much variation in quality of samples, No's. 1, 2 and 5 being fairly free from foreign matter. The others contain mostly chaff, there being little weed seed in any sample except in No. 7, and this was hard to remove. Some variation was shown in the vitality, No's. 1, 5, 6 and 7 being fairly good, while No. 4 was old seed and No's. 2 and 3 were light and chaffy, not being well matured. The order of desirability is first No. 5, second No.1, third No. 6, fourth No.7, fifth No. 2, sixth No. 3, seventh No. 4.

Table 12.

Alfalfa.

| No. of sample | source | per cent foreign material including foreign seeds | per cent of weed seed | vitality per cent | per cent foreign matter removed in the cleaning test | price per cwt. quoted by the dealer | actual cost per bu. of the good seed. |
|---|---|---|---|---|---|---|---|
| 1 | Kans. | 29 | 22 | 76 | 50 | $13.75 | $29.25 |
| 2 | Kans. | 33 | 25 | 73 | 25 | $13.50 | $27.00 |
| 3 (fancy) | Kans. | 3 | 2 | 92 | 5 | $15.00 | $16.85 |
| 4 (choice | Kans. | 9 | 6 | 89 | 75 | $14.50 | $18.12 |
| 5 | Colo. | 40 | 30 | 71 | 33-1/3 | $13.50 | $43.55 |
| 6 | Colo. | 25 | 10 | 68 | 50 | $13.50 | $31.38 |

Six samples of alfalfa were examined, four from Kansas, and two from Colorado. The samples showed a wide variation in both purity and vitality. No. 6 was irrigated seed and while it appeared to be an excellent sample the vitality was poorer than the others. The order of desirability is, first No. 3, second No. 4, third No. 2, fourth No. 1, fifth No. 6, sixth No. 5.

Table 13.

Kentucky blue grass.

| No. of sample | source | per cent foreign material including foreign seeds | per cent of weed seed | vitality per cent | per cent foreign matter removed in the cleaning test | price per cwt. quoted by the dealer | actual cost per bu. of the good seed. |
|---|---|---|---|---|---|---|---|
| 1 | Iowa | 14 | 8 | 60 | 50 | $8.00 | $17.49 |
| 2 (A No.1) | Kans. | 25 | 1/2 | 89 | 75 | $6.50 | $10.15 |
| 3 (fancy) | Neb. | 23 | 8 | 63 | 50 | $7.00 | $17.50 |
| 4 | Kans. | 17 | 2 | 92 | 25 | $6.50 | $8.66 |
| 5 | Iowa | 8 | 3 | 54 | 20 | $8.00 | $17.39 |

There were five samples received of this class, and much difference is shown in quality of samples. No's. 2 and 3 were very poorly cleaned and of the original samples they appeared to be the poorest for seeding. No's. 1 and 4 were only medium clean, No. 1 containing much Pig weed seed. The foreign material in this class of seeds was mostly chaff and broken straw, the samples all being comparatively free from weed seeds, No's. 1 and 3 are poorest in this respect. The vitality could only be called medium. While No's. 2 and 4 were good No'S. 1, 3, and especially 5 were poor. No. 5 was a sample of seed which would badly disappoint the grower, because of vitality. The cleaning tests show to an advantage in this case, samples No's. 2 and 3 are after cleaning, among the most desirable. The order of desirability is, first No. 4, second No. 2, third No. 3, fourth No. 1, fifth No. 5.

Table 14.
Bromus Inermis.

| No. of sample | source | per cent foreign material including foreign seeds | per cent of weed seed | vitality per cent | per cent foreign matter removed in the cleaning test | price per cwt. quoted by the dealer | actual cost per bu. of the good seed. |
|---|---|---|---|---|---|---|---|
| 1 | Iowa | 6 | 1 | 89 | 3 | $12.00 | $14.45 |
| 2 (fancy) | Neb. | 18 | 3 | 87 | 25 | $ 9.00 | $13.04 |
| 3 (choice) | Neb. | 25 | 10 | 63 | 50 | $12.00 | $31.58 |
| 4 | Kans. | 12 | 2 | 87 | 25 | $12.00 | $16.00 |
| 5 | Kans. | 22 | 2 | 60 | 50 | $12.00 | $31.58 |
| 6 | Kans. | 31 | 1 | 54 | 25 | $ 8.00 | $34.78 |
| 7 | Kans. | 15 | 4 | 88 | 33-1/3 | $12.00 | $16.44 |

Seven samples were examined. Bromus inermis is now handled by most firms that do much business in seeds. The poorer grades are generally bought by growers more or less unacquainted with the seed. Sample No. 6 was more than one-half chaff and broken straw; No's. 3 and 5 were only three-quarters seed, with 7 and 2 a very little better. No. 1 was an excellent well cleaned sample. The weed seeds are not abundant enough in any case to spoil the sample to any extent. The vitality of No's. 1, 2, 4, and 7 were good, No. 6 had the lowest vitality in this class, apparently being immature. Bromus inermis is very hard to rid of heavy broken straw, and if a sample contains a large amount it should never be accepted; the straw cannot be sieved out and it is very difficult to blow the seed clean. Of these samples the most desirable for seed would be No. 2, the order of desirability for the remainder being; second No. 1, third No. 4, fourth No. 7, fifth No. 3, sixth No. 5, seventh No. 6.

The price the dealer puts on his seed depends, almost entirely upon the amount of foreign material it contains, to a slight extent upon the maturity and color of the seed, and with almost an entire disregard for the vitality. The tests show that the good, pure, seed in the cheap grades costs more per bushel than the good, pure, seed in the higher priced grades, and the cost of this worthless foreign material may not be the only undesirable feature. It is very liable to be the cause of a failure to secure an even stand, and in the case of weed seeds, the chances are that you are seeding your land with pests of the worst kind, for they are already adapted to growing with the plants you are sowing, will ripen their seed at the same time, and so be harvested and threshed together again. In most cases the foreign material in the seed is unavoidable, but to the grower the most exasperating case is where an adulterant has been used, and the unprincipaled dealer who will practice this finds many opportunities to mix with his seed such material as ground corn, broken rock, and gravel, and even weed seeds have been used if they resemble to some extent the seed to be sold.

The lack of vitality is of equal consideration to the foreign material in the seed, and it is in this fault that the grower is most often disappointed. The price of the seed cannot be depended upon to tell its germinating qualities, and neither can the appearance of the seed, at least only approximately. The vitality of seeds is so easily determined that there is no excuse for not being sure of this point before buying the seed. A method for making this test is described in this paper, and is at the command of everyone.

The cleaning of seed is a question that has been studied by all who have had anything to do with seeding. In the case of grass seeds the cleaning question can be generally answered by saying that unless there is a great difference in price, in favor of the dirty seed, it

will be cheaper to buy the clean seed, and even then unless the seed is heavy and the trash consists largely of light chaff, it will be a difficult operation to remove it. The safe plan is to buy your seed already cleaned.

A point which has been brought out in the tests although not shown in the tables, is the class of dealers that sell the best seed. Of course it is very evident that the best dealer to buy of is the one whose seed you have seen growing in the field, for there you can tell exactly what you are getting, and what weed seed, if any, will be mixed with it. This is an opportunity that you will not always have, and in seeking your dealer it is the safe plan to let the small local man alone, unless you are positive you know what you want, and can recognize it when you see it, otherwise this is an unsafe place to buy, for the seller is very liable to know no more about what good seed should be, than the buyer. The safe plan is to deal with a responsible wholesale house, as they have a reputation to keep; they have the better chance of securing the best grade of seed for sale; and their prices and quality of seed will be uniform.