THESIS

# IMPURITIES IN CLOVER SEED

BY

H. W. Lawson. '95

Seed adulteration + inspection

Title

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In keeping with the general advancement in farming, the subject of purity, cleanliness, and vitality of seeds is an important one, and deserves far more attention than has been given it. The farmer who must prepare his ground for a crop and be to the expense of buying seeds, can neither afford to pay for weed seeds, nor to sow them on the ground most favorable to their extension. That such is often the case, it needs but superficial investigation to show.

Of all the seeds offered in the market, clover seed, probably, contains more impurities than any other. If material such as powdered quartz has been added to good seed by the dealer, as was found by the Ontario Agricultural College (Bulletin 98) to be the case in some instances, its presence in clover seed would be less easily detected than foreign material in most other seeds. But leaving aside the subject of adulteration, ~~clover~~ clover seed, for several reasons, is apt to contain impurities, even when raised and marketed by the most careful and honest producers. Few clover fields can be kept entirely free from weeds, the seeds of which ripening at the same time as clover, are necessarily harvested with it, and as the seeds of many of the common weeds, such as sorrel and pigeon grass, have nearly the same size and weight as clover seed, removing them from the clover seed is rendered practically impossible, at least by the means ordinarily found on farms.

In the examination of fifty-two samples of clover seed my object has been to determine the purity and cleanliness of the seed. Under the first consideration, the amount of foreign seeds present has been carefully estimated, and the different species have been identified as far as possible; under the second, the amount of dirt, including stems, chaff, sand and other material has been found. The vitality, though usually considered to be of even the

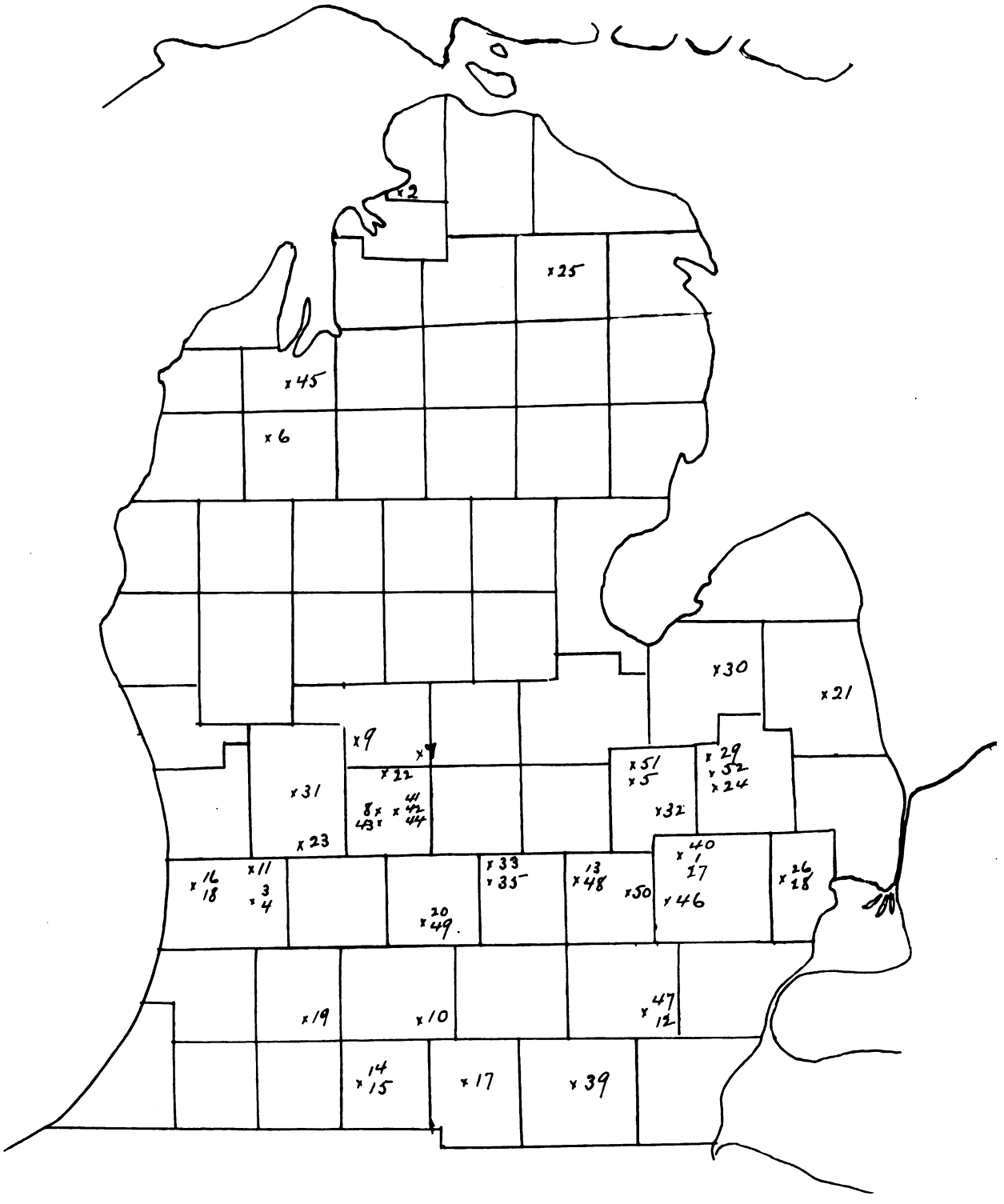
highest importance in seed testing, has not been determined with each sample since nearly all the samples were from the crop of 1894 and in good condition. Germination tests of various samples, with the recognized fact that clover seed possesses great vitality, led to the conclusion, that in this respect all could be considered as good seed. All the samples with the exceptions of numbers 34, 36, 37, and 38 in the following tables, were obtained directly from the farmers in this state. The seed was secured from this source so as to determine its condition as it was first offered for sale, rather than after it had passed through the hands of seedsmen or other dealers, after which any examination must bear in mind the greater liability of the seed being adulterated or its condition being improved by superior methods of cleaning.

The samples of clover seed that have been examined with reference to the impurities contained in them, were received from the following sources:

1. C. J. Allen, Holly, Oakland County.
2. Fred Reice, Petoskey, Emmet County.
3. Myron Powell, Monterey, Allegan County.
4. Myron Powell, Monterey, Allegan County.
5. Eli Benjamin, Flushing, Genesee County.
6. Wilbur Southwick, Sherman, Wexford County.
7. J.C. Morse, Carson City, Montcalm County.
8. B. Babcock, Ionia, Ionia County.
9. S.D. Peck, Greenville, Montcalm County.
10. Edgar J. Finch, Albion, Calhoun County.
11. John England, Burnip's Corners, Allegan County.
12. S.R.Crittenden, Saline, Washtenaw County.
13. Chas. Warden, Conway, Livingston County.
14. Edward Stanton, Sherwood, Branch County.
15. George Baad, Sherwood, Branch County.
16. Gerrit Masselink, Oakland, Allegan County.
17. J.B.Witherell, Church, Hillsdale County.

18. Fred Slagel, Salem Tp., Allegan County.
19. M. Werington, Vicksburg, Kalamazoo County.
20. F. Schneckerberger, Charlotte, Eaton County.
21. Frank Warren, Marlette, Sanilac County.
23. Alfred Newman, Caledonia, Kent County.
22. B. J. Borden, Palo, Ionia County.
24. W.H.Wallace, Carpenter, Lapeer. County.
25. Joe Milway, Atlanta, Montmorency County.
26. Levi Davis, Washington, Macomb County.
27. D. Mitchell, Holly, Oakland County.
28. Clark Miller, Washington, Macomb County.
29. D.V.Lambert, Columbiaville, Lapeer County.
30. Wm. Brady, Unionville, Tuscola County.
31. H.E.Ward, Ada, Kent County.
32. Henry Mason, Swartz Creek, Genesee County.
33. A.H.Whitehead, Lansing, Ingham County.
34. Dr. W.J.Beal from seed offered for sale at Laingsburg.
35. F. Shipp, Lansing, Ingham County.(Screenings).
36. Vaughan, Seedsman, Chicago.
37. Landreth, Seedsman, Philadelphia. (Mammoth Clover)
38. Landreth, Seedsman, Philadelphia.(June clover).
39. George Swartz, Tecumseh, Lenawee County.
40. C.J.Allen, Holly, Oakland County.
41. B. Hayes, Muir, Ionia County.
42. L.M.Olmstead, Muir, Ionia County.
43. B. Babcock, Ionia, Ionia County.
44. Jas. Hayden, Muir, Ionia County.
45. D.C.Kingsley, Summit City, Grand Traverse County.
46. M. Lackwood, Highland, Oakland County.
47. S.R.Crittenden, Saline, Washtenaw County.
48. Chas. S. Worden, Conway, Livingston County.
49. F. Schneckerberger, Charlotte, Eator County.
50. A. Macomber, Brighton, Livingston County.
51. John Morrish, Flushing, Genesee County.
52. D.V. Lambert, Columbiaville, Lapeer County.

The accompanying map illustrates the various localities from which the samples have been secured. From the places numbered 39 to 52 inclusive alsike clover seed was obtained; from all others either the June or the Mammoth.



The following table (Table I) shows the per cent. of pure clover seed contained in the samples, the per cent. of timothy seed, the total per cent. of weed seeds, and the per cent. of dirt. Numbers 1 to 33 inclusive are red clovers; numbers 39 to 52, alsike. Numbers 6 and 47 were taken directly from the clover huller.

Though open to serious objections as will be mentioned later the per cents were determined by weight. In examining the red clover, a sample of four grams of the seed was taken, with the alsike, two grams. No notice was taken of the few alsike seeds found in the red, nor of white or red found in the alsike, as the amounts were small and could not practically be considered as impurities.

Table I.

| Number | Clover | Timothy | Weed seed | Dirt, Stems, etc |
|---|---|---|---|---|
| 1 | 99.10 | .02 | .18 | .70 |
| 2 | 99.80 | | .18 | .02 |
| 3 | 94.24 | .02 | 5.34 | .40 |
| 4 | 99.80 | . | .05 | .15 |
| 5 | 72.40 | 25.60 | .50 | 1.50 |
| 6# | 76.00 | 3.80 | .20 | 20.00 |
| 7 | 94.00 | .14 | .40 | 5.46 |
| 8 | 99.00 | . | .02 | .98 |
| 9 | 99.80 | .04 | .02 | .14 |
| 10 | 78.20 | 12.00 | 5.88 | 3.92 |
| 11 | 95.90 | .34 | .72 | 2.44 |
| 12 | 99.38 | .12 | .12 | .38 |
| 13 | 99.50 | .03 | .22 | .25 |
| 14 | 99.95 | | None | .05 |
| 15 | 99.85 | .10 | None. | .05 |
| 16 | 98.50 | .25 | .77 | .48 |
| 17 | 99.88 | | .02 | .10 |
| 18 | 99.88 | | .09 | .03 |

Table I continued.

| Number | Clover | Timothy | Weed Seed | Dirt, Stems, etc |
|---|---|---|---|---|
| 20 | 99.63 | | .02 | .35 |
| 19 | 99.75 | .03 | .05 | 2.17 |
| 21 | 98.75 | .75 | .38 | .12 |
| 22 | 99.12 | .13 | .25 | .50 |
| 23 | 98.25 | .20 | .11 | 1.42 |
| 24 | 99.75 | .03 | .02 | .20 |
| 25 | 96.50 | 1.25 | .85 | 1.40 |
| 26 | 96.35 | .03 | .75 | 2.87 |
| 27 | 97.88 | .30 | .20 | 1.62 |
| 28 | 98.63 | | .17 | 1.20 |
| 29 | 90. | 3.75 | .05 | 6.20 |
| 30 | 98.10 | | None | 1.90 |
| 31 | 94.75 | .50 | 1.10 | 3.65 |
| 32 | 89. | 7. | 1.00 | 3. |
| 33 | 92.25 | 4.75 | .60 | 2.40 |
| # | | | | |
| # | | | | |
| # | | | | |
| 39 | 98.80 | 1. | .20 | None |
| 40 | 92. | 1.60 | 1.90 | 4.50 |
| 41 | 98.30 | | 1.50 | .20 |
| 42 | 98.60 | | 1. | .40 |
| 43 | 97.50 | 2. | .20 | .30 |
| 44 | 99.60 | .10 | None | .30 |
| 45 | 97.60 | | .50 | 1.90 |
| 46 | 98. | .20 | .60 | 1.20 |
| 47# | 81.20 | | 17.60 | 1.20 |
| 48 | 96.50 | 1.50 | 1.20 | .80 |
| 49 | 99.40 | .30 | .20 | .10 |
| 50 | 99.20 | .30 | .30 | .20 |
| 51 | 98.40 | | 1.00 | .60 |
| 52 | 91 | 1.00 | 7.00 | 1.00 |

, Inspection of the table above will show that of the 38 samples of red clover seed only three were entirely free from weed seeds, while the amounts ranged from .02 to 5.88 per cent. The average per cent. of pure clover seed is 95.55%, with 1.85 of timothy,.6% weed seeds, and 2% dirt. Sample number 34 was obtained by Dr. Beal in the market at Laingsburg and contains 75.20% clover, .10% timothy and 1.60 % dirt besides the exceedingly large amount of weed seed given on Table II. Sample Number 35 was a specimen of screenings such as many farmers sow in order to be "saving." Clover seed equals 41%, timothy, .4%, dirt 54.65%, with 1.85% of timothy, and the great variety of weed seeds given in Table II. It would take only a few samples like this to convince almost anyone that such stuff should never be sown. Numbers 36, 37 and 38 were from seedsmen and showed an average of 99.14% clover, .18% timothy, and .46% dirt, besides an average of .22% weed seeds. Even from such reliable firms, we must not too confidently expect pure seeds. Of the fourteen samples of alsike clover seed only one was free from weed seed, while the amount in one case was as high as 17. 60% and the average 2.29%. However, if we leave out sample 47 which was not prepared for the market the average of the thirteen samples would be 1.18%. The pure clover seed of the 14 samples equals 96.18%, timothy seed, .62% and dirt .91%

These results though not on a scale large enough to be entirely satisfactory, would indicate that alsike clover contains a greater amount of weed seed than the red clover but less timothy and less dirt, making the per cent. of the purity of the alsike greater than that of the red.

The following table gives the different species of weeds, and by weight approximately the per cent. of each found in the clover seed.

Table II.

| Name | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Sorrel<br>Rumex acetosella | .10 | .04 | 5.30 | | .16 | .14 | .12 | .02 |
| Yellow dock<br>Rumex crispus | .02 | | | | | | .08 | |
| Ladies' thumb<br>Polygonum persicaria | .04 | | | | | | | |
| Pigeon grass<br>Setaria glauca | .02 | .04 | | | .14 | | | |
| Green pigeon grass<br>Setaria viridis | | .02 | .02 | | | | | |
| Plantain<br>Plantago major | | .10 | | | .06 | .02 | | |
| Rib-grass<br>Plantago lanceolata | | | .02 | .05 | .04 | | | |
| June grass<br>Poa pratensis | | | | | .04 | .04 | .06 | |
| Red-top<br>Agrostis alba | | | | | .02 | | | |
| Chickweed<br>Stellaria media | | | | | .02 | | | |
| A sedge<br>Eleocharis ovata | | | | | .02 | | | |
| Smart weed<br>Polygonum hydropiper | | | | | | | | |
| Pigweed<br>Chenopodium album | | | | | | | .04 | |
| May-weed<br>Maruta cotula | | | | | | | .10 | |
| Old-witch grass<br>Panicum capillare | | | | | | | | |
| Night-flow ring catch-fly<br>silene noctiflora. | | | | | | | | |
| Wild lettuce<br>Lactuca canadensis | | | | | | | | |

Table II.

Continued.

| Name | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|
| Rumex acetosella | .02 | .10 | .40 | .07 | .15 | | | .15 | |
| Rumex crispus | | 3.10 | .22 | .05 | | | | .37 | |
| Polygonum persicaria | | 1.14 | | | | | | | |
| Setaria glauca | | .04 | .04 | | | | | | |
| Seataria viridis | | 1.24 | .02 | | .05 | | | | |
| Plantago major | | | | | | | | | .02 |
| Plantago lanceolata | | | | | | | | .13 | |
| Poa pratensis | | | | | .02 | | | | |
| Polygonum hydropiper | | | .04 | | | | | | |
| Chenopodium album | | .20 | | | | | | | |
| Maruta cotula | | .04 | | | | | | | |
| Panicum capillare | | .02 | | | | | | | |
| Silene noctiflora | | | | | | | | .10 | |
| Lactuca Canadensis | | | | | | | | .02 | |
| Cnicus lanceolatus | | | | | | | | | .07 |

Table II. Continued.

| | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
|---|---|---|---|---|---|---|---|---|---|
| Rumex acetosella | | .05 | | .38 | | | .02 | .25 | .03 |
| Rumex crispus | .02 | | | | | .03 | | .05 | |
| Polygonum persicaria | | | | | | | | .03 | |
| Panicum capillare | | | | | | | | .02 | |
| Setaria viridis | | | .02 | | .25 | .08 | | .25 | .02 |
| Plantago major | | | | | | | | .05 | |
| Chenopodium album | | | | | | | | .05 | |
| Ambrosia artemisiefolia | | | | | | | | .10 | .70 |

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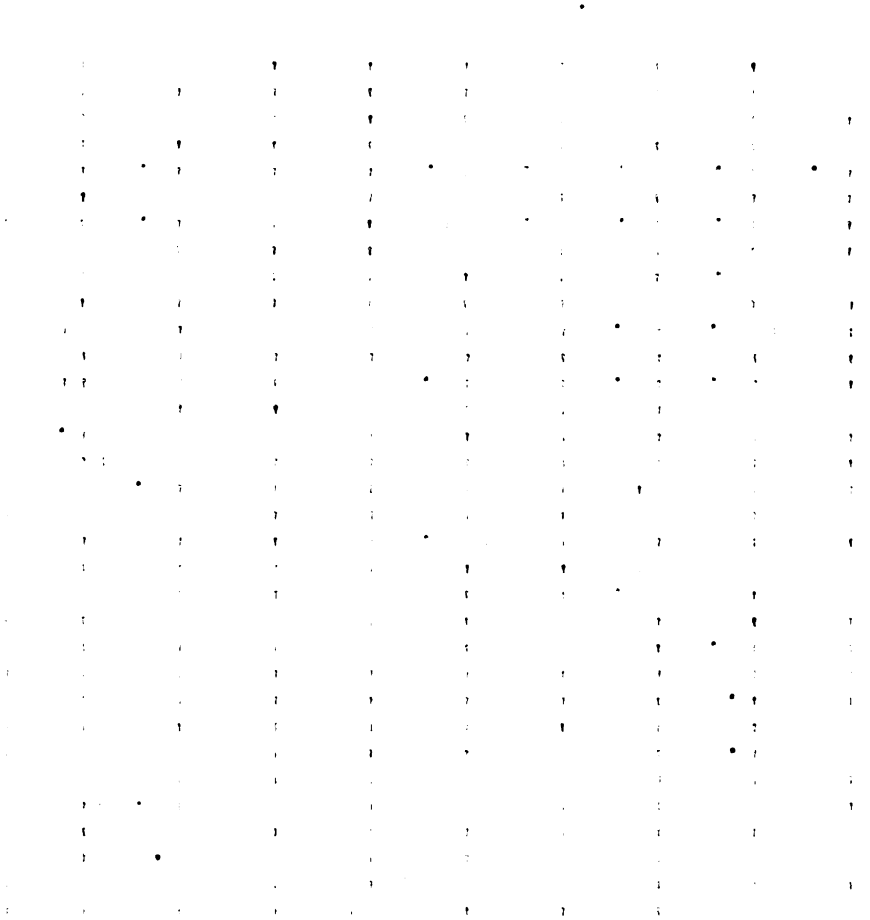


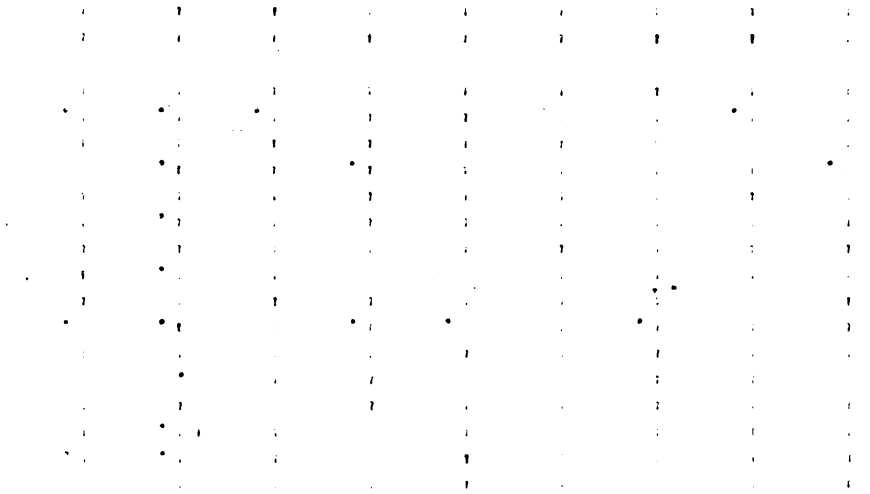


Table II. Continued.

| Name | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |
|---|---|---|---|---|---|---|---|---|---|
| Rumex acetosella | | | .05 | | .20 | .10 | .50 | .10 | |
| Rumex crispus | | | | | .15 | .60 | .10 | | .10 |
| Polygonum persicaria | | | | | | .10 | | | |
| Panicum capillare | | | | | .05 | | | | .05 |
| Setaria viridis | | .17 | | | .25 | | | | .05 |
| Plantago major & Rugelii | | | | | | | | | 2.25 |
| Plantago lanceolata | | | | | | | | 23.00 | |
| Chenopodium album | | | | | .10 | | | | |
| Panicum Crusgalli | | | | | .20 | | | | .15 |
| A. artemisiaefolia | .20 | | | | | | | | |
| Cnicus lanceolatus | | | | | | .20 | | | |
| Amarantus retroflexus | | | | | .10 | | | | |
| Lepidium intermedium | | | | | .05 | | | | |
| Potentilla Norvegica | | | | | | | | | .05 |
| Bromus secalinus | | | | | | | | | 1.25 |
| Panicum sanguinali | | | | | | | | | .05 |

Table II. Continued.

| - | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 |
|---|---|---|---|---|---|---|---|---|---|
| Rumex acetosella | .05 | | | | 1.20 | 1.50 | 1.00 | .20 | |
| Rumex crispus | .05 | .12 | | .20 | .20 | | | | |
| Polygonum persicaria | | .25 | | | | | | | |
| Setaria viridis | .05 | .12 | | | | | | | |
| Chenopodium album | .02 | | | | | | | | |
| Lepidium intermedium | | | | | .50 | | | | |

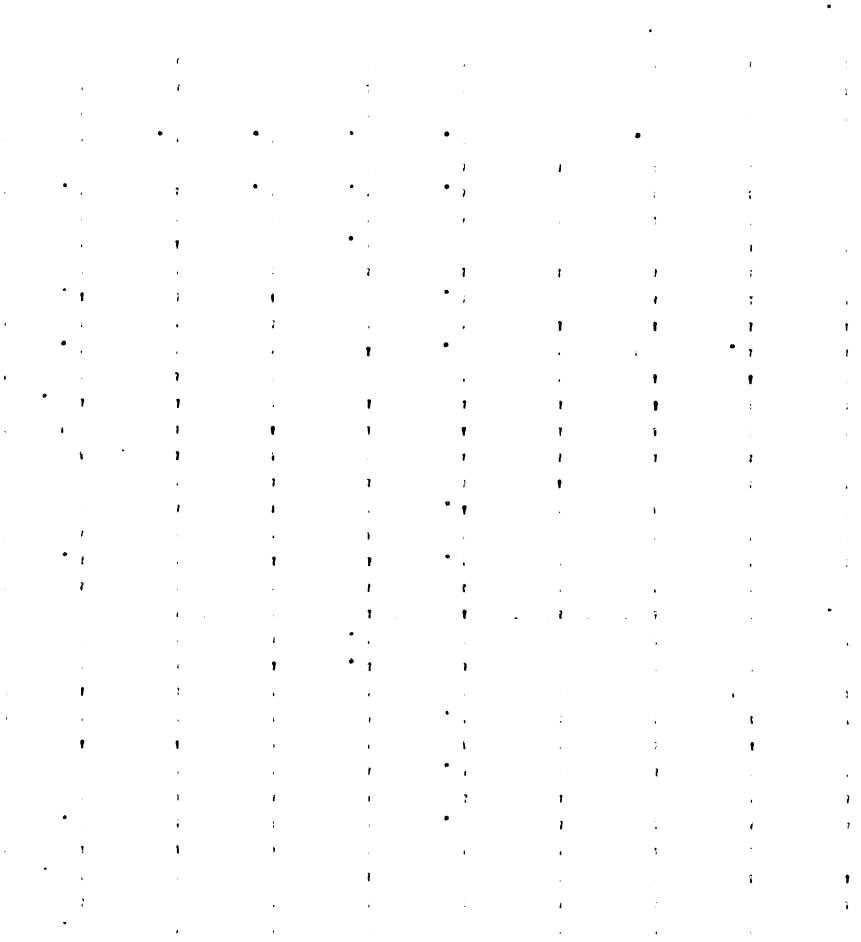


Table II. Continued.

| ) | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | |
|---|---|---|---|---|---|---|---|---|---|
| Rumex acetosella | .40 | .50 | 17.0 | 1.00 | .20 | .30 | .20 | 7.00 | |
| Rumex crispus | | | .60 | | | | | | |
| Rumex obtusifolius | | | | | | | .60 | | |
| Lepidium intermedium | .10 | | | | | | | | |
| Lipidium Virginicum | | .10 | | | | | | | |
| Poa pratensis | | | | .20 | | | .20 | | |

Seeds from the twenty-eight species of weeds, including the two grasses,---June grass and red top,---were found in the fifty-two samples of clover seed examined. The list is given below and the number of samples in which each was found. As will be seen sorrel occurs more frequently than any other followed by yellow dock, and that by green fox-tail. Of the other weeds, plantain, June-grass, Lady's thumb and pigeon grass evidently predominate.

| | |
|---|---|
| Agrostis alba | 1 |
| Amarantus retroflexus | 1 |
| Ambrosia artemisiaefolia | 4 |
| Bromus secalinus | 1 |
| Chenopodium album | 4 |
| Cnicus lanceolatus | 2 |
| Eleocharis ovata | 1 |
| Lactuca Canadensis | 1 |
| Lepidium intermedium | 3 |
| Lepidium Virginicum | 1 |
| Maruta cotula | 2 |
| Panicum capillare | 4 |
| Panicum Crus-galli | 2 |
| Panicum sanguinale | 1 |
| Plantago lanceolata | 5 |
| Plantago major | 6 |

| | |
|---|---|
| Plantago Rugelii | 1 |
| Poa pratensis | 6 |
| Polygonum hydropiper | 1 |
| Polygonum persicaria | 5 |
| Potentilla Norvegiaa | 1 |
| Rumex acetosella | 36 |
| Rumex crispus | 18 |
| Rumex obtusifolius | 1 |
| Setaria glauca | 5 |
| Searia viridis | 14 |
| Silene noctiflora | 1 |
| Stellaria media | 1 |

The nature of the different weeds, and the varying sizes of their seeds, render the per cents by weight as given in the preceding pages somewhat unsatisfactory. The relative number of seeds would perhaps be a better means of estimation; but such an examination would necessitate more work and time than, judging from the results, could profitably be put upon it. The investigation shows, at least, this much, that weed seeds are almost invariably present in clover seed.

Within certain limits, the kind of weed seed is more important than the amount. For example, the presence of three or four per cent. of sorrel or pepper-grass would not be so undesirable as even one per cent. of rib-grass. That the farmer should be able to recognize the common weed seeds, and thus to know what impurities he buys with the clover seed, needs scarcely an argument beyond an examination of a few varieties offered for sale. The aim of those writing upon this subject, should be to call his attention to the matter, to encourage him to make a collection of the weed seeds for reference, and to insist that no clover seed should be bought without an examination showing reasonable freedom from weed seeds.

Below are shown in a convenient form seeds from the twenty-eight species already mentioned. At least a collection of this kind with even more of the common weed seeds should be in the hands of every seed producer and every purchaser of seeds. In this way, only, can the farmer be assured of not increasing the weediness of his farm, when using seeds purchased on the market.

Agrostis alba. (Red top)

Amarantus retroflexus.(Pig-weed)

Ambrosia artemisiaefolia. (Rag-weed)

Bromus secalinus.(Chess)

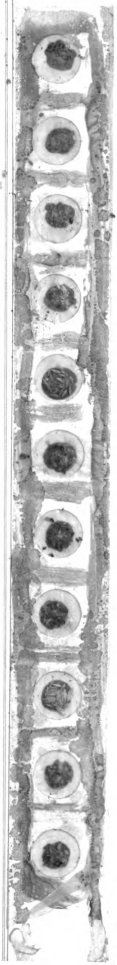
Chenopodium album.(Pig-weed)

Cnicus lanceolatus. (Bull thistle)

Eleocharis ovata. (A sedge)

Lactuca Canadensis. (Wild lettuce)

Lepidium intermedium. (Peppergrass)



Lepidium Virginicum.(Peppergrass)

Maruta cotula. (May-weed)

Panicum capillare.(Old-witch-grass)

Panicum Crus-galli.(Barnyard-grass)

Panicum sanguinale.(Crab-grass)

Plantago lanceolata.(English plantain)

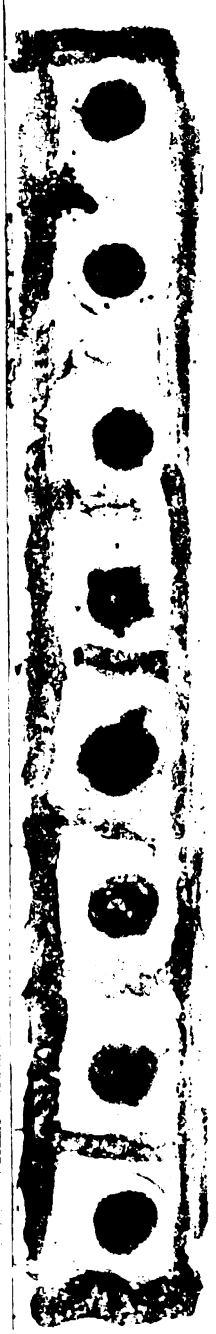
Plantago major,(Common plantain)

Plantago Rugelii.(Plantain)

Poa pratensis.(June-grass)

Polygonum hydropiper.(Smart-weed)

Polygonum persicaria.(Lady's thumb)



Potentilla Norvegici.(CInque-foil)

Rumex acetosella. (Sorrel)

Rumex crispus.(Yellow dock)

Rumex obtusifolius.(Bitter dock)

Setaria glauca.(Pigeon grass)

Setaria viridis.(Pigeon grass)

Silene noctiflora. (Catch-fly)

Stellaria media.(Chick-weed)