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Seed analyses of 1913 to 1921

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SEED ANALYSES, 1913 to 1921

AGRICULTURAL EXPERIMENT STATION
IOWA STATE COLLEGE OF AGRICULTURE
AND MECHANIC ARTS

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BOTANY AND PLANT PATHOLOGY SECTION



Ames, Iowa

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SEED ANALYSES OF 1913 TO 1921

By L. H. Pammel and C. M. King.

Both sellers and users of farm seeds in Iowa are alert to the menace that lies in weed seeds and other impurities and are striving to comply with the state seed laws and to prevent the introduction and spread of injurious weeds. That is indicated in the continually increasing number of seed samples submitted for testing to the Botany Section of the Iowa Agricultural Experiment Station. In the eight-year period ending June 30, 1921, the average number of samples tested was 1,060 annually, as against less than half that number in the previous corresponding period.

The tests of the past eight years show that each year some new weeds make their appearance in commercial seed, many of them of a menacing nature. The weed survey and seed testing of the Botany Section have helped to check the spread of these injurious weeds, as has also the inspection of commercial seed distributed in the state.

Of special value is the educational feature of the seed testing work. Farmers have been directed in their efforts to keep their fields free from noxious weeds. As farmers have recognized the profitableness of good seed, their demand for pure seed has influenced the trade and distributors of dangerous and inferior seed are being discriminated against by the farmer.

RESULTS OF EIGHT-YEAR PERIOD.

The 8,478 samples of seed submitted to the Station for examination in the eight-year period came from farmers, farmers' organizations, and wholesale and retail merchants. In this study there has been no differentiation between seed coming from farmers and from seed dealers.

It is impossible to state beyond question the sources of this seed, whether it was grown in Iowa or Wisconsin, Illinois or Minnesota, or in some other state. Experience shows that the merchant buys on the open market without regard to the locality where the seed was grown. The weed content does, however, in some cases reveal the probable territory where the seed was grown, as shown later.

It will be seen from the tabular summary that a large percentage of the samples are those of red clover, alfalfa, alsike clover, sweet clover, clover and timothy mixture, and timothy.

A study of the weed seed tests shows that a majority of the red clover seed sold in the state comes from the corn belt. In this seed, common pigweed occurred in 15.1 percent of clover samples, small ragweed in 29.6 percent, green and yellow foxtails in 59.8 percent, dock, yellow and tall, in 23.9 percent, lamb's

quarters in 33.3 percent, and crabgrass in 20 percent. These are all common Iowa weeds. The night-flowering catchfly occurred in 19.3 percent of the samples, chicory in .96 percent, Canada thistle in 1.5 percent, and field dodder in 2.4 percent. These weeds are not common in Iowa clover fields. It is probable that they came from sources other than the corn belt. No clover seed submitted indicated a foreign source.

In the case of the alfalfa seed tested, a western source is generally indicated by the presence of *Grindelia* (tarweed) and *Centaureas*. For the alsike clover received and tested, a general northern source is indicated by the presence of Canada thistle and night-flowering catchfly. Much timothy seed examined gave evidence of having been produced within Iowa.

Of all samples received, a number contained noxious seeds in sufficient quantity to make them illegal for the state according to the law in force at the time. Of these, Canada thistle occurred 160 times; wild mustard, 67 times; dodder, 181 times; wild oats, 44 times; quackgrass, 110 times; corncockle, 48 times.

It has not been possible to keep separate account of cleaned and uncleaned seed; therefore, our tests include seed of all degrees of cleanness, but comparisons of results between the years show no great deviation from the general average, as seen in table II.

In kinds of seed where a small number of samples was received, the results are less nearly representative than in kinds where a large number of samples was examined. This is particularly true in the case of samples of wheat and oats from suspected localities, sent in for purity test.

FUNGOUS DISEASES IN SAMPLES OF SEED.

Plant diseases are distributed in commercial seed; ergot appeared in 288 samples, and smut in 42.

SCREENINGS SHOULD BE EXAMINED.

The Botany Section has called attention frequently to the importance of using mill screenings only when they have been thoroughly ground. Not only may these mill screenings contain weed seed injurious to livestock, but sometimes ergot. Several instances have come to our attention where such products have caused some injury. Chicks may be poisoned by corncockle seeds. Screenings contain some food value. However, from a feeding standpoint this material should never be used unless first examined microscopically for injurious substances.

Foul weeds are often spread by screenings. The writers know of a city lot covered with harmful weeds which came from mill screenings. The Botanical Section in a previous year called attention to several small farms covered with corncockle, cowherb,

mustard, wild oats and other weeds. One field in particular, near Jordan, Iowa, has so much wild oats that the whole neighborhood might have become infested had the wild oats not been removed.

A list of the weeds found in the Jordan field, as evidenced by the seeds which appeared in screenings, follows: Common mustard (*Brassica arvensis*), smooth mustard (*B. juncea*), pennycress (*Thlaspi arvense*), hare's ear mustard (*Courtingia orientalis*), tumbling mustard (*Sisymbrium altissimum*), greater ragweed (*Ambrosia trifida*), small ragweed (*Ambrosia artemisiifolia*), cowherb (*Saponaria vaccaris*), corncockle (*Lychnis Githago*), European vetch (*Vicia sativa*), wild buckwheat (*Polygonum convolvulus*), slender wheat grass (*Agropyron tenerum*), chess (*Bromus sccalinus*). Some sunflower seed is often added to the screenings to improve them for chicken feed. It is urged that Iowa feed men refuse to sell this material unless ground up and submitted to analysis.

NEED OF FIELD INSPECTION.

The Botanical Section for many years has urged that crops desired for seed stock be examined in the field in which the grain was grown. It would pay to have an inspector examine a field of oats, for instance, which was intended for seed, and if found free from harmful weeds, put a stamp of approval on the entire field.

There are coming into the state many bad weeds, such as the perennial peppergrass (*Lepidium Draba*), Barnaby's thistle (*Centaurea solstitialis*), knapweeds, European morning glory (*Convolvulus arvensis*). The time must assuredly come when field examination of field seeds will be made, and a certificate of the character of the seed as found on such inspection will be given. Such seed should bring a higher price on the market. This method is now being successfully employed with potato seed, and it would pay the farmer to buy only such certified grain seed.

RED CLOVER, 1913-1921.

Number of samples received, 3,329.

Average percentage of purity,* 98.47.

Average percentage of germination, 86.34.

Average percentage of "hard seeds" in samples germinated, 8.51.

The range of purity average during the 8-year period was 1.83 percent, indicating that the samples as a whole were representative.

The range of germination average was about 5.35 percent. Some-seasonal difference in the proportion of "hard seeds" present is indicated by the range shown in the average percentage of "hard seeds" present, which is 7.53 percent.

Two adulterated samples were found; in both cases the adulterant was quartz particles.

*Timothy seed in clover samples and clover seeds in timothy samples, commonly present in small quantities, were not estimated.

In all, 127 different kinds of foreign seeds were found in the samples. The following were most common, in the order stated: Foxtails, lamb's quarters, small ragweed, Rugel's plantain, lady's thumb, curled dock, crabgrass, buckhorn, sheep sorrel, night-flowering catchfly, pigweed, old witchgrass, bracted plantain, wild carrot and Russian thistle.

Ergot was found in 39 samples (1.2 per cent).

Seeds of weeds unusual to this region were ox-eye daisy, prickly sida, sherardia, annual yellow clover and knapweeds.

Seeds of weeds becoming common were shoo-fly, yellow trefoil, buckhorn, chicory and wild carrot.

Squirrel-tail grass and white campion were occasionally found.

The extension of weeds thru seeding of impure clover seed is constantly coming to notice. Many of Iowa's serious weed pests, such as wild carrot and buckhorn, have been widely spread by this means.

ALFALFA, 1913-1921.

Number of samples received, 893.

Average percentage of purity, 99.07.

Average percentage of germination, 85.94.

The range of purity average during the 8-year period was 1.12 per cent.

The range of germination average, where "hard seed" were separated, was 9.72 percent. There is apparently some seasonal difference in proportion of "hard seed" present, since there is a range between the years of 14.46 percent of "hard seeds."

One adulterated sample, containing a large amount of sweet clover, was found.

That an excess of deteriorated seed was present during the period of the high prices of war times is indicated by the old and shrunken condition of seed in many samples received at that time. Such samples showed very weak germination.

A total of 115 kinds of weed seeds were found in the samples of alfalfa seed. The most common of these, in the order of frequency of occurrence, were foxtails, Russian thistle, lamb's quarters, pigweeds, buckhorn, curled dock, field dodder, alfalfa dodder, sweet clover, chicory, orach, old witchgrass, tarweed, knapweeds.

A group of western weed seeds is quite characteristic of alfalfa seed from that region: orach (*Atriplex sp.*), amsinckia, tarweed, *Stipa sp.* and western wheat grass.

Dodders were present in 90 samples (about 10 per cent).

Ergot was found in 9 samples.

Impure alfalfa seed has been responsible for much spreading of chicory and Russian thistle.

ALSIKE CLOVER, 1913-1921.

Number of samples received, 547.

Average percentage of purity, 97.5, with range of 5.43 percent.

Average percentage of germination, 85.5, with range of 5.05 percent.

Average percentage of "hard seeds" present, 8.4, with range of 6 per cent.

The number of different kinds of weed seeds found was 80, those especially characteristic of alsike clover being night-flowering catchfly,

sheep sorrel, peppergrass, Canada thistle, mayweed, fivefinger, sedges, chickweed, hopclover, velvetgrass, smooth crabgrass and buckhorn.

Common weed seeds of general occurrence in alsike, as well as in red clover and timothy samples, are Rugel's plantain, curled dock, pigweed, foxtail and lamb's quarters, all of which are generally found in fields and pastures. Smartweeds and ragweeds were not often found.

Of the more dangerous weed seeds, sorrel occurred in 49 percent of the samples, night-flowering catchfly in 45.3 percent. Russian thistle and the dodders were not frequent. Ergot was found in three samples.

SWEET CLOVERS, 1913-1921.*

Number of samples received, 314.

Average percentage of purity, 98.85, with range of 1.2 percent.

Average percentage of germination, 80.5, with range of 4.5 per cent.

Average percentage of "hard seeds" present, 8.4, with range of 6 percent. That a number of samples of sweet clover seed had been treated by a scarifier no doubt affects the "hard seed" average, but just how much could not be determined.

The different kinds of weed seed found in sweet clover seed numbered 103.

The more characteristic weed seeds for sweet clover, as found, were black bindweed, self heal, black medick (yellow trefoil), Canada thistle, evening primrose, quackgrass, chicory and wild mustard.

Common weed seeds generally present were buckhorn, Pennsylvania smartweed, curled dock, foxtail, pigweed, ragweed, peppergrass, lamb's quarters, old witchgrass, and switchgrass.

Serious weed seeds occasionally present were sheep sorrel, Russian thistle, black mustard, ox-eye daisy and Johnson grass.

Of the more dangerous weed seeds, chess occurred in one sample, field dodder in nine samples, Canada thistle in six, quackgrass in fifteen, corn cockle in two, wild oats in one.

Recently introduced weed seeds are Barnaby's thistle, chicory, and perennial peppergrass (*Lepidium Draba*).

Sweet clover seed from states south and west is liable to contain Johnson grass seed.

TIMOTHY, 1913-1921.

Number of samples received, 1,856.

Average percentage of purity,† 97.42.

Average percentage of germination, 94.04.

The number of kinds of weed seeds found was 89. Of these, the following may be said to be characteristic of timothy seed samples: Peppergrass, fivefinger, evening primrose, wild rose, Mayweed, sedges, chickweed, Rugel's plantain and common plantain. The weed seed impurity of timothy denotes a home source for most of the seed.

Weed seeds found most commonly, given in the order of frequency of occurrence, are: Fivefinger, 28.1 percent; peppergrass, 22.1 percent;

*Results of tests of the various sweet clovers are considered together. The 314 samples tested are both biennial white and biennial yellow clover.

†Clover seed in timothy samples, commonly present in small quantities, were not estimated.

foxtails, 13.2 percent; curled dock, 11.3 percent; lamb's quarters, 19.8 percent; sorrel, 19.9 percent; ergot, 9.7 percent; evening primrose, 15.1 percent; sedges, 5.1 percent; heart'sease (smartweed), 4.1 percent; pigweed, 3.4 percent; squirrel-tail, 3 percent; spurges, 1.5 percent. These plants seed about the time that timothy is cut.

Less frequently found, but important, were the following weed seeds: Russian thistle, European morning glory, field dodder, quackgrass, pennycress, and species of nightshade (*Solanum*).

It will be seen that impure timothy seed is often a means of spreading weed pests.

TIMOTHY AND CLOVER MIXTURES, 1913-1921.

Number of samples received, 394.

Average percentage of purity, 96.61.

Average percentage of germination for the timothy content, 92.25; for clover content, 81.4.

Alsike, or occasionally red clover, is used in these mixtures. It will be noted by comparison that these samples were much lower in percentage of purity, also in germination, than shown for separate samples of timothy or the clovers. This fact indicates the tendency toward the use of somewhat inferior seed and dirty seed in these mixtures; for instance, the presence of wild rose and ragweed always indicates uncleaned samples.

The number of kinds of weed seed found in the samples was 83.

The common weed seeds found are those found in separate samples of timothy and the various clovers. In order of frequency, they are as follows: Peppergrass, 131; lamb's quarters, 126; curled dock, 99; night-flowering catchfly, 70; foxtail, 70; Rugel's plantain, 138; buckhorn, 106; sorrel, 70; fivefinger, 49; vervains, 47; bracted plantain, 44; wild rose, 43; smartweed, 38; mayweed, 33; pigweed, 32.

The following harmful weed seeds were found: Velvetweed, quackgrass, Canada thistle (in about 10 percent of samples), black mustard, chess, chicory, ox-eye daisy, field dodder (in about 5 percent of samples), wild carrot, squirrel-tail grass. Ergot was present in 10 percent of the samples.

The general condition of these samples of timothy and clover mixtures indicates the need of especial attention to quality in seed used.

MILLET, 1913-1921.

Number of samples received, 133.

Average percentage of purity, 96.14.

Average percentage of germination, 72.93.

The number of kinds of weed seeds found was 34. In the order of frequency of occurrence they are ragweed, foxtail, smartweed, pigweed, lamb's quarters and vervains.

Not many dangerous weed seeds occurred. Velvetweed and Russian thistle were found in a few samples.

BLUEGRASS, 1913-1921.

Number of samples received, 80.

Average percentage of purity,* 98.05.

*Chaff contained in the samples was not estimated.

Average percentage of germination, 30.36.

The number of kinds of weed seeds found was 37.

The characteristic weed seeds found frequently were sedges, mustard, peppergrass, chickweed and sorrel.

Occasionally quackgrass and night-flowering catchfly were found. Ergot appeared in 15 percent of the samples.

SUDAN, 1913-1921.*

Number of samples received, 53.

Average percentage of purity, 98.74.

Average percentage of germination, 76.94.

Different kinds of weed seeds found numbered 18.

Weed seeds most commonly found were Pennsylvania smartweed, foxtail, small ragweed, large ragweed, pigweed, lamb's quarters.

Velvetweed occurred in 16 percent of the samples. Prickly sida, buffalo bur and other species of *Solanum* were found only infrequently.

Johnson grass was noticed in four samples.

BROME GRASS (*Bromus inermis*). 1913-1921.

Number of samples received, 35.

Average percentage of purity, 98.88.

Average percentage of germination, 73.72.

Number of kinds of foreign seed found was 11.

Quackgrass appeared in 15 samples; wheat grasses in 5 samples; ergot in 12; Russian thistle in 1; prickly sida in 1; smut in 1.

Quackgrass and wheat grass are commonly found in western brome grass.

WHITE CLOVER, 1913-1921.

Number of samples received, 14.

Average percentage of purity for all samples tested, 98.36.

Average percentage of germination for all samples tested, 86.

Average percentage of "hard seeds" present, about the same as found in sweet clover.

Number of kinds of weed seed found was 22.

Among the characteristic weed seed found are chickweed, penny-cress, mayweed, camomile, bracted plantain, Rugel's plantain, and buckhorn.

Among more serious weed seed appeared sorrel, wild mustard, Canada thistle and night-flowering catchfly.

LAWN GRASS MIXTURES, 1913-1921.

Number of samples received, 69.

Number of kinds of weed seeds found, 60.†

Among the common weed seeds more often present were pigweed, peppergrass, sweet clover, black medick, chickweed, the plantains (bracted, Rugel's and buckhorn), and sedges.

Of the serious weed seed more or less frequently found were velvet-grass, fall dandelion, sorrel, wild oats, quackgrass, wild and Indian mustards, knapweeds and Canada thistle. Ergot appeared in several samples.

*No samples of sudan were received in 1913 and 1914.

†Lawn grasses had a greater weed seed content than samples of other grasses received.

RAPE, 1913-1921.

Number of samples received, 99.

Average percentage of purity, 99.2.

Average percent of germination, 91.6.

The number of different kinds of foreign seed found was 13.

Among the seeds found were foxtails, smartweeds, chickweeds, black bindweed and chess.

No adulterated samples of rape seed were received.

WHEAT, 1913-1921.

Number of samples* received, 52.

Number of kinds of weed seed found, 15.

Corncockle was found in 73 percent of the samples; small ragweed in 5.4 percent; wild oats in 70 percent; black bindweed in 4 percent; cowherb in 48 percent; Indian mustard in 9.5 percent; morning-glory in 32 percent; vetch in 42 percent; buckbrush occurred in one instance.

OATS, 1913-1921.

Number of samples received, 36.

Number of kinds of foreign seed contained, 11. The following were of most frequent occurrence: Black bindweed, brome grasses, wild rose, curved dock, foxtails. Barley occurred in 8 percent, wild oats in 5 percent, and chess in 25 percent of the samples. Quackgrass and corncockle were occasionally found.

FEEDS,† 1913-1921,

Number of samples received, 29.

Harmful weed seeds were found as follows: Quackgrass, once; buckhorn, once; wild mustard, twice. Corncockle, which occurred three times, is regarded as poisonous to chicks.

A number of other common weed seeds were, of course, present.

WEED SEED IDENTIFICATION.

Weed seed samples were sent in for identification of weed seeds, numbering 235.

Those most frequently received for this purpose were samples of dropseed grass (*Muhlenbergia* sp. and *Sporobolus* sp.), Canada thistle (*Cirsium arvense*), chess (*Bromus secalinus*), wild barley (*Hordeum jubatum*), morning-glory (*Ipomoea hederacea*) Barnaby's thistle (*Centaurea solstitialis*), pennycress (*Thlaspi arvense*), Indian mustard (*Brassica juncea*), quackgrass (*Agropyron repens*).

Timothy in clover samples and clover in various samples occurred constantly in negligible amounts; in such cases they were not taken account of with the weed seed impurity.

*These samples are not representative of wheat sold in Iowa, as many of them were from Canadian shipments, sent, doubtless, because believed to contain exceptional impurities.

†These are made up of various chickfeeds and other feeding mixtures which were received for examination to determine their harmful or poisonous weed seed content.

NUMBER OF SAMPLES CONTAINING ADULTERANTS.

Alfalfa (adulterated with sweet clover).....1
 Sweet clover (adulterated with alfalfa).....1
Lolium perenne (adulterated with *L. Italicum*).....4
 Clover (adulterated with quartz particles).....2
 Meadow foxtail (adulterated with *Alopecurus agrestis*).....1
 Neither adulterated rape seed nor adulterated bluegrass seed were found.

TABLE I. SAMPLES OF COMMERCIAL AND FARM SEED RECEIVED DURING THE EIGHT-YEAR PERIOD, JULY, 1913, TO JULY, 1921.

	1913 1914	1914 1915	1915 1916	1916 1917	1917 1918	1918 1919	1919 1920	1920 1921	Total No. for Eight Years
Red clover.....	474	434	502	420	283	345	330	541	3,329
Alfalfa.....	202	162	106	150	68	89	66	50	893
Alsike clover.....	77	36	48	70	51	89	82	91	547
Sweet clover.....	69	43	35	39	16	43	47	22	314
Alfalfa and sweet clover mixture.....						1			2
Timothy.....	271	285	266	318	166	198	162	190	1,856
Timothy and clover mixture.....	26	32	28	39	39	105	75	50	394
Millet.....	34	17	12	24	17	17	15	7	133
Blue grass.....	8	15	7	6	6	13	18	7	80
Sudan grass.....			8	2	4	9	20	10	53
Redtop.....	2	1		1	1	1	6	1	13
Flax.....	2	3	7	4	7	1	7		31
Cane.....	8			7	11	2	2		30
Brome grass.....	7	4	7	11	3	2		1	35
White clover.....	1	1	3	1	1	1	5	1	14
Lawn grass mixtures.....	8	3	30	4	7	4	4	9	68
Orchard grass.....	1	1		1			2	3	8
Bur clover.....	1		1						2
Crimson clover.....				1			2		3
Crimson and red clover mixture.....							1		1
Trifolium minus.....	1							1	2
Japan clover.....	1		1						2
Trifolium procumbens.....						1			1
Medicago lupulina.....						1		1	2
Lolium italicum.....	1							2	3
Lolium perenne.....	1						4		5
Meadow foxtail.....			1					1	2
Fescue.....			2				4		8
Crested dog's tail.....			1						1
Rape.....	4	3	3	18	8	22	8	6	99
Birchseed.....								1	1
Buckwheat.....	3					1	6		10
Field peas.....	3	1					4		8
Soybeans.....						4	22	15	41
Barley.....	1						2		3
Wheat.....	1	5		4	37		3	9	52
Oats.....	2		5	7	2	1	8	11	36
Onion.....	3	3	12	5	13	3		27	67
Vetch.....			1				1	1	3
Mustard.....			1				1		2
Cabbage.....			2		2			1	5
Mangel.....			4				2		6
Turnip.....							1	2	3
Radish.....						3			3
Pumpkin.....		1							1
Cucumber.....		2	3	1					5
Beet.....		3	2	3	3			3	14
Tomato.....		1	3	1					5
Melon.....		1		1					2
Lettuce.....			3						4
Parsnip.....					2				2
Feed.....					2				2
Screenings.....	6	1	6	4	4	2	3		29
Sunflower.....							2		2
<i>Anthyllis vulneraria</i>						1			1
Weed seed samples.....	18	15	33	48	13	18	26	67	235
Total samples for each year.....	1,236	1,048	1,163	1,187	771	976	943	1,127	8,478

TABLE II. PURITY AND GERMINATION RESULTS OF COMMERCIAL SEED TESTED DURING EIGHT-YEAR PERIOD, FROM 1913-1921.

	1913	1914	1915	1916	1917	1918	1919	1920	1921	Total No. samples tested	Gen'l Ave.
Red clover—											
Ave. per cent purity-----	97.22	96.86	97.59	98.60	97.87	97.60	96.04	97.2		3,196	98.47
Ave. per cent germination-----	*89.08	*89.85	85.65	85.26	83.59	80.30	81.8	82.5		2,340	86.34
Ave. per cent hard seeds-----			4.36	8.65	11.9	6.80	9.9	9.45			8.51
Alfalfa—											
Ave. per cent purity-----	99.01	99.79	99.27	99.18	99.31	98.85	98.86	98.47		853	99.07
Ave. per cent germination-----	*92.69	*90.30	85.00	76.22	85.90	84.84	80.5	86		667	85.94
Ave. per cent hard seeds-----			6.64	21.10	10.19	7.8	7.25	12			10.83
Alsike clover—											
Ave. per cent purity-----	98.15	93.20	93.16	96.39	97.05	98.72	97.99	98.56		530	97.5
Ave. per cent germination-----	*92.30	*93.20	88.17	88.15	88.20	88.72	85.2	84.2		356	88.5
Ave. per cent hard seeds-----			4.41	9.00	10.00	8.20	8.4	10.4			8.4
Sweet clover—											
Ave. per cent purity-----	98.89	99.11	98.20	95.50	98.95	99.44	98.4	99.35		270	98.85
Ave. per cent germination-----	*78.70	*74.70	65.10	66.00	66.25	71.60	73.2	69.7		198	70.65
Ave. per cent hard seeds-----		17.60	28.30	25.00	24.05	17.10	25.7	25			26.1
Timothy—											
Ave. per cent purity-----	97.99	97.85	97.23	98.79	97.52	97.56	98.42	94		1,716	97.42
Ave. per cent germination-----	94.20	92.80	91.49	91.36	94.55	96.58	93.60	97.75		1,262	94.01
Timothy-clover mixture—											
Ave. per cent purity-----	94.30	96.39	97.50	97.70	94.84	96.49	96.98	98.34		332	96.61
Ave. per cent germination-----											
(timothy)		94.40		93.24	89.33	94.25	95	92.3		170	92.25
(clover)		88.00		87.00	81.73	67.86	86.33	77.9			81.4
Millet—											
Ave. per cent purity-----	98.02	96.91	95.75	98.86	99.52	82.00	99.56	98.5		100	96.14
Ave. per cent germination-----	65.00	89.10	83.30	81.99	81.33	96.66	74	77.4		60	72.93
Bluegrass—											
Ave. per cent purity-----	99.70	96.75	96.37		99.51	98.65	97.61	97.75		52	98.05
Ave. per cent germination-----		36.00	37.00	25.00	34.20	25.00	25.5	35		48	30.36
Sudan grass—											
Ave. per cent purity-----			99.90	100.00	99.31		99.56	94.93		38	98.74
Ave. per cent germination-----			72.00	90.00		75.00	70.21	77.5		39	76.94
Cane—											
Ave. per cent purity-----				100.00	99.88		100			13	99.92
Ave. per cent germination-----				51.40	38.70	71.00	89			17	62.25
Brome grass—											
Ave. per cent purity-----	96.60		99.50	97.65	99.50					25	98.88
Ave. per cent germination-----			66.76	81.00						11	73.72
White clover—											
Ave. per cent purity-----	98.27	97.81	99.08	95.25	93.10		96.18	99.86		12	98.36
Ave. per cent germination-----		95.0	81.00		90.00		78			12	86
Flax—											
Ave. per cent purity-----	99.40	98.11	99.80	99.71	99.86	99.32				28	99.03
Ave. per cent germination-----	87.00	83.30	99.00	89.60	80.00	77.8				23	86.11
Rape—											
Ave. per cent purity-----	99.80	99.89	93.45	99.91	98.08	99.00	96.52	99.9		66	99.02
Ave. per cent germination-----		92.00	94.00	91.00	100.00	92.00	79.2	93		36	91.6
Onion—											
Ave. per cent purity-----		100.00	100.00	100.00	99.00			100		44	99.8
Ave. per cent germination-----	92.30	89.60	74.00	92.00	84.60	81.00		50		61	80.5
Cabbage—											
Ave. per cent purity-----		100.00						100		5	100
Ave. per cent germination-----		95.00						89		5	92

The germination percentages marked "*" include one-half the "hard seed" percentage of the sample.

TABLE III. PURITY AND GERMINATION RESULTS (IN PER CENT) FOR SOME PREVIOUS YEARS.

	1907		1908		1909		1910*	1911*	1912		1913	
	Purity	Germination	Purity	Germination	Purity	Germination	Purity	Purity	Purity	Germination	Purity	Germination
Red clover.....	96.6	86	95.2	89.4	97.7	82.9	97.4	94.9	97.1	89.99	96.72	92.1
Alfalfa.....	91.1	68.2	89.9	77.4	99.7	89.1	99.45	95.93	98.1	83	97.3	92
Alsike.....	98.86	81.6	96.8	79.1	99	83.7	98.18	98.31	98.6	86.5	97.2	94
Timothy.....	98.9	75	89.9	97.9	98.7	99.3	97.19	96.05	97.9	72	97.75	96

* Germination tests were not made in 1910 and 1911.

TABLE IV. NUMBER OF SAMPLES CONTAINING NOXIOUS WEED SEEDS IN DETRIMENTAL QUANTITY.*
(i. e., exceeding the amount allowed by Iowa Seed Law of 1913.)

	Quack-grass	Wild oats	Dodder	Wild mustard	Canada thistle	Corn-cockle	Total illegal samples
Oats.....	1	1		6		1	9
Bluegrass.....	1						1
Sweet clover.....	15	1	7	7	6		36
Flax.....		1		1	1		3
Timothy.....	33		1	21	9		64
Sugar beet.....					3		3
Brome.....	12						12
Timothy and clover.....	11		2	5	34	2	54
Lawngrass mixtures.....	1	1			2		4
Chick feed.....	1					3	4
Millet.....				3			3
Wheat.....		35				38	73
Alsike.....	1		3	3	62		69
Alfalfa.....	4	2	56	7	4	1	74
Red clover.....	16	1	111	14	38	2	182
Miscellaneous.....	14	3	1		1	1	20
Total.....	110	44	181	67	160	48	570

* Many other samples contained a trace only of the prohibited weed seed; this explains why in the general table of purity results, is found in a number of cases, a different figure of weed seed occurrence from that given in this table (see the Iowa Law of 1913, on "trace of injurious seeds").

TABLE V.—OCCURRENCE OF WEED AND OTHER CROP SEEDS IN 8,478 SAMPLES OF COMMERCIAL SEED TESTED DURING THE PERIOD JULY, 1913, TO JULY, 1921.

Names of weeds.	Red clover	Alfalfa	Alsike	Sweet clovers	Timothy	Timothy, clover mixtures	Millet	Bluegrass	Sudan	Bromus inermis	White clover	Lawn grass mixtures	Rape	Wheat	Oats	Feeds	Miscellaneous	Total times found	Percentage of 8,478 samples in which found	
	3,329	893	547	314	1,856	394	133	80	53	35	14	69	99	52	36	29	545	-----		
<i>Abutilon Theophrasti</i> (velvet weed).....	1	1	2	-----	-----	1	1	-----	9	-----	-----	-----	-----	-----	-----	-----	3	18	.2124	
<i>Acalypha virginica</i> (three-seeded mercury).....	58	-----	-----	-----	-----	2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	61	.7118	
<i>Achillea Millefolium</i> (yarrow).....	-----	-----	1	-----	1	1	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	5	9	.1062	
<i>Agastache scrophulariaefolia</i> (giant hyssop).....	2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2	.0236	
<i>Agropyron repens</i> (quack grass).....	16	4	1	15	13	13	-----	1	-----	15	-----	1	-----	-----	1	1	21	102	1.2036	
<i>Agropyron sp.</i> (wheat grasses).....	1	11	6	5	-----	-----	-----	-----	-----	5	-----	-----	-----	-----	-----	-----	13	30	.354	
<i>Agrostemma Githago</i> (corn cockle).....	4	2	-----	2	-----	-----	-----	-----	-----	-----	-----	-----	-----	38	1	3	9	59	.6962	
<i>Agrostis alba</i> (red top).....	2	1	2	1	130	30	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	167	1.9706	
<i>Aira sp.</i> (hair grass).....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	-----	1	.0118	
<i>Alopecurus agrestis</i> (foxtail grass).....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	1	.0118	
<i>Amaranthus blitoides</i> (prostrate pigweed).....	2	3	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	6	.0708	
<i>Amaranthus graecizans</i> and <i>A. retrofractus</i> (pig-weeds).....	501	134	22	27	59	32	28	1	5	-----	-----	3	-----	-----	-----	-----	1	8	821	9.6878
<i>Amaranthus sp.</i>	-----	5	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	5	.059	
<i>Ambrosia artemisiifolia</i> (small ragweed).....	9-5	30	6	21	59	8	61	-----	9	-----	-----	1	-----	3	-----	1	12	1,196	14.1126	
<i>Ambrosia trifida</i> (greater ragweed).....	-----	-----	-----	-----	-----	-----	-----	-----	12	-----	-----	-----	-----	-----	-----	-----	3	5	.059	
<i>Amsinckia lycopsiodes</i> (amsinckia).....	-----	2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2	.0236	
<i>Andropogon</i> (sudan grass).....	-----	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	.0118	
<i>Andropogon furcatus</i> (beard grass).....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	.0118	
<i>Anthemis arvensis</i> (field camomile).....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	1	-----	-----	-----	-----	-----	2	.0236	
<i>Anthemis Cotula</i> (mayweed).....	43	2	60	3	32	33	-----	3	-----	-----	-----	1	-----	-----	-----	-----	2	179	2.1122	
<i>Antirrhinum majus</i> (snapdragon).....	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	.0118	
<i>Arctium Lappa</i> (burdock).....	-----	-----	1	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2	.0236	
<i>Asclepias sp.</i> (milkweed).....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	-----	1	.0118	
<i>Atriplex patula</i> and <i>A. nummularia</i> (orach).....	3	34	-----	4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	3	44	.5192	
<i>Avena fatua</i> (wild oat).....	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	-----	35	-----	-----	3	43	.5074	
<i>Avena sativa</i> (cultivated oat).....	1	2	-----	20	-----	1	1	-----	-----	-----	-----	-----	1	2	-----	-----	-----	28	.3304	
<i>Borage</i> (species undetermined).....	3	5	3	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	13	.1534	

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<i>Brassica arvensis</i> (wild mustard).....	28	12	2	7	30	11	4	1	5	5	2	12	119	1.3051	
<i>Brassica campestris</i> (rutabaga).....												1	1	.0118	
<i>Brassica juncea</i> (Indian mustard).....	11	2	1	9				1		5	1		31	.3658	
<i>Brassica nigra</i> (black mustard).....	13		7	10	2	3							36	.4248	
<i>Bromus ciliatus</i> (brome).....													1	.0118	
<i>Bromus inermis</i> (smooth brome).....		1	2	1									1	.059	
<i>Bromus mollis</i> (soft brome).....								1				7	12	.1416	
<i>Bromus secalinus</i> (cheat or chess).....	5			1	3	1		1	9			15	35	.4130	
<i>Bromus sterilis</i> (barren brome).....								1					1	.0118	
<i>Bromus</i> sp. (brome grasses).....	23	4	1	4	1		1		3			12	49	.2242	
<i>Calamagrostis canadensis</i> (blue joint).....					1								1	.0118	
<i>Camelina sativa</i> (false flax).....	1		5										1	.0826	
<i>Capsella Bursa-pastoris</i> (shepherd's purse).....	4		7		6	7	4	1					29	.3422	
<i>Carex</i> sp. (sedges).....	13	4	18	15	107	28	2	33	1	12		4	257	3.0826	
<i>Cassia Tora</i> (senna).....				1									1	.0118	
<i>Cenchrus tribuloides</i> (sandbur).....													1	.0118	
<i>Centaurea Cyanus</i> (corn-flower).....									1				2	.0236	
<i>Centaurea repens</i> (Asiatic centaurea).....		28											8	.36	
<i>Centaurea solstitialis</i> (Barnaby's thistle).....		1		1									3	.059	
<i>Centaurea</i> sp. (knapweeds).....	3	25	1	3	2					1			5	.472	
<i>Cerastium vulgatum</i> (common mouse-eared chickweed).....	1												2	.0236	
<i>Chenopodium album</i> (lamb's quarters).....	1,111	220	92	124	188	126	25	1	3	1	4		3	10	1,908
<i>Chenopodium murale</i> (western lamb's quarters).....		2		2									4	.0472	
<i>Chenopodium ambrosioides</i> var <i>anthelminticum</i> (wormseed).....													1	.0118	
<i>Chrysanthemum Leucanthemum</i> (ox-eye daisy).....	2		5	1	1	3							8	20	.236
<i>Cichorium Intybus</i> (Chicory).....	32	35	1	4	3	3							78	.9204	
<i>Cicuta maculata</i> (cowbane).....						1							1	.0118	
<i>Cirsium arvense</i> (Canada thistle).....	50	4	50	6	7	37		3	3		1	12	163	1.9234	
<i>Cirsium discolor</i> (field thistle).....	6			1									7	.0826	
<i>Cirsium lanceolatum</i> (bull thistle).....	24	2		1		2						7	36	.4248	
<i>Conringia orientalis</i> (hare's ear mustard).....	7	5	5	3		3							2	.30	
<i>Convolvulus arvensis</i> (European morning glory).....		2			2								1	.059	
<i>Convolvulus sepium</i> (morning glory).....	3	3			2	1				15			3	27	.3186
<i>Coronilla varia</i> (ax-seed).....	5			3									2	10	.118
<i>Crepis runcinata</i> (hawk's beard).....						1							1	.0118	
<i>Crucifer</i> (species undetermined).....		3											3	.0336	
<i>Cuscuta arvensis</i> (field dodder).....	79	41	3	9	2	5							139	1.6402	
<i>Cuscuta Epithymum</i> (clover dodder).....	10	38		1									49	.5782	
<i>Cuscuta</i> sp. (dodder).....	19	11	1										31	.3658	
<i>Cytisus scoparius</i> (broom).....													1	.0118	
<i>Dactylis glomerata</i> (orchard grass).....	1	9	1		2	1		1					1	16	.1888
<i>Dalea alopecuroides</i> (dalea).....		4		1		1							6	.0708	
<i>Daucus Carota</i> (wild carrot).....	117	11	1			8	2						139	1.6402	
<i>Delphinium Consolida</i> (larkspur).....	1												1	.0118	
<i>Digitaria humifusa</i> (smooth crabgrass).....	644	12	9		22	18	10	1	1				3	731	8.6258
<i>Digitaria sanguinalis</i> (common crabgrass).....	24	1	5		16	2	2		1				4	55	.6490

TABLE V.—OCCURRENCE OF WEED AND OTHER CROP SEEDS IN 8,478 SAMPLES OF COMMERCIAL SEED TESTED DURING THE PERIOD JULY, 1913, TO JULY, 1921—Continued.

Names of weeds.	Red clover	Alfalfa	Alsike	Sweet clovers	Timothy	Timothy, clover mixtures	Millet	Bluegrass	Sudan	Bromus tectorum	White clover	Lawn grass mixtures	Rape	Wheat	Oats	Feeds	Miscellaneous	Total times found	Percentage of 8,478 samples in which found
<i>Dracocephalum parviflorum</i> (dragon head).....																		2	.0236
<i>Echinochloa crusgalli</i> (barnyard grass).....	61	6	1	4	2	1	1		1									78	.8204
<i>Echium vulgare</i> (blue weed).....																		1	.0118
<i>Elymus</i> sp. (rye grasses).....	1			2	1													5	.059
<i>Epilobium</i> sp. (fireweed).....						1												1	.0118
<i>Eragrostis</i> sp. (yard grass).....		3			10	1						1						21	.2478
<i>Erechtites hieracifolia</i> (hawkweed).....																		1	.0118
<i>Ergot</i>	39	9	3	10	157	40		12		1		4		1			12	2-8	3.3984
<i>Erigeron canadensis</i> (fleabane).....						2												2	.0236
<i>Eruca sativa</i> (rocket).....		6																6	.0708
<i>Erysimum cheiranthoides</i> (wormseed mustard).....			2					1										5	.059
<i>Eupatorium urticaefolium</i> (white snakeroot).....					23			1										23	.3304
<i>Euphorbia Cyparissias</i> (cypress spurge).....		6																6	.0708
<i>Euphorbia maculata</i> and <i>E. Preslii</i> (spurge).....	111			1	27	6		1										146	1.7228
<i>Festuca duriuscula</i> (hard fescue).....																		2	.0236
<i>Festuca ovina</i> (sheep fescue).....	2	2																4	.0472
<i>Festuca pratensis</i> (meadow fescue).....				1		1												3	.0354
<i>Galium Aparine</i> (bedstraw).....	2	1			1		1			1				6				15	.1676
<i>Gaura biennis</i> (gaura).....				2														2	.0236
<i>Geranium carolinianum</i> (wild geranium).....	20	4	1			1												29	.3422
<i>Geranium dissectum</i> (cut leaved geranium).....																		2	.0236
<i>Glycyrrhiza lepidota</i> (wild licorice).....																		1	.0118
<i>Grindelia squarrosa</i> (tarweed).....	5	30		16	1							1						53	.6254
<i>Helianthus</i> sp. (sunflower).....	6	20		12		2	3		1									2	.5428
<i>Helopsis scabra</i> (ox eye).....																		1	.0118
<i>Hibiscus Trionum</i> (shoo-fly).....	3	1	1															2	.0236
<i>Hieracium canadense</i> (hawkweed).....												1						1	.0118
<i>Holcus lanatus</i> (velvet grass).....	10	4	37	3		10		3				4						71	.8378
<i>Hordeum jubatum</i> (squirrel-tail grass).....	20	3	1	5	52	6		1										9	1.1446
<i>Hordeum vulgare</i> (barley).....		1			1										3			5	.059
<i>Hypochaeris radicata</i> (cat's ear).....												1						1	.0118
<i>Hystrix patula</i> (bottle brush grass).....	2			2	4	1												2	.1298
<i>Ipomoea hederacea</i> (blue field morning glory).....																	6	6	.0708

<i>Iva xanthifolia</i> (marsh elder)	13	12	19							44	5182				
<i>Juncus</i> sp. (rush)	1			3				3		7	9826				
<i>Labiata</i> (species undetermined)	5	2		2						9	1062				
<i>Lactuca canadensis</i> (wild lettuce)	23		5	4	5	3		1		41	4838				
<i>Lactuca scariola</i> (prickly lettuce)			1							1	0118				
<i>Lapsana communis</i> (nipple-wort)										1	0118				
<i>Lepachys pinnata</i> (green coneflower)	2	1		1				1		6	0708				
<i>Leontodon autumnalis</i> (fall dandelion)								1		1	0118				
<i>Lepidium apetalum</i> and <i>L. virginicum</i> (pepper grasses)	63	2	60	10	480	131	2	18		5	1	33	805	9.4490	
<i>Lepidium Draba</i> (hoary cress)			1	2							1	1	1	0118	
<i>Linaria vulgaris</i> (toad flax)								1			1	1	1	0118	
<i>Linum usitatissimum</i> (flax)				1	2			1			1	4	1	0472	
<i>Lolium perenne</i> (perennial rye grass)				1				1		2		3	7	0826	
<i>Lolium temulentum</i> (darnel)											2	2	2	0236	
<i>Lolium</i> sp.	12	1			1							3	17	2006	
<i>Lotus corniculatus</i> (bird's foot trefoil)												1	1	0118	
<i>Lupinus</i> sp. (lupine)												1	1	0118	
<i>Lychnis alba</i> (white campion)	8		1		1			1				1	12	1410	
<i>Lychnis</i> sp.	2												2	0236	
<i>Malva rotundifolia</i> (cheeses)	7			2								1	10	1180	
<i>Malva</i> sp.	3	3	1	1						1		1	10	1180	
<i>Marrubium vulgare</i> (horehound)	17		2		1					1		1	21	2478	
<i>Medicago denticulata</i> (bur clover)		2	1	1									4	0472	
<i>Medicago lupulina</i> (black medick)	23	19	15	4	7	14				2		1	85	1.0030	
<i>Medicago sativa</i> (alfalfa)	6			7									13	1534	
<i>Melilotus alba</i> (white sweet clover)	23	46	2		4	5		1		2		1	84	9912	
<i>Melilotus indica</i> (annual yellow sweet clover)	1	1			1	1				1		1	6	0708	
<i>Melilotus officinalis</i> (biennial yellow sweet clover)	1		1										2	0236	
Millet	26	21		3	13								64	7552	
<i>Monarda fistulosa</i> (horsemint)						1							1	0118	
<i>Muhlenbergia mexicana</i> (mexican dropseed grass)	61	7	1	1	5		1						6	82	9676
<i>Nepeta cataria</i> (catnip)	12		2	1									1	16	1888
<i>Neakia paniculata</i> (ball mustard)													1	0118	
<i>Oenothera biennis</i> (evening primrose)	70	4	8	5	101		1	1					191	2.2588	
<i>Oxalis corniculata</i> (yellow oxalis)	16		2		7	5				1			32	3776	
<i>Onobrychis sativa</i> (sainfoin)													1	0118	
<i>Osmorrhiza brevistylis</i> (sweet cicely)													1	0118	
<i>Panicum capillare</i> (old witch grass)													2	2.9028	
<i>Panicum dichotamiflorum</i> (profuse panicum)	153	31	6	6	23	10	7	1	1				246	8.0944	
<i>Panicum virgatum</i> (switchgrass)	4			2	1								1	0944	
<i>Papaver</i> sp. (wild poppy)	3	12		4				1					21	2478	
<i>Paspalum</i> sp.	7	4		1	1					2			4	0472	
<i>Pastinaca sativa</i> (wild parsnip)													13	1534	
<i>Pennisetum spicatum</i> (pearl millet)						1			1				2	0236	
<i>Phleum pratense</i> (timothy)								1					1	0118	
<i>Pteris echioides</i> (ox-tongue)	568	15	108	7									699	8.2182	
	16	11			1	1		1					31	3458	

TABLE V.—OCCURRENCE OF WEED AND OTHER CROP SEEDS IN 8,478 SAMPLES OF COMMERCIAL SEED TESTED DURING THE PERIOD JULY, 1913, TO JULY, 1921—Continued.

Names of weeds.	Red clover	Alfalfa	Alsike	Sweet clovers	Timothy	Timothy, clover mixtures	Millet	Bluegrass	Sudan	Bromus inermis	White clover	Lawn grass mixtures	Rape	Wheat	Oats	Feeds	Miscellaneous	Total times found	Percentage of 8,478 samples in which found
<i>Plantago aristata</i> (bracted plantain).....	130	17	5	3	16	44					1	2						212	2.5016
<i>Plantago lanceolata</i> (buckhorn, rib grass).....	608	86	48	22	45	106	2	5			4	5				1	17	949	11.1982
<i>Plantago major</i> (dooryard plantain).....	34			2	11	3	4					1						55	.649
<i>Plantago rugelii</i> (Rugel's plantain).....	797	8	33	2	600	138		1		1	4	2		1			8	1,601	18.8518
<i>Poa pratensis</i> (bluegrass).....	7		10		159	22					1							189	1.1682
<i>Polygonum aviculare</i> (knotweed).....	17	21		4		1												43	.5074
<i>Polygonum erectum</i> (erect smartweed).....			1															1	.0118
<i>Polygonum Convolvulus</i> (black bindweed).....	6	6		4	6	1	1			2	2		4	2	5	2	16	57	.6726
<i>Polygonum Hydropiper</i> (water smartweed).....	8	5		1	1		1									3		19	.4242
<i>Polygonum lapathifolium</i> (smartweed).....	752	11	10	6	71	38	25			2			2	1			6	924	10.9032
<i>Polygonum Pennsylvanicum</i> (Penn. smartweed).....	20			5			2		13				1				1	42	.4956
<i>Polygonum ramosissimum</i> (branching smartweed).....	3	2		1													1	7	.0826
<i>Polygonum sagittatum</i> (arrow-leaved smartweed).....																	1	1	.0118
<i>Polygonum</i> sp.		9				4											1	14	.1652
<i>Potentilla arguta</i> (rough five-finger).....				3	1												2	6	.0708
<i>Potentilla canadensis</i> (cinquefoil).....			1														1	1	.0118
<i>Potentilla monspeliensis</i> (five finger).....	69	3	34		494				3			8					5	616	7.2688
<i>Prunella vulgaris</i> (self heal).....	97	6	16	6	16	49		1			1						1	195	2.301
<i>Psoralea argophylla</i> (psoralea).....																	1	1	.0118
Quartz.....	3																	3	.0354
<i>Ranunculus acris</i> (tall buttercup).....	1	2										2					2	7	.0826
<i>Ranunculus</i> sp.	2																	2	.0236
<i>Roripa palustris</i> (cress).....			1	1														2	.0236
<i>Rosa pratincola</i> (wild rose).....	37		2		38	13									1	1	10	102	1.2036
<i>Rubus occidentalis</i> (raspberry).....																		1	.0118
<i>Rumex acetosella</i> (sheep sorrel).....	388	12	268	5	190	70		11			11	18					5	978	11.5404
<i>Rumex altissimus</i> (tall or smooth dock).....	63	2	10	5	29	15												124	1.4332
<i>Rumex crispus</i> (curled dock).....	726	47	117	74	205	99	2	4			1	3		1	3			1,282	15.1476
<i>Salsola Kali</i> var <i>tennifolia</i> (Russian thistle).....	112	316	2	31	1	13	10		1	1			2	1		1	3	494	5.8292
<i>Salvia lanceolata</i> (blue salvia).....		1																1	.0118
<i>Saponaria officinalis</i> (bouncing Bet).....		1															2	3	.0354

Pammel and King: Seed analyses of 1913 to 1921

<i>Saponaria Vaccaria</i> (cowherb).....	1	1																		28			2	32	.3776	
<i>Schrankia uncinata</i> (sensitive brier).....																							1	1	.0118	
<i>Setaria corrugata</i> (corrugated foxtail).....																								1	1	.0118
<i>Setaria glauca</i> and <i>S. viridis</i> (yellow and green foxtalls)	2,091	395	83	103	227	73	48	3	17	1	1	4	2		6								3	2,876	33.9368	
<i>Setaria verticillata</i> (whorled foxtail).....			1																				3	3	.0354	
<i>Sherardia arvensis</i> (field madder).....	11			2	1							1											3	18	.2124	
<i>Sida spinosa</i> (prickly sida).....	1								1	1														2	.0236	
<i>Silene antirrhina</i> (sleepy catchfly).....	6				3				1															10	.1180	
<i>Silene dichotoma</i> (branched catchfly).....	5	2	2	2	1																			12	.1416	
<i>Silene latifolia</i> (bladder campion).....		1		2																				3	.0354	
<i>Silene noctiflora</i> (night flowering catchfly).....	363	9	248	18	30	98		3			7	1	1										8	786	9.2714	
<i>Silene sp.</i>	2	1		3	1																			7	.0826	
<i>Sisymbrium altissimum</i> (tall mustard).....																								1	1	.0118
<i>Sisymbrium officinale</i> (hedge mustard).....	31		7		3	3		2																46	5.428	
Smut.....	12	2		3	3			19		1													2	42	.4956	
<i>Solanum carolinense</i> (horse nettle).....																								1	1	.0118
<i>Solanum nigrum</i> (black night shade).....																								1	1	.0118
<i>Solanum rostratum</i> (buffalo bur).....				1			1																	3	3	.0354
<i>Solanum sp.</i> (including ground cherry).....	79	9		1	13	2	2																1	2	109	1.2862
<i>Sonchus arvensis</i> (sow thistle).....	1				1							1												1	1	.0472
<i>Sorghum halepense</i> (Johnson grass).....	2	5		8						4														3	22	.2506
<i>Sorghum sp.</i>										1															1	.0118
<i>Spergula arvensis</i> (spurrey).....												1												1	2	.0236
<i>Sporobolus sp.</i>	3	5																						8	8	.0944
<i>Stachys palustris</i> (hedge nettle).....	1																								1	.0118
<i>Stellaria media</i> (chickweed).....	16	6	26	2	5	30		17			1	9	1										3	116	1.3688	
<i>Stipa sp.</i>	1	10				1																		2	14	.1652
<i>Symphoricarpos occidentalis</i> (buckbrush).....		1																						2	4	.0472
<i>Taraxacum officinale</i> (dandelion).....			1		3	1	4		1	1														2	8	.0944
<i>Teucrium canadense</i> (germander).....	20			3	12	13																		2	50	.590
<i>Thalictrum dioicum</i> (meadow rue).....				1																					1	.0118
<i>Thlaspi arvense</i> (penny cress).....	6		4	2	2	6					1	1												3	26	.3068
<i>Tragopogon sp.</i>												1													1	.0118
<i>Trifolium hybridum</i> (alsike clover).....	63	8		3	187					2														265	3.1270	
<i>Trifolium incarnatum</i> (crimson clover).....		1																							1	.0118
<i>Trifolium pratense</i> (red clover).....		3	15	7	538				1	2														566	6.6788	
<i>Trifolium procumbens</i> (hop clover).....	4	1	22			7																		34	.4012	
<i>Trifolium repens</i> (white clover).....	10	3	3	1	39	2				2														60	.7090	
<i>Triticum sativum</i> (wheat).....													1											1	3	.0354
<i>Umbellifer</i> (species undetermined).....	2	1				1																		4	4	.0472
<i>Verbena hastata</i> and <i>V. stricta</i> (blue vervains).....	84	10	8	13	122	47	3	1																288	3.4028	
<i>Verbena urticifolia</i> (white vervain).....	9				4																			14	1	.0118
<i>Veronica sp.</i> (speedwell).....												1												1	1	.0118
<i>Vicia sp.</i>				9								1	1	20	2									3	37	.4366
<i>Xanthium canadense</i> (cocklebur).....						1																		1	1	.0118

