

BULLETIN NO. 333.

FEBRUARY, 1911.

New York Agricultural Experiment Station.

GENEVA, N. Y.

SEED TESTS MADE AT THE STATION DURING 1910.

G. T. FRENCH.



PUBLISHED BY THE STATION.

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No. 333-342

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The Bulletins published by the Station will be sent free to any farmer applying for them.

* Riverhead, N. Y. † Absent on leave. ‡ Connected with the Chautauqua Grape Work.

SEED TESTS MADE AT THE STATION DURING 1910.

G. T. FRENCH.

SUMMARY.

Farmers and others may send samples of agricultural seeds to the Station and have them tested for purity free of charge; but the Station does not make germination tests. During 1910, 947 samples were tested — 566 of alfalfa, 200 of red clover, 69 of alsike clover, 13 of white clover, 77 of timothy and 22 of miscellaneous seeds. Many of the samples received were too small for a dependable analysis. The percentage of samples infested with dodder (11.13 per ct. for alfalfa and 3.5 per ct. for red clover) is considerably smaller than that found in previous years. This indicates that seedsmen are now more careful about dodder than they were formerly. The alfalfa samples show a marked increase in the number containing large-seeded dodder. In more than half of the infested samples the dodder was of the large-seeded kind which can not be separated by sifting. The frequent occurrence of the seed of *Centaurea repens* in the alfalfa samples shows that much of our seed is imported from Asia Minor. This is known as Turkestan alfalfa. Only 4 samples (3 of alfalfa and 1 of alsike clover) were found to be adulterated. It appears that red clover seed sold in the State during 1910 was of higher average quality than usual. As regards purity and general appearance, the timothy seed, also, was of high grade. Russian thistle seed is a frequent impurity of alfalfa seed, but the experience of farmers indicates that the weed is rarely able to maintain itself in New York and is not to be feared. Roquette, a foreign, mustard-like plant, has appeared in some alfalfa fields in the State having been introduced with imported alfalfa seed. Little is known of its capabilities as a troublesome weed.

INTRODUCTION.

During the past five or six years farmers and seed dealers throughout the State have been sending to the Station samples of agricultural seeds to be tested for purity. Such tests are made willingly and without expense to the sender; but the number of samples received is now so large that the Station is unable to make complete quantitative analyses such as would enable us to report the exact percentage of each kind of impurity present as is done by several seed laboratories of the country. However, it is our aim to give such information concerning noxious weeds, adulterants and general appearance as will enable the purchaser to grade and judge the sample fairly. This seems to be all that is necessary for most practical purposes, although a complete test is sometimes requested and could, perhaps, be used to advantage.

Most of the samples are received during the purchasing season, that is, between February 1st and June 1st; but some are received at intervals throughout the whole year. Since most senders of samples wish a report at once, analyses are made as promptly as possible. Usually, a report can be mailed the same day the sample is received. However, it is advisable to commence looking for seed early so that there may be plenty of time for having tests made. Sometimes it is necessary to test several lots of seed before one is found which is fit to sow.

During the year 1910, 947 samples of seed were received and tested for purity. Of these, 566 were alfalfa, 200 red clover, 69 alsike clover, 13 white clover, 77 timothy and 22 miscellaneous. Samples received prior to June 5th were tested by Mr. S. M. McMurrin; those received after this date, by the writer.

METHODS OF MAKING TESTS AND REPORTING RESULTS.

Each sample received is examined very thoroughly. In the case of alfalfa and red clover the sample is first carefully sifted in a 20-mesh sieve in order to separate as many foreign seeds as possible, especially dodder. If dodder is found the number of seeds per pound is computed. Also, the size of the dodder seed (whether of the large or small-seeded kind) is noted,

and if it is too large to pass through the 20-mesh sieve recommended for removing dodder from alfalfa¹ special mention is made of the fact. Usually, if a sample appears to contain more than about one per ct. of any one kind of foreign seed the exact percentage is determined. However, a sample is not reported as adulterated unless it contains five per ct. or more of some one kind of foreign seed or inert matter. When weed seeds are found their presence is always reported, the amount being indicated by the use of such phrases as, "present in considerable quantity," "quite a little," "present in traces," etc. If inert matter such as dirt or chaff is present in considerable quantity it is so stated in the report. Also, if the seed appears to be old, or if many shriveled or dead seeds are present a statement to that effect is made. In short, our report furnishes the purchaser the information necessary for judging fairly well the quality of the seed. Certainly, it enables him to avoid adulterated samples and those containing seeds of dodder or other noxious weeds.

GERMINATION TESTS.

In many cases germination tests are necessary to determine what percentage of the seed will grow. Some kinds of seeds, if not harvested and stored properly, soon lose their ability to germinate. Then too, the mixing of old seed with new is sometimes practiced so that the only safe and reliable way to learn the viability of a given lot of seed is to make a germination test. Frequently, the Station receives samples of seed with the request that they be tested for germination. While we realize the importance of germination tests it seems necessary to refuse such requests. At present, the Station has not the facilities for making large numbers of germination tests. Besides, the Station should not do for farmers what they can so easily do for themselves.²

SUGGESTIONS CONCERNING SEED SAMPLES.

Those who are to have seed tested must be warned that a fair analysis cannot be made from a small sample. In order to make a dependable analysis a considerable amount of seed is necessary.

¹ Circular No. 8 of this Station.

² Directions for making germination tests of seeds at home are given in Leaflet M of this Station.

It is self-evident that as the weight of the sample decreases so must its chance of being a fair representative of the lot of seed from which it was taken. Attention is called to this point because more than half of the samples received during 1910 were below the required weight, and 163, or 17 per ct., were altogether too small for a dependable analysis. We strongly urge that for the several kinds of seed the following quantities be sent for purity tests:

Alfalfa and clovers..... 2 ounces
 Grass seeds, millet and the smaller vegetable seeds... 1 "

The samples should be as representative of the seed in bulk as is practicable. For instance, in sampling a bag care should be taken to obtain seed from the top, middle and bottom. A sample taken wholly from the top of the bag may be very misleading.

STANDARDS OF PURITY AND GERMINATION.

The United States Department of Agriculture has published a table³ showing the percentage of purity and viability of high-grade seed of different kinds and recommends that these percentages be adopted as standards. This table is here reproduced (in part) as a guide to purchasers.

TABLE I.—PURITY AND VIABILITY OF HIGH GRADE SEEDS.

SEED	Purity	Viability	SEED	Purity	Viability
	<i>Per ct.</i>	<i>Per ct.</i>		<i>Per ct.</i>	<i>Per ct.</i>
Alfalfa.....	98	85-90	Clover, white.....	95	75-80
Barley.....	99	90-95	Corn, field.....	99	90-95
Beans.....	99	90-95	Corn, sweet.....	99	85-90
Beet.....	99	150	Fescue, meadow.....	95	85-90
Blue grass.....	90	45-50	Millet.....	99	85-90
Buckwheat.....	99	90-95	Oats.....	99	90-95
Cabbage.....	99	90-95	Onion.....	99	80-85
Celery.....	98	60-65	Peas.....	99	93-98
Clover, alsike.....	95	75-80	Timothy.....	98	85-90
Clover, crimson.....	98	85-90	Tomato.....	98	85-90
Clover, red.....	98	85-90	Wheat.....	99	90-95

³ U. S. Dept. Agr. Yearbook. 1896:624.

RESULTS OF ALFALFA SEED TESTS.

During the past year 566 samples of alfalfa seed have been tested for purity. Of 368 samples which were graded according to color and general appearance, 229 were marked "excellent," 115 "average," and only 24 "poor." Of samples considered practically pure, there were 43. In general, these samples seem to be of a higher grade than the 548 samples tested between November 20, 1906, and August 15, 1908. Fewer samples contained dodder, and there was less evidence of adulteration. That much imported seed is still on the market in the State seems probable from the fact that 89 samples contained *Centaurea repens*. The presence of seed of this weed is considered strong evidence that alfalfa which contains it was grown in Asia Minor. *Centaurea repens*, which is a native of Asia Minor, when grown under natural conditions in this country, has never been known to produce seed.

DODDER SEEDS IN ALFALFA SEED.

The dodder found in 35 of the 63 samples which contained it was of the large-seeded species and would not go through our 20-mesh sieve. It appears, therefore, that the large-seeded species was more common than during 1906-1908, for during that period only 14 of the 126 dodder-infested samples contained the large kind. Also, since 112 of the 548 alfalfa samples tested during 1906-1908 contained the small-seeded dodder, and only 28 of the 566 samples tested in 1910 contained this kind, one might infer that the alfalfa seed on the market during 1910 was more thoroughly sifted than that sold in the previous years. Seed containing the large dodder should be avoided, since little or no dependence can be placed upon its removal by ordinary methods of sifting.

TABLE II.—DODDER IN ALFALFA SEED SAMPLES ANALYZED IN 1910

SAMPLE NUMBER	Number of seeds per lb.	Size of seed		SAMPLE NUMBER	Number of seeds per lb.	Size of seed	
		Large	Small			Large	Small
566	1		X	282	32		X
599	2		X	118	34		X
154	3	X		16	36		X
468	5	X		99	36	X	
365	6	X		229	36		X
430	6	X		421	36	X	
456	6	X		231	40	X	
447	7		X	300	41	X	
175	8	X		520	46	X	
178	8	X		409	48		X
209	8		X	506	48		X
342	10	X		310	50	X	
346	10	X		477	54		X
377	10		X	519	57	X	
207	11		X	424	58	X	
482	11	X		451	62	X	
147	12		X	264	64		X
294	12		X	406	66	X	
380a	14		X	562	68	X	
379	15		X	126	70	X	
216	16	X		440	79		X
278	16		X	533a	102	X	
297	16	X		446	108		X
163	20		X	513	145		X
13	22	X		31	156	X	
180	22	X		510	161	X	
369	22	X		448	240		X
430	25		X	487	374		X
417	25		X	362	451	X	
170	26	X		511	453		X
223	26	X					
456	28	X					
527	31	X					
				Total (63)		35	28

ADULTERATED SAMPLES.

Only three alfalfa samples were found to be adulterated. One of these contained 35 per ct. yellow trefoil (*Medicago lupulina*), while the other two were adulterated with 6 per ct. of sweet clover (*Melilotus* sp.). During 1906-1908 ten samples showed evidence of adulteration, that is, they contained 5 per ct. or more of sweet clover or yellow trefoil. Over 1 per ct. of yellow trefoil or sweet clover was present in eleven of the 1910

samples. Nine of these contained sweet clover and two yellow trefoil.

TABLE III.—ALFALFA SAMPLES WHICH CONTAINED AT LEAST 1 PER CT. SWEET CLOVER OR YELLOW TREFOIL

Lab. number	ADULTERANT		Lab. number	ADULTERANT	
	Kind	Per ct.		Kind	Per ct.
466	Sweet clover.....	2-3	35	Yellow trefoil.....	35
477	Sweet clover.....	3	417	Sweet clover.....	6
485	Sweet clover.....	2	440	Sweet clover.....	6
490	Sweet clover.....	2	447	Sweet clover.....	2
497	Sweet clover.....	2	457	Sweet clover.....	2
522	Yellow trefoil.....	1			

It is probable that with the exception of the three adulterated samples the sweet clover and yellow trefoil seed found came from plants that were growing in the alfalfa fields at harvest time, and that no willful mixing was intended.

One sample of alfalfa was received which contained 50 per ct. of flax seed. Just how this occurred we do not know. Certainly, flax seed looks so little like alfalfa seed that one would hardly think of using it as an adulterant.

Judging from these samples it seems quite probable that in New York State the adulteration of alfalfa is much less common than in previous years.

NOXIOUS WEEDS.

Our analyses show that English plantain (*Plantago lanceolata*), chicory (*Cichorium intybus*) and curled dock (*Rumex crispus*) are the noxious weeds which occur most commonly in alfalfa seed. Wild carrot (*Daucus carota*) and charlock (*Brassica arvensis*) were found in only a few samples. In the 566 samples examined, English plantain was present in 187, chicory in 116, dock in 110, charlock in 31, and wild carrot in 14. In 14 samples, English plantain was reported in considerable quantities, but in the other 173 it occurred only in traces. In one of the chicory-infested samples there was considerable of the weed, but in the remaining 115 it was present only in traces. No

samples contained dock, wild carrot or charlock in considerable quantities.

OTHER WEEDS AND IMPURITIES.

As previously stated, 89 of the samples examined contained seeds of *Centaurea repens* and were considered to be samples from seed that had been grown in Turkestan. This Turkestan variety has been known to succeed in New York State, but it is best to obtain American grown seed when possible. Eight other samples, though not containing seeds of *Centaurea repens*, were thought to have been imported from Turkestan because of the dull, grey and dusty color which seems to be characteristic of this variety.

Seeds of green foxtail (*Setaria viridis*), lamb's quarters (*Chenopodium album*) and pigweed (*Amaranthus* spp.) were found in many samples. Green foxtail occurred in considerable quantity in 8 samples, Russian thistle in 7, and lamb's quarters in 1. Other samples contained these weed seeds in traces only. Following is a list of the more common weeds found and the number of samples which contained them:

Green foxtail (<i>Setaria viridis</i>).....	occurred in 340 samples.
Lamb's quarters (<i>Chenopodium album</i>).....	" 231 "
Pigweed (<i>Amaranthus</i> spp.).....	" 111 "
Russian thistle (<i>Salsola Kali</i> var. <i>tenuifolia</i>).....	" 94 "
Yellow foxtail (<i>Setaria glauca</i>).....	" 90 "
<i>Centaurea repens</i>	" 89 "
Timothy (<i>Phleum pratense</i>).....	" 33 "
Alsike clover (<i>Trifolium hybridum</i>).....	" 24 "
Catchfly (<i>Silene</i> spp.).....	" 22 "
Sheep sorrel (<i>Rumex acetosella</i>).....	" 16 "
Melilot (<i>Melilotus</i> spp.).....	" 14 "
Crab grass (<i>Digitaria sanguinalis</i>).....	" 7 "
Roquette (<i>Eruca sativa</i>).....	" 2 "

RESULTS OF RED CLOVER SEED TESTS.

Red clover seed is notorious for its impurity. It frequently contains dodder and many other kinds of foreign seeds, much small, low-grade clover seed, and is sometimes adulterated with seeds of yellow trefoil. In this State, analyses made prior to 1910 indicate that it is more likely to be of low grade than is alfalfa seed. Accordingly, it is encouraging to note that analyses made at the Station during the past year show that red clover seed sold in the State during 1910 was, on the average, much purer and of higher grade than usual. In grading the 200 red

clover samples according to color and general appearance, 165 were marked "excellent," 30 "average," and only 5 "poor." Although only 48 of these were pure samples, the others (with five exceptions) contained foreign seeds only in traces. Of the 5 excepted samples, 2 contained considerable English plantain, 2 considerable timothy, and one considerable alsike clover. Fully half of the 200 clover samples weighed less than two ounces (the smallest amount that should be used for a purity test) and, of these, 43 were *much* too small for a dependable analysis. No case of adulteration was found.

DODDER AND OTHER FOREIGN SEEDS.

Dodder was found in seven samples at the rate of 15, 15, 22, 36, 56, 824 and 1,159 seeds per pound. In every case it was of the large-seeded kind. Other kinds of weed seeds found and the number of samples containing them were as follows:

English plantain (<i>Plantago lanceolata</i>).....	occurred in	96	samples
Dock (<i>Rumex</i> spp.).....	"	94	"
Wild carrot (<i>Daucus carota</i>).....	"	3	"
Canada thistle (<i>Cirsium arvense</i>).....	"	2	"
Chicory (<i>Cichorium intybus</i>).....	"	2	"
Green foxtail (<i>Setaria viridis</i>).....	"	107	"
Lady's thumb (<i>Polygonum persicaria</i>).....	"	52	"
Sheep sorrel (<i>Rumex acetosella</i>).....	"	51	"
Yellow foxtail (<i>Setaria glauca</i>).....	"	35	"
Timothy (<i>Phleum pratense</i>).....	"	35	"
Lamb's quarters (<i>Chenopodium album</i>).....	"	18	"
Pigweed (<i>Amaranthus</i> spp.).....	"	17	"
Alsike clover (<i>Trifolium hybridum</i>).....	"	11	"
Catchfly (<i>Silene</i> spp.).....	"	8	"

RESULTS OF ALSIKE CLOVER SEED TESTS.

The 69 samples of alsike clover seed received show that this kind of seed sold in the State during 1910 was, on the whole, of average grade. Six samples were pure. Only 1 sample was adulterated (with yellow trefoil), and none contained dodder. Besides the adulterated sample, yellow trefoil was found in 4 others, 1 of which contained 2 per ct. trefoil and the other 3 only traces. Timothy, sheep sorrel, dock, catchfly and English plantain were the foreign seeds most often found. Graded on the basis of color and general appearance, 52 samples were marked "excellent," 16 "average," and 1 "poor." Six samples were altogether too small for a dependable analysis, and many others weighed less than two ounces, the quantity which should

be sent. Below is a list of the common impurities found and the number of samples in which each was present:

Dock (<i>Rumex</i> spp.).....	occurred in	22	samples.
English plantain (<i>Plantago lanceolata</i>).....	"	9	"
Ox-eye daisy (<i>Chrysanthemum leucanthemum</i>).....	"	5	"
Canada thistle (<i>Cirsium arvense</i>).....	"	1	"
Timothy (<i>Phleum pratense</i>).....	"	61	"
Sheep sorrel (<i>Rumex acetosella</i>).....	"	38	"

RESULTS OF TIMOTHY SEED TESTS.

Timothy seed samples examined during 1910 were very free from impurities, but since the vitality of timothy seed in storage decreases more rapidly than that of many other agricultural seeds we take this opportunity to urge that buyers make a practice of determining the percentage of germination for each lot of timothy before purchasing.

On the basis of color and general appearance, seventy-four samples were marked "excellent," three "average" and none "poor." Fifty-seven were practically pure, but four were altogether too small for a reliable test. Following is a list of the impurities found and the number of samples in which each occurred:

Dock (<i>Rumex</i> spp.).....	occurred in	2	samples.
English plantain (<i>Plantago lanceolata</i>).....	"	2	"
Alsike clover (<i>Trifolium hybridum</i>).....	"	35	"
Sheep sorrel (<i>Rumex</i> spp.).....	"	8	"
Pigweed (<i>Amaranthus</i> spp.).....	"	7	"
Green foxtail (<i>Setaria viridis</i>).....	"	7	"
Lamb's quarters (<i>Chenopodium album</i>).....	"	4	"
Broad plantain (<i>Plantago</i> spp.).....	"	3	"
Lady's thumb (<i>Polygonum persicaria</i>).....	"	1	"
Sweet clover (<i>Melilotus</i> spp.).....	"	2	"

MISCELLANEOUS SAMPLES TESTED.

The miscellaneous samples sent in for analysis included the following:

White clover.....	13	samples.	Rape.....	1	sample.
Red top.....	5	"	Millet.....	1	"
Kentucky blue grass.....	6	"	Lawn grass.....	1	"
Meadow fescue.....	1	"	Oats.....	1	"
Orchard grass.....	1	"	Beardless barley.....	1	"
Vetch.....	2	"	Onion.....	1	"
Crimson clover.....	1	"			

Though cases of adulteration of Kentucky blue grass, orchard grass, meadow fescue and red top have been reported by several seed laboratories, no evidence of adulteration was found in the few samples of these seeds examined in this laboratory during 1910.

ROQUETTE.

Eruca sativa.

Several times during the past year our attention has been called to the occurrence of roquette in alfalfa fields. In one case a farmer brought in specimens of the weed for identification and seed for examination, saying that his alfalfa field was full of it and that he was convinced that it had been introduced along with the alfalfa seed used, for several other fields sown with this lot of seed also produced a crop of the same weed. Upon testing one pound of the alfalfa seed, ten seeds of roquette were found.

It seems that the seed was purchased with the understanding that it had been tested at this Station and reported free from seeds of noxious weeds. The farmer, therefore, felt that he should get what he had paid for and since he was very desirous of avoiding the introduction of noxious weeds this experience was discouraging to say the least.

Roquette is new to this State and until the past year its seeds have either been absent from samples of alfalfa examined or else overlooked. During the year, Mr. F. H. Hillman of the Department of Agriculture at Washington kindly identified some of the seeds for us and since then their occurrence has been reported.

Roquette belongs to the mustard family, is a rank-growing plant sometimes two feet in height, has light yellow flowers with purple veins, and flat-beaked pods two-thirds of an inch long. It is, therefore, a striking weed in alfalfa fields and at once leads one to believe that it may be a troublesome one. Though our observations are of too short duration for a definite statement of what its nature will be in this State it seems likely that very little trouble from it will be experienced. Reports from Oklahoma⁴ and Kansas state that it is an annual and indicate that where it is winter killed farmers need not worry over its occurrence. In Europe roquette is sometimes grown as a salad plant.⁵

RUSSIAN THISTLE.

(Salsola Kali var. tenuifolia.)

Russian thistle, which has been considered a bad weed in the West, is frequently sown in this State with alfalfa seed. Natur-

⁴ Okla. Sta. Bul. 83:17.

⁵ Bailey, L. H. *Cyclopedia of American Horticulture*, p. 1546.

ally, considerable fear has been expressed concerning its outcome here and many inquiries have come to the Station. From reports sent in to us recently by W. J. Wilkie of Geneva, John Crowe of Dundee, A. H. Coonradt of Morristown, C. W. Stanton of Cohocton and O. F. Ross of Lowville, who have had an opportunity to observe the progress of this weed for two seasons at least, it seems safe to conclude that little or no fear need be felt concerning it as a troublesome weed in alfalfa fields of this State. Under some conditions it will appear every year here, for it has been found growing abundantly around the works of the Solvay Process Company at Syracuse for several years. Mr. C. W. Stanton of Cohocton reports that a few plants appeared in one of his alfalfa fields the second year and grew to be sixteen or eighteen inches high. These plants, when noticed by him during 1909 and 1910, were destroyed and he does not expect any further trouble from them. In no case did the thistle appear outside of the alfalfa field. The other four men report that nothing was seen of the weed after the first season.⁶

BULLETINS ON SEEDS AND WEEDS.

For further information concerning seed testing, impurities in agricultural seeds, weeds, and adulteration of forage plant seeds, the reader is referred to the following publications:

- Beal, W. J. Seeds of Michigan weeds. Mich. Sta. Bul. 260. 1910. East Lansing, Mich.
- Brown, E. and Hillman, F. H. Seed of red clover and its impurities. U. S. Dept. Agr. Farmers' Bul. 260. 1906. Washington, D. C.
- Hillman, F. H. Dodder in relation to farm seeds. U. S. Dept. Agr. Farmers' Bul. 306. 1907. Washington, D. C.
- The adulteration of forage plant seeds. U. S. Dept. Agr. Farmers' Bul. 382. 1909. Washington, D. C.
- Roberts, H. F. and Freeman, G. F. Commercial seeds of brome-grass, and of English and Kentucky blue grasses: Adulterants and substitutes and their detection. Kan. Sta. Bul. 141. 1907. Manhattan, Kans.
- Selby, A. D. A second Ohio weed manual. Ohio Sta. Bul. 175. 1906. Wooster, O.

⁶ The Station desires information concerning the occurrence of troublesome new weeds which appear to have been introduced into the State by means of impure seed; also, specimens of such weeds are desired.