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Forage Plants at the Highmore Sub-Station, 1906

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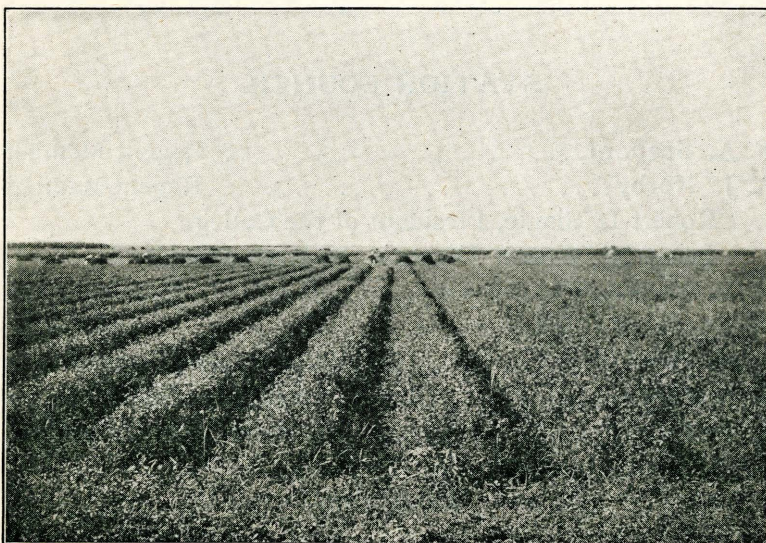
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Strong Seed

SOUTH DAKOTA Agricultural Experiment Station

South Dakota State College of Agriculture and
Mechanic Arts,

BROOKINGS, SOUTH DAKOTA



Alfalfa, S. D. No. 167 Grown In Rows For Seed Production.

FORAGE PLANTS AT THE Highmore Sub-Station, 1906

DEPARTMENT OF BOTANY.

WILL A. BEACH PRINTING CO.
Sioux Falls, S. D.

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Any farmer of the state can have the Bulletins of this Station free upon application to the Director.

FORAGE PLANTS AT THE HIGHMORE SUB-STATION FOR 1906.

W. A. Wheeler

Sylvester Balz

The season of 1906 at the Highmore Experiment Station was one of considerable rainfall. The precipitation for the year amounted to about twenty-five inches which is but a trifle under that of 1905. This precipitation, however, was not the greatest in the same months of the year as that in 1905. In 1906 considerable rain fell during the months of May and August, with but very little during the months of June and July. In 1905 the fall was very uniform and heavy during the months of May, June and July. Both seasons were favorable to the production of large crops of both corn and forage. The scant rainfall during the month of July and early part of August in 1906 was very noticeable in its effect upon crops and probably materially lessened the yield of some kinds. The rain on the 9th of August came just in time to save many of the crops which would otherwise have suffered. (See table 1.)

The work of the Highmore Experiment Station, in all lines, is very encouraging. It may be that this condition is due to the excessive rainfall of the last two years, but it appears to the writer that this is not wholly the case. The work seems to be so well in hand that it is doubtful if any dry spell such as has been experienced in years past can materially check the progress of the work. Plant-breeding work is being extended so as to cover many of the crops which seem to show adaptability to the region. Alfalfa, millet, sorghum and corn are receiving their due share of attention, and some work is also being done with annual leguminous

plants and grasses. The work with all of the crops has been very satisfactory.

Results are being obtained in the development of plants adapted to our conditions that are very gratifying. This is particularly true with the plant-breeding work with alfalfa. This department of the South Dakota State College of Agriculture is co-operating with the United States Department of Agriculture in this line of work.

The series of rotation plots which were started in 1905 were extended as planned, the past season, to include 94 one-tenth acre plots. No results can be published from these tests until the crops have gone at least one round in the rotation. This work is being carried on in co-operation with the Division of Dry Land Agriculture of the United States Department of Agriculture and is planned so that results may be compared with similar co-operative work which is being carried on at various points in North and South Dakota, Nebraska, Kansas and Texas.

The State Legislature which has just completed its sessions appropriated \$8,000 for buildings and granted a considerable increase in the annual appropriation for maintenance. With the new buildings it will be possible not only to increase the amount of work that is done, but to carry on the work in a more thorough and satisfactory manner than has been possible with the limited facilities of the past.

Alfalfa.

The work with alfalfa at the Highmore Station has been considerably extended during the past year. Variety testing of alfalfas from various regions has been taken up in co-operation with the United States Department of Agriculture. About 20 regional varieties were sown in the Spring of 1906 in duplicate square-rod plots. No results of any consequence were obtained from these the first year from seed. From the plots that were sown in 1905 and years

Table I.

GIVING THE PRECIPITATION IN INCHES FOR THE HIGHMORE STATION SO FAR AS IT HAS BEEN RECORDED TO DATE.

Year	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Annual Precipitation	Precipitation growing season April-August.
1888	....	....	....	....	....	....	5.79	3.10	....	....	....	....	.....	.....
1889	....	....	....	....	....	....	....	....	....	....	....	....	.....	.....
1890	....	....	0.30	0.19	0.83	6.17	0.36	0.56	0.45	0.32	0.30	....	.....	8.11
1891	....	Trace	0.83	1.94	....	....	0.72	0.80	....	....	....	....	.....	.....
1892	....	....	....	....	....	....	1.20	1.17	1.10	0.75	0.20	0.20	.....	.....
1893	0.15	0.15	....	3.85	1.90	2.55	2.64	....	Trace	....	....	....	.....	10.94
1894	0.45	0.05	2.20	0.98	0.33	5.91	0.42	0.01	0.10	1.63	Trace	Trace	12.08	7.65
1895	0.20	Trace	0.74	2.08	1.66	3.73	0.86	1.06	0.70	0.22	1.15	....	12.40	9.39
1896	Trace	0.30	0.85	2.50	0.95	2.28	6.67	....	....	....	....	....	.....	12.40
1897	....	0.80	2.57	3.44	1.86	2.79	3.75	....	0.41	1.16	0.48	0.40	.....	11.84
1898	Trace	0.01	1.40	1.51	4.17	1.67	2.33	0.62	....	....	....	....	.....	10.30
1899	0.45	0.15	1.50	2.00	3.75	4.20	1.81	2.19	0.48	0.84	0.03	0.27	17.67	13.95
1900	Trace	0.06	1.75	3.20	0.47	2.53	2.69	7.56	4.39	....	....	0.32	.....	16.45
1901	0.30	0.05	0.60	1.00	0.72	5.93	2.68	2.34	3.93	....	....	....	.....	12.67
1902	....	....	....	....	....	....	....	3.20	0.40	0.20	....	1.10	.....	.....
1903	0.05	0.30	0.87	0.70	0.85	2.93	3.58	2.40	1.46	0.66	0.65	0.63	15.08	10.46
1904	0.15	0.17	0.05	1.43	0.99	2.25	2.40	1.48	0.38	0.60	Trace	0.60	10.50	8.55
1905	0.60	Trace	0.60	1.39	5.23	5.64	5.54	3.56	0.56	1.95	1.29	Trace	26.36	21.36
1906	0.30	0.40	0.80	2.40	5.00	2.50	1.19	6.35	2.80	0.30	2.47	0.40	24.91	17.44
Ave.	0.22	0.17	1.08	1.91	2.05	3.65	2.63	2.43	1.23	0.78	0.66	0.39	17.00	12.25

Trace—An amount less than 0.01 inch.

previous to this, results are being obtained which seem to warrant the publication at this time of a list giving notes on such varieties. The data at hand is not in such shape that it can be put in the form of tables giving yields, but is more of the nature of determining the hardiness, seed production and forage qualities from observation. Considerable information of this kind has been obtained from the breeding plots as well as from the ordinary field tests. These alfalfas are all known under the South Dakota Accession numbers. About 20 numbers are included in the following list. Among these are several that represent duplicates from original sources but which have been handled somewhat differently since being first distributed.

No. 65. The seed was screened from a lot of Macaroni wheat imported from Tashkent, Turkestan, in 1902. It has been grown at Brookings in a small plot since that time and appears to be hardy. Seed from this plot was sown at Highmore in 1905 in a selection row. A few of the plants in this row died during the winter of 1905-6, showing that it is not perfectly hardy under severe test. The quality of the plant is fair. Some of the selections from this number bore a large number of seed pods in 1906 but did not mature much seed.

No. 66. This seed was obtained by Prof. N. E. Hansen from Merke, (Lat. 43° N., Long. 73° E.), Northern Turkestan, in 1898, for the United States Department of Agriculture. It was distributed by the Department as S. P. I. No. 1169. It was sown in a small plot at Brookings in 1899 and has not winter-killed to date.

The seed from this plot was sown at Highmore in 1905 in selection rows. The results seem to show this about equal to No. 65 in quality, hardiness and seed production. It has not been sufficiently tried or acclimated to determine its real value.

No. 67. Seed was obtained from the Minnesota Experiment Station as Minnesota No. 3, for trial, in 1902. It was

said to be a hardy strain of alfalfa. This variety which is otherwise known as the Grimm alfalfa has shown itself to be perfectly hardy in all tests at Brookings and Highmore. This number is from the same original source as No. 162, but in our test seems to be somewhat inferior to No. 162 in both quality and seed production.

No. 105. Seed was obtained from Northrup, King & Co., Minneapolis, Minn., in 1905, as "Imported German" alfalfa.

The quality of this variety was good but it failed in the test of hardiness so that it has been dropped from our trial list.

No. 106. Seed was obtained from Northrup, King & Co., in 1905, as "Montana" alfalfa. In tests this has shown up somewhat better than No. 105, in both hardiness and seed production, but is not sufficiently hardy to continue in trial plots.

No. 107. Seed was obtained from Northrup, King & Co. in 1905 as "Turkestan" alfalfa. This variety appears to be hardier than either Nos. 105 or 106 and ranks well with all alfalfas obtained from commercial sources.

No. 149. Seed obtained from the J. A. Salzer Seed Co., La Crosse, Wis., in 1905 as "Northern Grown" alfalfa. This was entirely killed out by the winter of 1905-6 in plots both at Brookings and Highmore.

No. 150. Seed obtained from J. A. Salzer Seed Co. in 1905 as "Turkestan" alfalfa. This ranks about with No. 107 in all tests.

No. 162. The seed of this number is, according to records, from the same original source as No. 67, but in all tests made during the last two years the results obtained from these two numbers are at variance. No. 162 is very much hardier than No. 67; in fact, it seems to be perfectly hardy as not a plant was known to winter-kill in 1905-6, either in selection rows or in plots under varying conditions at Brookings or Highmore. The selection row test for hardiness is the most severe that can be given, as the plants, when

grown in these rows, have three feet of bare ground on each side of them. In quality of forage and in the vigor of growth in early spring, this number is second to none listed here. In seed production it is one of the best but has not been compared a sufficient length of time with No. 167 to determine which produces the greater amount and better quality of seed.

The Grimm alfalfa, which is the original No. 162, has been grown near Excelsior, Minnesota, for about forty years and appears to be thoroughly acclimated to Minnesota conditions as far as forage value is concerned. In Minnesota, however, it fails, under ordinary conditions, to produce seed readily. The Grimm alfalfa has been tested in many parts of the United States as well as Canada and has shown itself to be one of the hardiest, if not the hardiest, alfalfa under trial either by the State stations or by the United States Department of Agriculture. A plot of this variety was seen by the writer at Indian Head, Saskatchewan, in the summer of 1906 which was being grown in comparison with several others. It had passed through two winters without winter-killing in the least and was making a very fine growth, while others under trial had, to a large extent, winter-killed. South Dakota No. 162, which is the Grimm, acclimated to South Dakota conditions, ranks with the two or three best alfalfas for South Dakota.

No. 163. The seed of this was obtained from the United States Department of Agriculture in 1900. The original introduction number does not show on the records but this is known to be one of the Turkestan importations. In quality, hardiness and seed production it ranks with Nos. 107 and 149.

No. 164. The seed of this alfalfa was obtained from the United States Department of Agriculture in 1898. The records do not show the introduction number but it is thought to be S. P. I. No. 991, which was obtained from Tashkent, Turkestan, by Prof. N. E. Hansen. This has been raised at

Brookings and Highmore since its introduction. The No. 164, however, is applied to that which was originally sown at Brookings and the seed product taken to Highmore in 1905. In all tests of this number both at Brookings and Highmore, it appears to be almost, if not quite, perfectly hardy. In quality, hardiness and seed production, this number leads all the Turkestan alfalfas to date. It appears to be one of the best in this list for South Dakota conditions.

No. 167. The original source from which the seed of this number was introduced into this country is unknown. Mr. W. F. Kelly of Renner, South Dakota, purchased the seed about ten years ago from a seed dealer at Hartford, South Dakota. He and Mr. E. C. Evans of the same place, have grown it for about ten years and consider it better than other alfalfas tried in their vicinity. Mr. Kelly furnished several pounds of seed to the Agricultural College in 1905. A two years' trial of the variety is rather short upon which to draw conclusions. In all our tests, however, both at Highmore and Brookings, this number has shown itself equal to any in quality, hardiness and seed production. It has not been sown in the selection rows and so has not been put to quite so severe a test for hardiness as No. 162, and as there is no record of its having been tested under northern conditions in the past as has No. 162, it cannot be compared in hardiness to the latter number. In seed production it is equal if not superior to No. 162. In quality and the vigor of early spring growth it appears to be equal to any. (See figure on front page of cover.)

No. 168. Seed was obtained from Cody, Wyoming, in 1905.

This shows no qualities of value for South Dakota.

No. 200. Seed was obtained from the United States Department of Agriculture under S. P. I. No. 12747 as "Montana" alfalfa. This seemed to be rather hardy as tried in plots at Highmore and Brookings. The quality is good but it is a poor seed producer.

No. 201. Seed was obtained from the United States De-

partment of Agriculture under S. P. I. No. 12846 as "Oasis" alfalfa. This was entirely winter-killed in all plots both at Highmore and Brookings in 1905-6.

No. 202. Seed was obtained from the United States Department of Agriculture under S. P. I. No. 12992 as "Arabian" alfalfa. This was entirely killed out at Brookings and nearly so at Highmore by the winter of 1905-6.

No. 203. Seed was obtained from the United States Department of Agriculture under S. P. I. No. 13436 as "Turkistan" alfalfa. This variety was not perfectly hardy as tested in plots at Highmore. Further trial, however, is necessary with this number.

No. 204. Seed was obtained from the United States Department of Agriculture under S. P. I. No. 12847 as "Tri-poli" alfalfa. This number was entirely winter-killed both at Highmore and Brookings during the winter of 1905-6.

No. 239. Seed was obtained from the United States Department of Agriculture under S. P. I. No. 1159. This was collected by Prof. N. E. Hansen at Kopal, (Lat. 45° 10' N. Long. 79° E.), Siberia, in 1898. It has been grown in a plot at Brookings since that date and apparently has not killed out. The plant is a very strong grower but does not produce much seed at present. Further trial is, however, necessary before any conclusions can be drawn as to the value of this number as compared with other importations.

No. 240. Seed was obtained from the United States Department of Agriculture under S. P. I. No. 991. This was collected by Prof. N. E. Hansen at Tashkent, Turkestan, in 1898. It has been grown in plots at Highmore since 1899 and apparently has not killed out. This is a severe test of its resistance to both cold and drought. A small plot has been cut for seed in both 1905 and 1906 and some seed has been obtained. So far it does not appear to be nearly as good a seed producer as any of Nos. 162, 164 or 167, but it cannot be compared with these until it has gone through as

many generations from seed in this state as have the other three numbers cited. This alfalfa is thought to be of the same introduction as No. 164. If this is correct it will probably become a better seed producer after it has been grown from several seed producing generations in this state. The quality of this number is about the same as No. 164. This ranks as one of the four best alfalfas which have been tried at Highmore. (See figure 2.)

In summing up the observations made on the alfalfas listed above we may say that numbers 105, 106, 149, 168, 201, 202 and 204 are not sufficiently hardy for South Dakota conditions as these conditions are represented at the Brookings and Highmore Stations. Numbers 65, 66, 67, 107, 150, 163, 200, 203, and 239 have not been shown to be sufficiently hardy to recommend them for the central and northern part of the state, but further trial is necessary with some of these as they have not yet become thoroughly acclimated. Numbers 162, 164, 167 and 240 are hardy and are possessed of high forage qualities so that they can be recommended for the conditions under which they have been tried. Numbers 162 and 167 start earlier in the spring and produce a stronger and more vigorous first crop than numbers 164 and 240. With the second crop this difference is not so noticeable. These four numbers have been tested from eight to ten years in this state and with the exception of number 240 have gone through several generations from seed. The fact that they have reproduced from seed through several generations seems to have more to do with acclimating alfalfas than has the mere fact that they have grown so many years under these conditions from a single seeding. This is where number 164 leads over number 240. Some of those cited as requiring further trial may improve by this method but the results with them so far have not been favorable.

The work in alfalfa breeding has attained such proportion that it is necessary to confine attention to fewer kinds.

For the present the work will be restricted almost entirely to selected stocks from numbers 162, 164 and 167. Work with number 240 progresses more slowly because of its poorer seed production.

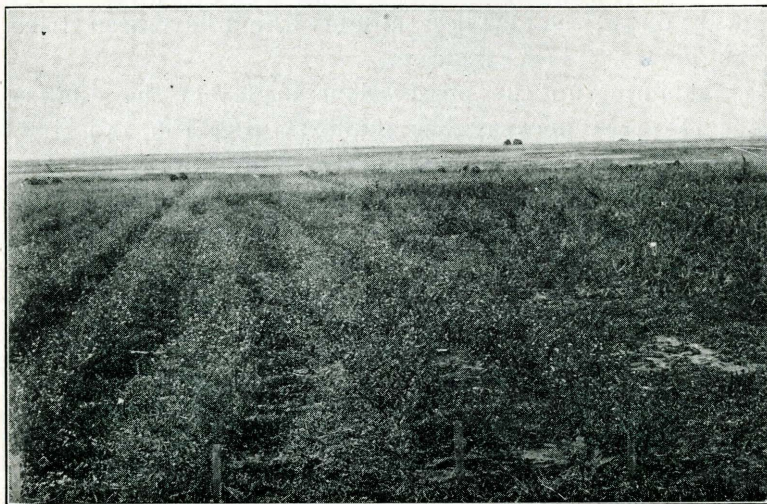


Figure 1. Selection rows of Alfalfa.

In the breeding of alfalfas the seed from various sources is sown in selection rows, each row representing a single source of South Dakota accession number. (See figure 1.) The rows are three feet apart and each plant occupies one foot of row. One hundred or more plants are grown in each row. From the selection rows the best appearing individuals from the best original sources are selected and marked by numbered stakes. The seed from these plants is saved separately and sown the next season in centgener or pedigree rows. The plants in these rows are grown the same as in the selection rows. The difference between selection and pedigree rows is simply in the source of seed; selection rows are from single regional sources while pedigree rows are from single plants selected from selection rows or from older pedi-

gree rows. Pedigree rows are known as first, second or third generation pedigree rows respectively as to whether they are one, two, or three selected generations from the original selection row.

First generation pedigree rows from numbers 65, 66, 67, 107, 150, 162, 163 and 164 were grown in 1906. Second generation pedigree rows from selections from these numbers will be grown in 1907. Other numbers were sown in selection rows in 1905 and are therefore one generation behind the above named in breeding work.

In the pedigree rows of 1906 a general tendency towards uniformity was observed in the plants from the same selection; for example, all the plants in pedigree row number 162-98 exhibited exceptional forage qualities as compared with the plants of other rows grown, whatever the source, and all the plants of pedigree row number 65-74 bore heavily of seed pods, while others from the same original source were light bearers of pods.

On account of the labor involved no attention has been given, so far, to isolating the plants by covering or other means to prevent contamination from foreign pollen. Whether more rapid progress in improvement can be made by this method than by the open method, has not therefore been demonstrated.

The conditions which control seed production in alfalfa are being studied at the station. Small yields of seed are obtained from the field plots of some of the varieties under trial. It appears, however, that one of the reasons for not obtaining larger yields from field plots is that the plants are too close together. In 1905 plots B1 and B4 of one-fourth acre each, were sown to alfalfa No. 167 in double rows about three feet apart, that is, the spaces between the rows were alternately six inches and thirty-six inches apart. The three foot space was occasionally cultivated to keep down weeds and to keep the surface broken. (See front cover page.)

In 1906 the first crop on plot B4 was left for seed and the second crop on B1. On plot B4 a crop of 37 pounds of seed was harvested which is equivalent to 148 pounds per acre or nearly two and one-half bushels of seed per acre. Plot B1 produced no seed. This result may have been due to one or more of several causes. From Plot B4 the second crop was cut for hay and yielded 348 pounds or at the rate of 1392 pounds per acre.

Plot B6, which is occupied by alfalfa number 240, was cut for seed in 1905 and 1906 and yielded at the rate of 104 pounds per acre in 1905 and 23 pounds per acre in 1906.

The above records offer no comparison of the broadcast and row methods for seed production because of the different age of the plots and the different kinds of alfalfa used, but observation on all plots tends to show that the row method, with cultivation, is the best for seed production under conditions as they exist at Highmore.

Five one-tenth acre plots were sown to five different regional varieties of alfalfa in the spring of 1905. The seed was obtained from the United States Department of Agriculture. Table II gives a record of these plots for the two years 1905-6. In this table it will be seen that two crops of hay were taken from the plots in 1906. Three cuttings were made but only two crops gathered which were from the first and third cuttings. The second cutting was made just following the dry weather in July and was too light together. The cutting was made so that the plants would be in shape to produce a crop later in the season.

Alfalfa No. 240 is the only one that has been under trial at Highmore for a period of years and the records of this variety are incomplete. The seed was sown on five one-fourth acre plots in 1899 but only two of these plots remain undisturbed. These are B5 and B6. No record of yield was made before 1903. The record of plot B5 from 1903 to 1906 is given in table III. Plot B6 has been cut for seed the past two years.

Table II.

GIVING RECORD FOR 1905-6 OF FIVE KINDS OF ALFALFA
SOWN IN 1905.

S. D. Accession number.	Regional variety.	U. S. Dept. Agri. S. P. I. numbers.	Yield of hay per acre in 1905.	Per cent winter killed 1905-6	Yield of hay per acre in 1906		
					First Crop	Second Crop	Total 1906.
200	Montana	12747	1850 lbs.	5%	2130	830	2960 lbs.
201	Oasis	12846	1930 lbs.	100%	.....	.....	.....
202	Arabian	12992	1620 lbs.	75%	1730	830	2560 lbs.
203	Turkestan	13436	1720 lbs.	5%	2060	1000	3060 lbs.
204	Tripoli	12847	1630 lbs.	100%	.....	.....	.....
Average			1750 lbs.		1973	887	2860 lbs.



Figure 2. Alfalfa, S. D. No. 240 grown on plots B5 and B6.
Growth of 1906, the eighth year from seeding.

Milletts.

More work in plant-breeding has been done with the fox-tail millets at the Highmore Station than with any other one crop. The detailed results are, however, not sufficiently

Table III.

GIVING RECORD FROM 1903 TO 1906 OF ALFALFA NUMBER
240 SOWN ON PLOT B5 IN 1899. (SEE FIGURE 2.)

Yield of hay per acre.			
Year	First crop	Second crop	Total
1903	2080 pounds	980 pounds	3060 pounds
1904	1672 pounds	none	1672 pounds
1905	2148 pounds	1412 pounds	3560 pounds
1906	2880 pounds	1252 pounds	4132 pounds
Average	2195 pounds	911 pounds	3106 pounds

complete for publication. One or two more years of work will be required before tabulated data giving results of value to the public can be published. In 1906 a large number of second generation pedigree rows were grown from selections made from the first generation pedigree rows in 1905. One-twentieth acre hay plots were also grown from the seed of the best pedigree rows of 1905. About 40 plots were grown from pedigreed stocks, and in addition, about 10 plots from commercial sources for comparison. A storm coming just before the time of cutting for hay lodged so many of the plots that accurate data as to yield could not be secured. (See figure 3.) The average yield of the whole series was about two and one-half tons per acre. One plot of southern grown German millet yielded over four tons per acre but was so late in maturing and so very coarse as to be unfit for hay. It is a custom among many seedsmen to advertise southern grown German millet as preferable to northern grown. The results at Highmore in 1906 do not support this view. Millets which have been grown in South Dakota for six or eight years yielded as well as any except the large, coarse southern varieties, and the hay is much superior to the southern in quality.

The Kursk millet obtained by Mr. M. A. Carleton in 1899, from the government of Kursk, Russia, for the U. S. Department of Agriculture, appears to be as well adapted to South

Dakota conditions as any variety under trial. Some of the pedigreed stocks from this source are very promising.

The Kursk millet has been grown at the Brookings and Highmore stations ever since its introduction and has yielded well under unfavorable conditions. (See figure 4.)

The broom-corn or proso millets are coming to occupy a place as a farm crop in central South Dakota. Several varieties have been tried at the Station. Because of poor yield or lateness of ripening some varieties have gradually been eliminated. Table IV gives the results of a trial of 5 varieties, in duplicate plots in 1906. In this test the Black Voronezh or Black Turkestan and the Tambov were the best

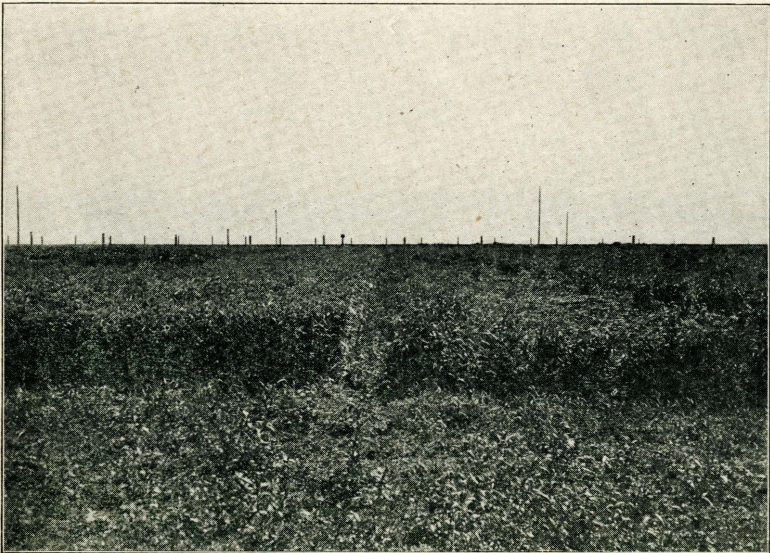


Figure 3. Pedigree plots of Millet after a storm, the one on the left remaining erect, the one on the right badly lodged.

yielders. Both of these varieties are early and seem to be in all respects, well adapted to the region between the James and Missouri rivers in South Dakota and possibly west of this region.

Breeding work was begun with the broom-corn millets in

1905 but on account of the wet season the results of that year were nearly valueless. In 1906 the work was again started on higher ground and better results were obtained. Selection rows were sown from 15 sources representing 9 original regional varieties. Table 5 gives the yields from these rows. As the broom-corn millets are grown almost exclusively for seed the yield of seed is more important than the total weight of the plants. In this table it will be noticed that S. D. numbers 331 and 366 were the best yielders in the selection rows as well as in the plots as recorded in table IV. Table also gives a comparison of the home

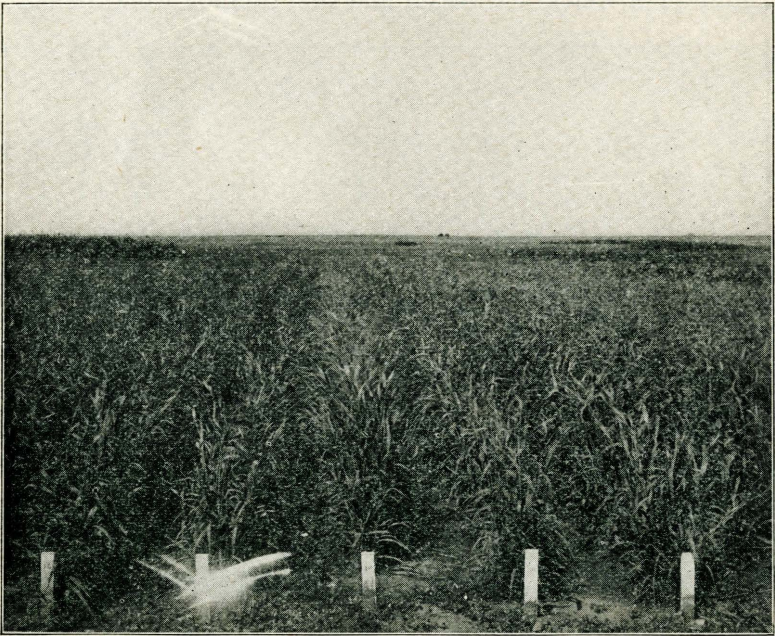


Figure 4. Pedigree rows of Kursk Millet.

grown seed with foreign seed. With the Red Orenburg and Black Voronezh varieties which are the only ones in which a comparison can be made; the Highmore seed yielded better than either of the others of the same variety under trial.

Table IV.

GIVING YIELDS OF 5 VARIETIES OF BROOM-CORN MILLET
GROWN IN DUPLICATE SERIES IN 1906.

S. D. No.	Variety	Yield series 1.		Yield series 2.		Average	
		Straw	Grain	Straw	Grain	Straw	Grain
333	Red Orenburg	2040 lbs	31.6 bu.	2320 lbs	32.1 bu.	2180 lbs	31.8 bu.
334	Red Russian	2080 lbs	39.6 bu.	2420 lbs	41.3 bu.	2250 lbs	40.4 bu.
331	Black Voronezh	2860 lbs	42.5 bu.	2960 lbs	42.9 bu.	2910 lbs	42.7 bu.
74	S. P. I. No. 10625	2060 lbs	39.6 bu.	2400 lbs	37.9 bu.	2230 lbs	38.8 bu.
366	Tambov	2460 lbs	46.3 bu.	3020 lbs	40.4 bu.	2740 lbs	43.3 bu.
	Average	2300 lbs	39.9 bu.	2624 lbs	38.9 bu.	2462 lbs	39.4 bu.

Table V.

GIVING YIELDS OF BROOM-CORN MILLETS FROM SELECTION
ROWS IN 1906.

S. D. Accession number.	Variety	Source of Seed	Height	Days from seeding to maturity	Total weight of 100 plants.	Weight of grain from 100 plants.
72	Early Fortune	Exp. Sta., Brookings	2 ft.	72	14.5 lbs.	4.3 lbs.
73	White Ural	Exp. Sta., Brookings	2.2 ft.	69	10 lbs.	3.0 lbs.
320	"	H. C. Warner, Forestburg	2 ft.	69	8.5 lbs.	2.4 lbs.
75	Red Orenburg	Exp. Sta., Brookings	2.3 ft.	69	7 lbs.	2.3 lbs.
321	"	H. C. Warner, Forestburg	2.3 ft.	69	8 lbs.	2.8 lbs.
333	"	Exp. Sta., Highmore	2 ft.	72	11 lbs.	3.5 lbs.
76	Black Voronezh	Exp. Sta., Brookings	4 ft.	72	21 lbs.	6.2 lbs.
319	"	H. C. Warner, Forestburg	4.2 ft.	72	20 lbs.	6.0 lbs.
331	"	Exp. Sta., Highmore	3.8 ft.	72	19 lbs.	6.5 lbs.
77	Tambov	Exp. Sta., Brookings	2.8 ft.	72	15.2 lbs.	5.3 lbs.
366	"	J. L. Loeb, Aberdeen	2.6 ft.	72	15 lbs.	6.3 lbs.
74	S. P. I. No. 10625	Exp. Sta., Brookings	2.7 ft.	71	15 lbs.	5.5 lbs.
165	Red Voronezh	Exp. Sta., Brookings	2.6 ft.	69	7.5 lbs.	2.3 lbs.
318	Red Lump	H. C. Warner, Forestburg	2.1 ft.	72	14.5 lbs.	4.9 lbs.
334	Red Russian	Exp. Sta., Highmore	2.6 ft.	72	15 lbs.	5.3 lbs.

Sorghum.

The following paragraphs give notes on the value of the three sorghums which have been under trial at Highmore for the past three years.

No. 137. Minnesota Early Amber Cane. The seed of this variety was obtained from Mr. Seth Kenney, Waterville, Minn., in 1904, and was grown at the station in 1905 and 1906. It yields well of a good quality cane but is rather

late to mature at Highmore. In 1906 the general crop matured about October 9th.

No. 159. Similar to 137. Seed obtained in 1905 from the John A. Salzer Seed Co. under the name of "Salzer's



Figure 5. Pedigree rows of Sorghum. The second row from the left is heading out ahead of the other three rows in view. All of the rows are from the same original source.

Earliest Cane." Season and yield about the same as No. 137.

No. 341. The original source of this sorghum is unknown. The seed was found at the Highmore station by the present superintendent when he began work in 1903. It was labeled "Montana" and this is all that is known about its history. This number is of the same Amber Cane type but is much earlier than numbers 137 and 159. In 1906 the

general crop ripened about September 26th which is nearly two weeks earlier than numbers 137 and 159.

Seed was collected from forty of the earliest plants of each of the above numbers in 1905 and sown in pedigree or centgener rows in 1906, the product of a single selected plant being used for each row. There was a great variation in the height and maturity of the different rows but very little variation was shown in the plants making up each row. (See figure 5.)

The earliest row of number 137 matured October 3rd with a height of 8 feet 7 inches.

The earliest row of number 159 matured the same date as number 137, with a height of 8 feet 1 inch which was below the average for number 159. Two rows of number 341 matured September 24th, 8 feet two inches in height.

In the variety test of the three sorghums under trial at Highmore no accurate results can be tabulated for 1906 on account of the poor stand obtained in some plots. The average yield of the plots in the variety test was two tons, 75 pounds of cured fodder per acre. Two one-tenth acre plots of number 341 in the rotation plots averaged 5 tons, 810 pounds of cured fodder per acre. In all plots the seed was sown with a grain drill in rows three feet apart. Five holes of the drill out of every six were closed so as to sow in rows three feet apart.

The sorghums will probably be grown more in the central and western portions of South Dakota in the future than in the past on account of their drought-resistance. The development of early varieties will also tend to bring about their more general culture.

In breeding saccharine sorghums at Highmore attention will be confined almost entirely to improving stock number 341 as it is the only one that can be depended upon to mature in ordinary seasons and it is a well recognized fact that to secure the greatest food value from a given crop, it must be grown so as to nearly, if not quite, reach maturity.

Corn.

There is no crop being grown at the station in which a deeper interest is taken than corn, unless it be alfalfa. The agitation about corn the past few years is beginning to show results in all parts of the state. The season of 1906 was similar to 1905 in that the corn developed very slowly during the early part of the season. The hot weather in July and August hastened this development and the lateness of the first autumn frost allowed it to mature.

Sixteen varieties were under trial in the variety test. The Minnesota No. 13 still appears to be unexcelled by any other variety in quality or yield. In the table giving the records of this variety test one variety, the Golden Ideal, appears to have exceeded it in yield. There are several points to be noted, however, about this variety. It required six days longer to mature than Minnesota No. 13, it has a larger percentage of cob to the ear and it contained much more water when weighed than did the Minnesota No. 13. Taking all these points into consideration, it is doubtful whether the Golden Ideal is worth considering for Highmore conditions. The one other variety of Dent corn, which appears to be a competitor worth considering, is an early White Dent corn from North Dakota. This yielded nearly as much as the home grown No. 13 and more than the No. 13 brought in from Minnesota. Like the Golden Ideal, this variety has quite a percentage of barren stalks as will be noticed by the column giving the per cent. in number of ears to stalks. The corn does not show very high breeding as to uniformity but appears to be a promising variety. A Yellow Dent corn which was obtained from Brown County, S. D., too late to plant in the variety test was planted in the plot June first, twelve days later than the other varieties were planted. This Yellow Dent matured before any of the other varieties. It yielded about fifty bushels per acre. On ear characteristics and uniformity this corn would not score high but it appears to be a very good stock upon which to

Table VI.

VARIETY TEST OF CORN FOR 1906.

Variety	Source of Seed.	Average height.	Average height of ears from ground.	Date of ripening.	Days from coming up to maturity	Number stalks per plot.	Number ears per plot.	Per cent in No. ears to stalks.	Average weight per ear in ounces.	Yield per acre in bushels.
Golden Ideal	Michigan	7 ft. 0 in.	3 ft. 2 in.	9-21	126	464	397	86	7.4	60.0
Minnesota No. 13	Highmore Station	6 ft. 4 in.	3 ft. 0 in.	9-15	120	422	399	95	6.9	56.3
Early White Dent	North Dakota	5 ft. 6 in.	2 ft. 0 in.	9-14	119	470	395	84	6.9	55.4
Minnesota No. 13	Minnesota	6 ft. 6 in.	3 ft. 5 in.	9-15	120	423	406	96	6.4	53.7
Extra Early White	Iowa	7 ft. 10 in.	2 ft. 10 in.	10-8	143	384	351	91	7.3	55.0
Dakota Sunshine	North Dakota	5 ft. 10 in.	2 ft. 6 in.	9-7	112	358	339	95	7.3	51.3
N. D. Golden Dent	North Dakota	5 ft. 4 in.	2 ft. 0 in.	9-13	118	548	497	91	3.8	38.3
North Dakota King	Brown Co., S. D.	5 ft. 0 in.	1 ft. 2 in.	9-11	116	440	411	93	4.6	38.0
White Flint	Miller, S. D.	5 ft. 0 in.	1 ft. 0 in.	9-14	119	436	510	117	4.8	52.3
Yellow Flint	Highmore Station	5 ft. 4 in.	1 ft. 0 in.	9-14	119	469	478	102	5.1	51.6
Moore's Premium	Massachusetts	5 ft. 10 in.	1 ft. 0 in.	9-19	124	416	407	98	5.1	45.0
90-day Yellow Flint	Connecticut	5 ft. 4 in.	1 ft. 0 in.	9-15	120	470	437	93	5.6	50.0
Triumph Yellow Flint	Minnesota	5 ft. 10 in.	1 ft. 6 in.	9-10	115	490	451	92	5.3	48.5

work to develop a Yellow Dent from a week to ten days earlier than Minnesota No. 13. For the extreme northern part of the state from which this corn came, it is probable that this would be one of the best varieties, as Minnesota No. 13 is probably somewhat late in maturing for the extreme northern tier of counties. This Brown County Yellow Dent in quality is equal to, if not better than the North Dakota Golden Dent which is being grown in North Dakota. It is earlier maturing and has a larger ear. The average yield of the five Flint varieties under trial is very good. With the Dent varieties that we have for Highmore conditions it hardly seems necessary to grow Flint corn. The ears are so near the ground that it is a very difficult matter to husk them. Three varieties of Dent corn, namely, Shenandoah Special, Red 90 day, and the Early Ohio, all from Shenandoah, Iowa, were grown to offer a comparison between the native varieties and those offered by Iowa growers as extremely early corn for the Northwest. None of these three matured sufficiently to make a record of a yield. Some of these early varieties from Iowa mature in the southern part of the state but they have no place in corn growing north of the latitude of the northern boundary of Iowa.

Of all the Dent varieties of corn tried at the Highmore Station the past season, only three seemed worthy of extended trial; these are the Minnesota No. 13, the Early White Dent from North Dakota and the Brown County Yellow Dent. The latter two having been tried only one year at the Station need further testing before a high recommendation can be given but they show points of value which make them worthy of trial.

The great demand for Minnesota No. 13 seed corn this spring is evidence of its popularity throughout the state. But for the extreme southern counties it is not to be recommended as the best corn, for there are other varieties which will yield much heavier under the conditions that obtain in that part of the state.