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South Dakota State University Agricultural
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The Sugar Beet

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DAKOTA
AGRICULTURAL COLLEGE
AND
EXPERIMENT STATION,
BROOKINGS, DAKOTA.

Bulletin No. 14.

APRIL, 1889.

DEPARTMENT OF CHEMISTRY.

THE SUGAR BEET.

OFFICERS OF THE
Experiment Station.

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Any resident of Dakota can have the bulletins of the Station mailed to him free by addressing a request to the Director at Brookings, Dakota.

Correspondence is invited upon any question relating to farm interests. Questions relating to farm crops or stock should be addressed to Professor Foster; questions relating to tree culture or to gardening should be addressed to Professor Keffer; questions relating to insects should be addressed to Professor Orcutt; questions concerning the chemical composition of soils or waters should be addressed to Professor Shepard, and questions about the diseases of animals and their treatment should be addressed to Dr. Alloway—all at Brookings, Dakota.

LEWIS McLOUTH, Director.

DEPARTMENT OF CHEMISTRY.

JAS. H. SHEPARD, Chemist.

THE SUGAR BEET.

During the preceding year seven varieties of sugar beets have been cultivated on the college farm under the supervision of Professor Foster who has furnished the data concerning the preparation of the soil and the care of the crop.

In the spring the ground was manured with well rotted barn-yard manure at the rate of 100 cubic yards per acre. In May the ground was plowed 9 inches deep without subsoiling. Before the beets were sown the land was thoroughly pulverized by means of the harrow and after sowing the ground was rolled. The beets were not planted in ridges but the ground was left as nearly level as possible.

The seed of three varieties, Vilmorin's Improved, Lane's Improved and the White Sugar beet was purchased of J. C. Vaughn & Co., Chicago. The seed of the other four varieties was obtained from the Sioux City Seed and Nursery Co.

June 8th, the seed was sown by means of a garden hand seeder, in drills two feet six inches apart. It is needless to add that the time of sowing was altogether too late. Moreover it was very dry till the 26th of the same month. July 7th, the beets were hoed and thinned to eight inches in the row as nearly as possible. The stand in all cases was thin and bunchy.

July 16th, the ground was cultivated with a spring tooth cultivator August 4th, the beets were again hoed. In all the crop was hoed three times and cultivated three times.

October 15th, the beets were harvested and topped by hand at the time of harvesting. The samples which were subsequently submitted

to analysis were stored in the cellar under the stock barn und covered to a depth of about forty inches.

It is but just to this department to state that the work in analysis was unavoidably delayed through waiting for the Saccharimeter to be shipped from the German makers. The samples were analyzed in March, the first analysis being made March 9th, and the last March 16th.

All the samples were treated uniformly as far as possible. The beets were first washed, after which the small roots were trimmed and then each beet was thoroughly dried and weighed. A longitudinal quadrilateral prism as large as possible was taken from each beet, thoroughly grated to a pulp, and then the pulp from the several beets used was intimately mixed and a definite quantity was weighed out for extraction. The pulp was extracted by Scheibler's process, the juice clarified by the addition of the smallest possible quantity of lead solution and the sugar content determined by polarization.

Following are the preliminary notes on each sample. The per cent of sugar and of marc (dry woody fibre) and the yield per acre are given farther on.

SAMPLE I.

Villmoran's White Sugar beet. Five beets taken. Weights 3lb. $\frac{3}{4}$ oz.; 3lb. 2oz.; 3lb. $2\frac{1}{4}$ oz.; 3lb. $2\frac{1}{2}$ oz.; 3lb. $1\frac{1}{4}$ oz. Nos. 1 and 4 were slightly withered. The pulp was very watery.

SAMPLE II.

White Sugar Beet. Five beets taken. Weights 1lb. $15\frac{1}{2}$ oz.; 2lb. $3\frac{3}{4}$ oz.; 2lb. $9\frac{1}{4}$ oz.; 2lb. $6\frac{1}{4}$ oz.; 2lb. 12oz. No. 1 was wited slightly and No. 5 was somewhat pithy. Pulp watery.

SAMPLE III.

Lane's Imperial Sugar Beet. Three beets taken. Weights 2lb. $6\frac{1}{2}$ oz.; 1lb. $12\frac{1}{2}$ oz.; 2lb. $6\frac{3}{4}$ oz. All these were slightly flecked with decayed spots. Of the remaining specimens saved for analysis it was deemed unsafe to take the remaining two necessary to make the number five employed in the preceeding samples. Pulp dry.

SAMPLE IV.

Excelsior; Sugar Beet. Four beets taken. Weights 2lb. $2\frac{3}{4}$ oz.; 3lb. $8\frac{1}{2}$ oz.; 2lb. $6\frac{1}{2}$ oz.; 3lb. $1\frac{1}{4}$ oz. These were good samples but it

was impossible to select one more at this late date that was at all fairly representative. Pulp wet.

SAMPLE V.

Improved Imperial Sugar Beet. Five beets taken. Weights 4lb. 6¼ oz.; 4lb. 2½ oz.; 3lb. 11 oz.; 2lb. 10¼ oz.; 1lb. 13½ oz. All these were sprouted. Pulp wet.

SAMPLE VI.

Villmorin's Improved White Sugar Beet. Four beets taken. Weights 1lb. 13½ oz.; 1lb. 12½ oz.; 1lb. 15¾ oz.; 2lb. 9 oz. All slightly sprouted. Remaining specimens not at all representative. Pulp dry.

SAMPLE VII.

Lane's Improved Sugar Beet. Four beets taken. Weights 2lb. 8¾ oz.; 3lb. 11¾ oz.; 3lb 5½ oz.; 2lb. 12¾ oz. Samples slightly sprouted and all had lost some small roots. Other specimens badly damaged by loss of roots and by sprouting. Pulp moderately wet.

For the purposes required it was deemed sufficient to make two determinations upon each sample, the per cent of sugar and the per cent of marc. These determinations and the yield per acre are shown in the following table:

NAME OF VARIETY.	PER CENT SUGAR.	PER CENT MARC.	YIELD PER ACRE IN POUNDS.
Villmorin's W. S. B.	7.6	3.1	30,615
White S. B.	7.3	2.14	27,500
Lane's Imperial S. B.	10.5	3.43	12,625
Excelsior S. B.	7.4	2.03	15,875
Improved Imperial W. S. B.	7.6	2.69	22,750
Villmorin's Improved W. S. B.	10.2	3.21	21,250
Lane's Improved S. B.	6.5	2.43	23,750

In conclusion it might be well to state that owing to the wide spread and ever increasing interest in sugar bearing plants and their adaptability to different climatic conditions, the foregoing experiments with sugar beets were undertaken. Of course the primary object was to ascertain if sugar beets were adapted to our soil and climate. The fact that all root crops grow to perfection and afford enormous yields in this Territory was an encouragement to undertake the work. And perhaps it may be permissible to state that if we may take into consideration the reported yield in per cent. of sugar in countries where the sugar beet industry is carried on successfully, the experiments have been very encouraging. Especially is this true when the extremely unfavorable conditions under which the experiments were conducted

are taken into consideration. In the first place the Station work at the time of planting had barely been commenced and the beets were sown at least three weeks too late; again the ground on which the beets were sown, and this was the only ground available at the time, had been cropped with wheat for four years and with oats three years without any return having been made to the soil; and then the seed did not germinate well owing to the fact that the spring rains were nearly over before the seeds were sown. The yield per acre would have been much greater had the seed germinated properly. Moreover the samples at the time of analysis were in bad condition.

The experiments will be repeated this season under more favorable conditions so far as culture is concerned and it is to be hoped that farmers in different parts of the territory will undertake to raise small quantities (say one-fourth to one-half acre) of those varieties of beets that give the greatest yields of sugar. Of course such work can not be undertaken with the expectation of making a directly profitable investment in sugar, since that can only be accomplished after large and expensive sugar factories have been established. [But if it can be demonstrated that sugar beets may be grown successfully in different sections of this Territory the factories will be quick and sure to follow.

It has been and is the aim of this Station to aid the farmer in adding to the number of crops that may be grown at a profit; and in furtherance of this line of policy the Station hereby offers to analyze free of charge any samples of sugar beets that may be grown in the Territory. It is desirable that the data of the treatment of crops and soil shall accompany each sample, for thus may we determine just what treatment yields the best returns. Moreover it must be remembered that the beets so grown are valuable for feeding purposes. This fact makes it easier for the Station to ask for the co-operation of farmers in this line of investigation, since under no possible circumstances would they incur any risk of loss greater than in raising any other root crops. All correspondence in reference to methods of cultivation should be addressed to Professor Foster, while correspondence in reference to analysis should be addressed to the Chemist of the Station.