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Corn and Millet Silage For Fattening Cattle



Animal Husbandry Department



SOUTH DAKOTA STATE COLLEGE OF
AGRICULTURE AND MECHANIC ARTS
AGRICULTURAL EXPERIMENT STATION

Brookings, South Dakota

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SUMMARY

1. A choice silage was secured from corn when cut at time of tasseling and also from millet when about 90 percent of grain was ripe.

2. The steers that received shelled corn, oilmeal, and hay did not bring enough more on the market over the lot that received corn silage and oilmeal to justify the feeding of this comparatively expensive ration.

3. The best gains were secured in feeding silage made from White Dent corn, medium sized, a variety that matures ears before frost. This variety has been used at this station for several years and results secured in each experiment have been extra good; hence, we recommend this as a suitable variety to grow for the cattle feeder.

4. Results indicate that as an emergency crop corn is superior to millet when both are made into silage.

5. The results from feeding silage made of Rainbow Flint corn were practically as good as results from feeding silage made from the dent varieties; but the yield of flint was larger per acre and in sections with short growing seasons it might be advisable to grow this kind in preference to the dent varieties.

PART I

CORN AND MILLET SILAGE FOR FATTENING CATTLE

James W. Wilson

Arthur H. Kuhlman

The experimental results reported in this bulletin represent data secured the past two years in cattle feeding at this station. They represent further study in the utilization of comparatively cheap feeds which may be produced on many farms of this state.

Since the publication of Bulletin 182 of this station, on the subject of fattening cattle with corn silage, many requests for additional information have been received from different sections of the cornbelt. It is evident that a greater interest is being shown in the economical production of beef than ever before.

For several years the relation between the value of corn and the value of fat cattle has not warranted the production of prime beef. Then, too, the difference between the purchase price of good feeders and the selling price of fat cattle has not been as great as it should be to encourage feeding.

Corn, when properly supplemented, is still, as it has been for many years, the most efficient common feed to produce prime beef. Yet, if economy of production is considered, more of the comparatively cheap feeds must be used during a longer feeding period in order to avoid heavy losses.

In Bulletin 160 of this station it was shown that it is desirable to have a preliminary feeding period in producing beef economically. During this time a comparatively cheap feed such as corn silage may be used. It was demonstrated that steers so fed can be put into marketable condition to sell as killers. If it is desirable to make fatter and better beef, corn or other fattening grains may be added to the silage.

It cannot be claimed that the use of corn silage as the major part of a fattening ration for cattle will produce prime beef. It is, however, a well known fact that the result of fattening is largely to increase the juiciness and flavor of beef rather than to increase the food value. Evidently certain

conditions may arise at various times which will determine whether the feeder shall choose to produce a fair quality of beef without expensive grains or to produce a better quality of beef at a greater cost. The whole proposition is intimately related to the question of economy of production, and such methods of operation as will give the greatest assurance of profitable returns for the feeder merit careful consideration.

The question of profitable beef production at this time involves not primarily the securing of maximum gains of high quality obtained through the use of expensive grains but a consideration of methods that will make satisfactory gains from comparatively cheap crops such as grass and silage. It is not so much a question of how to produce the best beef but rather how to produce beef by such methods as will tend to eliminate the big losses which have attended the operations of many feeders of cattle during the past two seasons.

THE VALUE OF SILAGE MADE FROM SEVERAL VARIETIES OF CORN IN FATTENING STEERS

In February, 1919, 20 head of 2-year old grade Hereford steers were purchased in South Omaha for this test. They were divided into four lots of five steers each, care being taken to secure as far as possible uniformity as to weight, condition, and individuality.

WEIGHT RECORDS

At the beginning of the trial each steer was weighed individually on three consecutive mornings and the average of the three weights was taken as the initial weight. Feed records were begun on the second of these three days. In a similar manner the final weight of each steer represents the average of three weights taken on consecutive days at the end of the trial and the records of the trial closed on the second of the three days. Each steer was also weighed at the end of periods of about a month.

In each case the weighing was begun at about 10 o'clock a. m. The usual method of feeding and watering was followed on these days.

THE EXPERIMENT

Lot I received silage made from sweet corn.

Lot II received silage made from Early White Dent corn.

Lot III received silage made from Rainbow Flint corn.

Lot IV received silage made from Reed's Yellow Dent corn.

Although there were two light frosts, all four varieties matured before the silos were filled, and the quality of the silage was good. Each lot of five steers was started on two daily feeds of 135 pounds of silage and three pounds of pea sized oilmeal. The amount of silage was gradually increased until the steers in each lot were receiving all the silage they would clean up readily. The amount of oilmeal was increased until each steer was receiving three pounds daily. The steers were fed in this manner from February 20 to May 21, a period of 90 days. They were then shipped to the Chicago market and sold as killers.

CHEMICAL ANALYSIS OF THE SILAGE USED

By B. A. Dunbar, Station Chemist

	Moisture	Ether Extract	Crude Fiber	Protein	Ash	N-Free Extract	Acidity
Sweet Corn-----	64.00	1.42	7.84	3.32	3.15	20.27	2.35cc.
White Dent Corn----	77.20	.93	5.78	2.20	1.78	12.11	3.42cc.
Rainbow Flint Corn--	74.80	1.11	5.35	2.65	1.71	14.38	2.65cc.
Red's Yellow Dent Corn-----	78.00	.86	5.51	2.24	2.12	11.27	3.02cc.

LOT I

SWEET CORN SILAGE

Many inquiries have been made as to the value of sweet corn for silage purposes. In this trial one silo was filled with this variety of corn. On account of a thin stand due to poor seed the yield was only 2.1 tons per acre. There were more weeds in this silage than in the other silages fed because the sweet corn did not shade the ground as much as the other varieties after cultivation ceased, thus giving the weeds a better chance to grow. Probably this is the main reason why the gains were not as large for this lot as for the other lots. Because of these factors and the high cost of seed, sweet corn can not be recommended as a crop for the silo.

Number of Steer	Weight Feb. 20	Weight Mar. 24	Weight Apr. 24	Weight May 21	Gain per head	Average gain per head daily
80	872	980	1002	1053	181	2.00
81	820	886	958	984	164	1.82
84	896	994	1054	1106	210	2.33
90	820	930	998	1031	211	2.34
93	911	1026	1084	1127	216	2.40
Totals	4319	4816	5096	5301	982	
Average gain per head		99	56	41		2.18

	Pounds
Total silage consumed -----	24929.00
Silage for pound of gain -----	25.30
Total oilmeal consumed -----	1135.00
Oilmeal for pound of gain -----	1.15
Silage consumed per head daily -----	55.39

LOT II

EARLY WHITE DENT CORN SILAGE

The Early White Dent corn used in this experiment has been grown in the central counties of eastern South Dakota for many years. Some local strains are known by such names as Moody County White Dent, Early Wisconsin White Dent, and Dakota White. This variety was planted as a check lot. Most of the experiments in feeding corn silage at this station have been secured with this variety. It has given very satisfactory results on the college farm because it matures earlier than most varieties and produces an excellent yield of matured corn. On good soil it grows about six feet high and while not very tall or large in stalk it seems to produce silage with a very efficient proportion of grain to stalk for fattening cattle. In the season of 1918, when the corn was produced for this trial, this variety after being frosted twice yielded 8.29 tons of green corn per acre.

The five steers in this lot made a total gain of 1294 pounds in 90 days which is equivalent to an average daily gain of 2.87 pounds per steer. This is the largest gain that has been secured from a ration of corn silage and oilmeal at this sta-

tion. Moreover, this is a bigger gain than is usually made with ear corn, oilmeal, and hay. An average daily gain of 2.40 pounds per steer for a 90 day feeding period is reported in Bulletin 137 of this station. The cattle used in that trial, however, were one year younger than those used in this experiment and did not receive oilmeal in addition to corn silage.

The very satisfactory results obtained from the use of this variety in this and other trials for silage would seem to indicate that owners of silos would do well to plant this variety because of its comparatively high feeding value.

Number of Steer	Weight Feb. 20	Weight Mar. 24	Weight Apr. 24	Weight May 21	Gain per head	Average gain per head daily
83	819	916	972	1033	214	2.37
85	915	1028	1080	1173	258	2.86
86	897	1060	1150	1225	328	3.64
87	794	924	996	1036	242	2.68
89	884	1010	1086	1136	252	2.80
Totals	4309	4938	5284	5603	1294	
Average gain per head		126	69	64		2.87

	Pounds
Total silage consumed.....	23879.00
Silage for pound of gain.....	18.30
Total oilmeal consumed.....	1135.00
Oilmeal for pound of gain.....	.88
Silage consumed per head daily.....	53.06

LOT III

RAINBOW FLINT CORN SILAGE

Rainbow Flint is a high growing variety. The ears are comparatively long and the kernals on individual ears may be of various colors. This variety produces many suckers and usually does not mature as early as most flint varieties. Under field conditions a yield of 12.63 tons of green corn was obtained in this trial. This was the best yield of the four varieties grown for this experiment. The table below shows that the steers in Lot III, receiving silage made from Rainbow Flint corn, made a total gain of 1242 pounds in 90 days which

is equivalent to 2.76 pounds daily per steer. This remarkable gain is surpassed in one instance only, namely, Lot II in this trial, in any feeding experiment with a similar feed at this station. Moreover, the individual gains of the steers in this lot were more uniform than in any other lot.

Because of the high yield and the excellent gains secured Rainbow Flint corn should be considered one of the best varieties for silage purposes.

Number of Steer	Weight Feb. 20	Weight Mar. 24	Weight Apr. 24	Weight May 21	Gain per head	Average gain per head daily
82	826	960	1010	1061	235	2.61
88	831	940	1014	1088	257	2.85
92	914	1032	1102	1176	262	2.91
94	958	1072	1152	1214	256	2.84
99	779	888	950	1011	232	2.57
Totals	4308	4892	5228	5550	1242	
Average gain per head		117	67	64		2.76

Total silage consumed	Pounds	28752.00
Silage for pound of gain		23.10
Total oilmeal consumed		1135.00
Oilmeal for pound of gain		.91
Silage consumed per head daily		63.89

LOT IV

REED'S YELLOW DENT CORN SILAGE

Reed's Yellow Dent corn is one of the largest and heaviest yielding of the dent varieties. It is a late maturing variety and ordinarily will not ripen well before early frosts except in the southeastern part of this state. However, in 1918 it ripened well and was not injured by the light frosts which occurred before the silos were filled. The yield was 10.98 tons per acre. While it grew taller than the Rainbow flint, it produced very few suckers, a condition which may account for the difference in yields of this variety and Rainbow Flint corn.

This lot made a total gain of 1197 pounds in 90 days which is equivalent to an average daily gain of 2.66 pounds per steer. While the gains of these steers were very good they were not quite as large nor as uniform as for the steers in Lot III.

It is evident that the total yield per acre is not the only point to be considered in selecting corn for silage purposes. For fattening cattle on a silage-alone or on a silage-and-oilmeal ration varieties that produce an average sized stalk with a rather heavy yield of grain seem to produce the best gains.

Number of Steer	Weight Feb. 20	Weight Mar. 24	Weight Apr. 24	Weight May 21	Gain per head	Average gain per head daily
23	821	908	976	1019	198	2.20
95	866	1000	1052	1120	254	2.82
91	769	880	978	1040	281	3.12
97	904	1028	1068	1133	229	2.54
100	952	1022	1024	1187	235	2.61
Totals	4302	4838	5098	5499	1197	
Average gain per head		107	52	80		2.66

Total silage consumed	28308.00
Silage for pound of gain	23.60
Total oilmeal consumed	1135.00
Oilmeal for pound of gain	.95
Silage consumed per head, daily	62.90

SUMMARY OF RESULTS IN FATTENING STEERS ON CORN
SILAGE MADE FROM DIFFERENT VARIETIES OF CORN

	Sweet Corn Silage	White Dent Corn Silage	Rainbow Flint Corn Silage	Reed's Yellow Dent Corn Silage
Number of Steers in Each Lot	5	5	5	5
Number of Days Fed	90	90	90	90
Average Init. Weight Per Steer	863.80	861.80	861.60	860.40
Average Final Weight Per Steer	1060.20	1120.60	1110	1099.8
Total Gain Per Lot	982.	1294	1242	1197
Average Daily Gain Per Head	2.18	2.87	2.76	2.66
Total Silage Consumed	24929	23879	28752	28308
Total Oilmeal Consumed	1135	1135	1135	1135
Average Feed Required for 100 pounds of Gain				
Linseed Oilmeal (O. P.)	2538.6	1845.4	2314.9	2364.9
Silage	115.58	87.71	91.39	94.89
Average Daily Feed Per Head				
Silage	55.40	53.06	63.89	62.91
Linseed Oilmeal (O. P.)	2.52	2.52	2.52	2.52

PART II

A STUDY OF THE FEEDING VALUE OF DIFFERENT
KINDS OF SILAGE IN FATTENING CATTLE

In the winter of 1920, 20 head of 2-year old Colorado range steers of Hereford and Shorthorn breeding were purchased on the Sioux City market. After they had been in the feed lots for several days and regained a normal fill they were divided into five lots of four steers each. As far as possible the selection was made in such a way as to have uniformity as to breed representation, individuality, conformation, and weight. The steers secured for this trial were not quite as good in type nor as quiet in disposition as those fed in 1919.

WEIGHT RECORDS

The method of securing weight records was the same as that used in the 1919 experiment and described in Part I of this bulletin.

THE EXPERIMENT

The principal object of this experiment was to ascertain the relative feeding value of a ration consisting of shelled corn, oilmeal, and hay as compared to (1) a ration of corn silage made from corn that was well matured, (2) a ration of corn silage made from corn that was beginning to tassel and (3) a ration of silage made from millet.

These rations were fed to Lots I, II, III, and IV respectively in the order named above. Oilmeal was fed to each lot throughout the entire period. When on full feed each steer received three pounds of oilmeal daily. Towards the close of the first month it was noticed that the steers in the various lots occasionally consumed some of the straw used for bedding. As it appeared that they were craving additional feed of a dry nature, oat straw was offered in separate feed racks in each lot after the first month. Although the straw was fed during only three months of the trial, in the tabulated results the computations for the amount of oat straw fed daily are on the basis of the entire feeding period. Considerable amounts of straw were frequently wasted by being thrown on the ground and therefore the actual amounts consumed are undoubtedly much lower than the records indicate. This is the first time that straw has been fed with silage in fattening cattle at this station. The tabulated records show that comparatively small amounts were eaten by the different lots.

The steers in these four lots were fed from January 6 to May 5, 1920, a period of 120 days. They were then shipped to the Sioux City market and sold as killers.

CHEMICAL ANALYSIS OF SILAGE USED IN THIS EXPERIMENT

By B. A. Dunbar, Station Chemist

	Moisture	Ether Extract	Crude Fiber	Protein	Ash	N-Free Extract	Acidity
Matured Corn -----	56.21	1.08	8.63	5.59	2.10	26.39	1.26
Immature Corn -----	87.73	.29	3.80	1.69	.98	5.51	2.00
Millet -----	74.40	1.00	6.10	4.01	2.27	12.22	1.48

LOT I

SHELLED CORN, OILMEAL, AND WILD HAY

This lot was the check lot of the experiment. The four steers in this lot which were very similar to those in other lots at the beginning of the trial, made a total gain of 1252 pounds in 120 days. They made a larger total gain than any other lot, producing a total of 135 pounds or almost 34 pounds more per head than Lot II, receiving corn silage from mature corn.

These steers at the close of this test were the fattest but they were not smoother than Lot II. They sold at \$11.75 at Sioux City. Two hogs followed the steers in this lot throughout the trial and made a total gain of 241 pounds of pork.

Number of Steer	Weight Jan. 6	Weight Feb. 5	Weight Mar. 6	Weight Apr. 5	Weight May 5	Gain per head	Average gain per head daily
23	921	990	1098	1166	1251	330	2.75
40	1138	1220	1336	1384	1461	323	2.68
80	1035	1150	1236	1316	1378	343	2.85
92	887	956	1046	1088	1143	256	2.13
Totals	3981	4316	4716	4954	5233	1252	
Av. Gain per head		111	100	59	69		2.60

	Pounds
Total hay consumed.....	4520.00
Hay for pound of gain.....	3.60
Total shelled corn consumed.....	9597.00
Corn for pound of gain.....	7.67
Total oilmeal consumed.....	1368.00
Oilmeal for pound of gain.....	1.09
Total straw consumed.....	1248.00
Straw for pound of gain.....	.99

- LOT II -

CORN SILAGE FROM MATURE CORN AND OILMEAL

Lot II was fed on silage made from Early White Dent corn. Silage made from the same variety was fed to Lot II in the experiment which was discussed in Part I. The corn for this trial was well matured and some of the lower leaves on the stalks were dry when it was put into the silo; but there was sufficient moisture in the plant to insure proper packing and keeping qualities.

These steers made an average daily gain of 2.48 pounds per head during the first 90 days as compared with a daily gain of 2.87 per steer in Lot II in 1919, which received the same ration for the same period. Much of the difference in the gains made by these two lots is undoubtedly due to the wilder disposition of the steers and the very muddy condition of the feed lots during the feeding period in 1920. Neither of these factors is conducive to maximum gains in fattening cattle.

The records of this lot show that these steers continued to make good gains throughout the trial, for the average daily gain per head was 2.32 pounds for 120 days. As to condition, these steers were second only to those of Lot I and the price received for them on the market was \$11.65, only 10 cents below the corn fed steers of Lot I.

Number of Steer	Weight Jan. 6	Weight Feb. 5	Weight Mar. 6	Weight Apr. 5	Weight May 5	Gain per head	Average gain per head daily
83	969	1056	1106	1160	1209	240	2.00
84	1023	1146	1220	1262	1340	317	2.64
97	1071	1190	1250	1326	1385	314	2.61
99	969	1080	1134	1178	1215	246	2.05
Totals	4032	4472	4710	4926	5149	1117	
Av. Gain per head		110	59	54	55		2.32

	Pounds
Total silage consumed.....	31074.00
Silage for pound of gain.....	27.81
Total oilmeal consumed.....	1368.00
Oilmeal for pound of gain.....	1.22
Total straw consumed.....	855.00
Straw for pound of gain.....	.76

LOT III

CORN SILAGE FROM IMMATURE CORN AND OILMEAL

Lot III was fed silage made from corn when it was beginning to tassel. The field on which this corn was grown was planted to corn at the usual time but because of prolonged wet weather it was necessary to replant it on July 15. This crop was, therefore, in the nature of an emergency or "catch" crop. The yield of green corn was 6.98 tons per acre.

Number of Steer	Weight Jan. 6	Weight Feb. 5	Weight Mar. 6	Weight Apr. 5	Weight May 5	Gain per head	Average gain per head daily
86	917	998	1056	1114	1163	246	2.00
90	953	1026	1080	1120	1176	223	1.85
94	1049	1130	1178	1236	1304	255	2.12
100	1015	1084	1162	1224	1296	281	2.34
Totals	3934	4238	4476	4694	4939	1005	
Av. Gain per head		76	59	54	61		2.09

Pounds

Total silage consumed	39827.00
Silage for pound of gain	39.62
Total oilmeal consumed	1368.00
Oilmeal for pound of gain	1.36
Total oat straw consumed	1366.00
Straw for pound of gain	1.35

The analysis shows that this silage contained 87.73 percent of moisture or 31.52 percent more than the silage made from well matured corn. This explains why a rather large number of pounds of silage was required for a pound of gain. It was also noticeable that the steers in this lot did not drink as much water as those in the other lots.

It is evident, however, that there is much nutriment in the corn plant before ears have formed and that the same is in an available form for growth and fattening, for these steers made an average daily gain of 2.09 lbs. per head for 120 days. When sold on the market they brought \$11.45 or only 30 cents per hundred below the corn fed steers and only 20 cents per hundred below the steers fed silage made from mature corn.

The making of silage from immature corn is not recommended as a general proposition but there are many sections in this state in which the corn plant will not mature ears. Even in the corn belt the land is sometimes too wet to plant to corn in season. The results of this trial indicate that under such conditions it may be possible to produce considerable feed, and that it can perhaps be utilized to the best advantage in the form of silage.

LOT IV

MILLET SILAGE AND OILMEAL

A portion of the same field which was replanted to corn on July 15 was seeded with Tambov S. D. No. 85, which is a red seeded variety of the proso type. This is a medium sized variety but a heavy producer of seed. During a five year period it has made an average yield of 18 bushels of seed per acre.

This proso which was also grown as a "catch" crop was cut with a grain binder when about 90 percent of the seed was ripe. The labor required to produce a ton of millet for the silo is much less than for corn.

The steers in this lot made an average daily gain of 1.82 pounds per head. As millet silage is not as rich in nutrients as corn silage, it would probably be advisable to feed some grain in addition in order to secure maximum gains. The gains obtained and the good condition of the cattle do, however, indicate that millet silage may often be used to good advantage in beef production. The making of silage from millet is probably one of the best ways of utilizing this emergency crop.

Number of Steer	Weight Jan. 6	Weight Feb. 5	Weight Mar. 6	Weight Apr. 5	Weight May 5	Gain per head	Average gain per head daily
81	803	900	932	943	978	175	1.45
87	1067	1170	1202	1228	1280	213	1.77
95	1097	1198	1246	1256	1379	282	2.35
166	917	1026	1062	1084	1124	207	1.72
Totals	3884	4294	4442	4551	4761	877	
Av Gain per head		102	37	27	52		1.82

Total silage consumed	35751.00
Silage for pound of gain	40.70
Total oilmeal consumed	1368.00
Oilmeal for pound of gain	1.50
Total oat straw consumed	674.00
Straw for pound of gain	.76

Pounds

SUMMARY OF RESULTS IN FATTENING STEERS ON SEVERAL
KINDS OF SILAGE

	Lot I Wild Hay Shel'd Corn Oilmeal	Lot II Mature Corn Silage Oilmeal	Lot III Immature Corn Silage Oilmeal	Lot IV Millet(Proso) Silage Oilmeal
Number of Steers in Each Lot	4	4	4	4
Number of Days Fed-----	120	120	120	120
Average Init. Weight Per Steer	995	1008	983	971
Average Final Weight Per Steer	1308	1287	1234	1190
Total Gain Per Lot-----	1252	1117	1005	877
Average Gain Per Steer-----	313	279	251	219
Average Daily Gain Per Steer	2.60	2.33	2.09	1.82
Total Silage Consumed-----		31074	39827	35751
Total Oilmeal Consumed -----	1368	1368	1368	1368
Total Oat Straw Con. 90 days	1248	855	1366	674
Total Shelled Corn Consumed	9597			
Total Wild Hay Consumed-----	4520			
Average Feed Required for 100 pounds of Gain				
Silage-----		2781.91	3962.88	4076.51
Oilmeal-----	109.27	122.47	136.12	155.99
Straw-----	99.50	76.54	135.92	76.85
Shelled Corn-----	766.53			
Wild Hay-----	361.02			
Average Daily Feed Per Head				
Silage-----		64.74	82.94	74.48
Oilmeal-----	2.87	2.87	2.87	2.87
Straw-----	2.60	1.78	3.08	1.40
Shelled Corn-----	19.999			
Wild Hay-----	9.42			