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Sunflower Silage for Milk Production.

By

F. W. ATKESON

UNIVERSITY OF IDAHO
AGRICULTURAL EXPERIMENT STATION
Department of Dairy Husbandry

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Summary and Conclusions

SUNFLOWER silage is suggested as a substitute for corn silage in areas where the yields of corn silage are not large or are not dependable.

Two feeding trials, using a total of 15 dairy cows, were conducted to compare sunflower silage with corn silage for milk production. Alfalfa hay and a grain mixture were fed in addition to the silages. The cows produced practically the same amount of milk and butterfat and maintained body weight on the two silages. On the basis of total digestible nutrients consumed and milk produced the sunflower silage was equal to corn silage.

Palatability tests showed that the cows generally preferred corn silage to sunflower silage, but when no choice was permitted, ate the same amount of sunflower silage as of corn silage. In commercial milk production palatability would not be a limiting factor, but for cows fed to capacity it would be of more importance.

Choice between corn silage and sunflower silage is a problem of more milk per acre rather than more milk per cow.

Sunflower Silage for Milk Production

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INTRODUCTION

SUNFLOWERS, because of their high yield and resistance to drought and early frost, are often used as a silage crop instead of corn, especially in areas where the yields of corn silage are not large or are not dependable. Corn is the most satisfactory silage crop in sections where good yields can be relied upon. Dairymen located in areas with short growing seasons or insufficient rainfall are usually interested in sunflower silage as a substitute for corn silage. In northern Idaho and in the Upper Snake River region the yield of sunflowers in comparison with that of corn justifies their use as a silage crop.

Table I shows the comparative yields of corn and sunflowers obtained by the Department of Agronomy of the Idaho Agricultural Experiment Station at Moscow and the Substation at Sandpoint.** The average yield per acre, covering a six-year period at Moscow, was 14.8 tons of corn and 8.6 tons of sunflowers. At Sandpoint sunflowers averaged 11.5 tons and corn 3.8 tons. Sunflowers yielded 72 per cent more silage than corn at Moscow and 303 per cent more at Sandpoint.

This bulletin is a report on the relative feeding value of corn silage and sunflower silage for milk production in the area adjacent to Moscow.

FEEDING TRIALS

Two feeding trials, 120 days in length, were conducted at the Idaho Agricultural Experiment Station at Moscow. Each trial was divided into three experimental periods of 30 days each, with a 10-day preliminary period preceding each experimental period. The conditions under which the two trials were conducted were kept as uniform as possible.

Two groups of cows were used in each trial. An effort was made to balance the groups as evenly as conditions permitted. Each of the four groups represented 4 cows, except Group I of Trial I, in which only 3 cows were used because it was found necessary to eliminate one of the cows due to rapid decline in milk production. All the cows in both trials were fed alfalfa hay and a grain mixture, the variant in the ration being the kind of silage fed. In the beginning the amount of hay and silage each cow would readily consume was determined, and this amount was fed throughout the feeding trial. The grain mixture was fed to Holsteins at the rate of 1 pound of grain to 3 pounds of milk produced daily and to Jerseys at the rate of 1 to 2.5. Changes in the daily allowance of grain were made every five days. The grain mixture used consisted of 350 pounds of wheat bran, 200 pounds of ground barley, 200 pounds of ground oats, 100 pounds of linseed meal, 100 pounds of cottonseed meal, and 12 pounds of salt. Chemical composition of the feeds used in both trials, as derived from composite samples, is shown in Table I.

The double reversal system of feeding was used, cows in Group I being fed corn silage the first and third periods and sunflower silage the

*Dairy Husbandman, Agricultural Experiment Station.

**Growing Sunflowers for Silage in Idaho. Hulbert, H. W., and Christ, J. H., 1926. Idaho Agr. Expt. Sta. Bul. 141.

second, and Group II being fed sunflowers the first and third periods and corn silage the second. Management of the cows was kept as uniform as possible.

RESULTS

A summary of the results obtained from each group for both trials is presented in Table II. The average of the first and third periods was compared with the second period in all instances to offset natural decline in milk production and other conditions of the trial. The fact that the average butterfat production per cow for each of the four groups was above one pound per day would indicate that the production was sufficiently high to reflect significant differences in the two rations.

In Trial I the average daily feed consumption of both groups of cows while being fed corn silage was 32.1 pounds of silage, 18.1 of hay, and 9.4 of grain mixture. While on the sunflower silage ration these same cows consumed daily 29.9 pounds of silage, 18.2 of hay, and 9.1 of grain mixture. Both groups consumed slightly more feed during the second experimental period, Group I consumed more while on sunflower silage and Group II while on corn silage.

The two groups combined averaged 25.4 pounds of milk and 1.05 pounds of fat daily per cow when corn silage was fed and 26.3 pounds of milk and 1.03 pounds of fat when sunflower silage was fed. When milk and fat production was computed to 4 per cent milk (fat-corrected basis*), which makes adjustment for any differences in per cent of fat, the daily production of milk per cow was exactly the same, 25.9 pounds, for the two groups combined while on each ration.

The average weight of the cows in the two groups combined was practically the same when placed on the two rations, 1231 pounds when started on corn silage and 1230 pounds when started on sunflower silage. Changes in weight while on the experimental feeds were not significant, the increases averaging 1 pound when corn silage was fed and 8 pounds increase when sunflower silage was fed. Group I increased slightly on sunflower silage; Group II did just the reverse.

Summarization of the two groups combined showed that when corn silage was fed the cows consumed daily 3.17 pounds of digestible crude protein and 20.24 pounds of total digestible nutrients, and when sunflower silage was fed the daily consumption per cow was 2.98 pounds of digestible crude protein and 18.81 pounds of total digestible nutrients. About 6 per cent less digestible crude protein and 7 per cent less total digestible nutrients were consumed daily on the sunflower silage ration. The nutrients consumed per 100 pounds of 4 per cent milk showed less digestible crude protein and less total digestible nutrients used on the sunflower silage ration (11.47 and 72.62 pound respectively) than was used on the corn silage ration (12.24 and 78.15). Based on the pounds of total digestible nutrients required for 100 pounds of 4 per cent milk, the sunflower silage ration was 97.1 per cent as efficient as the corn silage ration in Group I, 116.1 per cent in Group II, and 107.6 per cent for the two groups combined.

*Relation between percentage fat content and yield of milk; correction of milk yield for fat content. Gaines, W. L. and Davidson, F. A., 1923, Ill. Agr. Expt. Sta. Bul. 245.

Results from Trial II show that when the two groups were combined the cows consumed daily per cow an average of 30.8 pounds of silage, 13.6 of hay, and 10.0 pounds of grain mixture, while corn silage was fed. The same cows, while sunflower silage was fed, consumed daily per cow 30.0 pounds of silage, 14.2 of hay, and 9.0 of grain mixture. Average daily production per cow was 28.2 pounds of milk and 1.13 pounds of fat on the corn silage ration, and 26.3 pounds of milk and 1.12 pounds of fat on sunflower silage. Average daily production of 4 per cent milk (fat-corrected basis) per cow was 28.3 pounds and 27.3 pounds on corn silage and sunflower silage rations, respectively.

Difference in the average weights of the cows when started on the two rations was not significant, the cows averaging 8 pounds more when started on sunflower silage than when started on corn silage. Neither were the average changes in body weight while on the two rations enough to be of importance, an average increase per cow of 4 pounds being obtained in 30 days when corn silage was fed and an average decrease of 2 pounds resulting when sunflower silage was fed. The average of Group I showed a loss in weight on the corn silage ration and a gain on the sunflower ration. Group II showed just the reverse. None of the changes for group averages were large enough to be very significant, and it is worthy of mention that not only did the two groups change in weight opposite to each other on the same ration but the two groups in Trial II reacted opposite to those in Trial I. This would indicate that not only the amount of the changes on the two rations was not of importance but the direction, that is, increase or decrease, was not significant either when both trials are considered.

Summarization of the two groups combined showed that when corn silage was fed the cows consumed daily 2.69 pounds of digestible crude protein and 18.48 pounds of total digestible nutrients; while when sunflower silage was fed the daily consumption was 2.58 pounds and 17.38 pounds, respectively. About 4 per cent less digestible crude protein and 6 per cent less total digestible nutrients were consumed on the sunflower ration than on the corn silage ration. The nutrients consumed per 100 pounds of 4 per cent milk showed less digestible crude protein and less total digestible nutrients used on the sunflower ration (9.46 and 63.66 pounds respectively) than was used on the corn silage ration (9.47 and 65.30). Based on the total digestible nutrients required per 100 pounds of 4 per cent milk, the sunflower silage ration was 101.4 per cent as efficient as the corn silage ration in Group I, 104.1 per cent in Group II, and 102.6 per cent for the two groups combined. Less variation existed in the results obtained from the two groups in Trial II than in Trial I.

Based on the results of these two trials representing 4 groups, or a total of 15 cows, it may be concluded that sunflower silage is equal to corn silage for milk production. In Trial I the average of the two groups combined showed sunflower silage to be 7.6 per cent more efficient than corn silage, while similar calculations for Trial II showed sunflower silage 2.6 per cent more efficient. In only one group (Group I, Trial I) was corn silage slightly superior. These differences in favor of sunflower silage are in most instances within the limits of experimental error (5 per cent) and, therefore, the silages are about equal.

COMPARATIVE PALATABILITY OF CORN AND SUNFLOWER SILAGES

Many dairymen object to sunflower silage because they claim the cows do not relish it. Other feeders claim that there is little difference in the palatability of the two silages after the cows become accustomed to sunflower silage. To check on these opinions a palatability test, four days in length, was conducted after each of the two feeding trials were ended. In the palatability test the same cows were used as in the feeding trials in order that the cows would be accustomed to both kinds of silage.

The usual allowance of silage was weighed out to each cow, but half of it was corn silage which was placed in one side of the feed manger, while the other half was sunflower silage placed in the opposite side of the manger. Observations were recorded concerning the relative preference of each cow for each of the silages.

In the first test 4 of the 8 cows showed consistent preference for corn silage by eating all of it before starting to eat sunflower silage. The other 4 cows were not so consistent but the tendency was toward a preference for corn silage. Much the same results were obtained during the second test. Although all of both kinds of silage was consumed, most of the cows preferred the corn silage and ate it faster and more greedily. The fact that in the two feeding trials the cows consumed practically the same amounts of the two silages daily would indicate that when the cows are accustomed to sunflower silage and have no choice, palatability is not a limiting factor in production under ordinary herd conditions.

Experience in feeding sunflower and corn silages in the routine feeding of the University dairy herd has shown that with cows fed more as a commercial dairy herd might be fed, no difficulty was encountered in getting them to consume normal amounts of sunflower silage. Cows making large records on official test (milking 70 to 100 pounds daily) and being fed nearer to capacity showed a decided dislike for sunflower silage as compared with corn silage. In fact, consumption was reduced to the extent of being a factor in maintaining the high level of milk production.

MILK PRODUCTION PER ACRE

Sunflowers being equal to corn, pound for pound, as a silage crop for dairy cows the choice between the two crops resolves itself into a problem of farm organization more than to one of dairy feeding. In other words, milk production per acre is the question rather than milk production per cow, as far as commercial dairy production is concerned. It was shown in Table I that sunflowers averaged over a period of years 14.8 tons in the Moscow area, while corn averaged 8.6 tons, or 72 per cent more tonnage from sunflowers than corn. Both sunflower and corn silages are low protein feeds, valued for their content of total digestible nutrients. With these average yields corn produced 3044 pounds of total digestible nutrients per acre while sunflowers produced 3731 pounds per acre. Using unnecessary additional acres to produce a certain quantity of nutrients is as uneconomical as feeding low producing cows when fewer high producers would return the same amount of butterfat.

TABLE I
Comparative Yields of Sunflowers and Corn at Moscow and Sandpoint^a

Season	Yield in Tons per Acre			
	University Farm		Sandpoint	
	Sunflowers	Corn	Sunflowers	Corn
1920	19.76	8.02	10.1	3.5
1921	9.99	9.30
1922	9.22	6.45	10.7	4.9
1923	16.90	9.76	13.2	4.1
1924	16.72	10.27	10.9	3.8
1925	16.02	8.00	12.5	2.9
Average	14.77	8.60	11.5	3.8

^aIdaho Agr. Expt. Sta. Bul. 141.

TABLE II
Chemical Analyses of Feeds

Feed	Water	Ash	Crude Protein	Crude Fiber	Nitrogen Free Extract	Fat
Trial I						
Grain Mixture	11.7	5.6	19.1	8.8	50.6	4.2
Alfalfa Hay	11.8	7.3	9.6	41.1	29.0	1.2
Corn Silage	73.2	1.6	2.9	6.7	15.2	0.4
Sunflower Silage	74.2	2.0	2.3	8.8	12.1	0.6
Trial II						
Grain Mixture	12.0	5.7	17.4	9.6	49.8	5.5
Alfalfa Hay	7.3	6.6	9.5	42.0	32.5	2.1
Corn Silage	75.5	2.0	2.3	5.2	14.2	0.8
Sunflower Silage	76.6	2.7	2.4	6.5	9.9	1.9

NOTE—Chemical analyses made by the Department of Agricultural Chemistry, Idaho Agricultural Experiment Station.

TABLE III
Results of Two Feeding Trials Comparing Sunflower Silage with Corn Silage for Dairy Cows

	Trial I						Trial II					
	Group I		Group II		Weighted Average Both Groups		Group I		Group II		Weighted Average Both Groups	
	Corn silage	Sun-flower silage	Corn silage	Sun-flower silage	Corn silage	Sun-flower silage	Corn silage	Sun-flower silage	Corn silage	Sun-flower silage	Corn silage	Sun-flower silage
Period	I & III Ave.	II	II	I & III Ave.			I & III Ave.	II	II	I & III Ave.		
Number of Cows Used	3	3	4	4	7	7	4	4	4	4	8	8
Average lbs. silage consumed daily per cow.	30.6	30.8	33.3	29.2	32.1	29.9	33.3	34.3	28.2	25.6	30.8	30.0
Average lbs. alfalfa hay consumed daily per cow.	17.1	18.5	18.9	18.0	18.1	18.2	14.2	15.0	12.9	13.3	13.6	14.2
Average lbs. grain mixture consumed daily per cow.	8.4	9.0	10.1	9.2	9.4	9.1	11.0	9.3	8.9	8.6	10.0	9.0
Average lbs. of milk produced daily per cow.	22.9	22.7	27.2	29.0	25.4	26.3	32.3	29.4	24.1	23.2	28.2	26.3
Average lbs. butterfat produced daily per cow.	1.05	1.02	1.05	1.03	1.05	1.03	1.23	1.20	1.03	1.03	1.13	1.12
Average percentage of fat in milk	4.59	4.49	3.86	3.55	4.13	3.92	3.81	4.08	4.27	4.44	4.01	4.26
Average lbs. of 4 per cent milk [†] produced daily per cow.	24.9	24.4	26.6	27.1	25.9	25.9	31.4	29.8	25.1	24.7	28.3	27.3
Average body weight per cow at beginning (pounds).	1202	1217	1253	1240	1231	1230	1337	1330	1101	1124	1219	1227
Average gain per cow in body weight per 30-day period.	+19	-13	-13	+23	+1	+8	-12	+21	+19	-24	+4	-2
Average lbs. digestible crude protein* consumed daily per cow.	2.92	2.97	3.36	2.97	3.17	2.98	2.90	2.73	2.45	2.41	2.69	2.58
Average lbs. total digestible nutrients* consumed daily per cow.	18.84	19.01	21.28	18.68	20.24	18.81	19.85	18.58	16.97	16.04	18.48	17.38
Average lbs. digestible crude protein consumed per 100 lbs. 4% milk.	11.73	12.17	12.63	10.96	12.24	11.47	9.24	9.16	9.76	9.76	9.47	9.46
Average lbs. total digestible nutrients consumed per 100 lbs. 4% milk.	75.66	77.90	80.00	68.93	78.15	72.62	63.22	62.35	67.61	64.94	65.30	63.66

*Computed from chemical analyses in Table I and digestion coefficients in "Feeds and Feeding" by Henry and Morrison, 1923.

[†]"Fat-corrected". Bulletin No. 245, Ill. Agr. Expt. Sta.

NOTE.—In Trial I, 1 Holstein and 2 Jersey cows were in Group I, and 3 Holsteins and 1 Jersey were in Group II; while in Trial II, 3 Holsteins and 1 Jersey were in Group I, and 2 Holsteins and 2 Jerseys were in Group II.