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Agricultural Experiment Station
College of Agriculture, West Virginia University
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Sunflower Silage vs. Corn Silage for Milk Production

By
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*Sunflower Silage vs. Corn Silage for Milk Production**

During the past few years, the use of sunflower silage as a substitute for corn silage has aroused considerable interest. The interest has been particularly keen in those sections of the country where corn does not grow satisfactorily on account of climatic or other unfavorable conditions, or in sections of limited tillable acreage where it is difficult to grow sufficient silage and other roughage for dairy cows. A preliminary report was published by this Station in 1920, in which the results of one trial comparing the feeding value of corn silage and sunflower silage were given.† These results were such that it was thought that further study should be made in order to obtain more definite information as to the feeding value of sunflower silage as compared to corn silage. Accordingly, two more trials have been completed. The results of these, together with the results of the first trial are published in this bulletin. A report on a study of the culture of sunflowers is given in Bulletin 204 of this Station.

RESULTS AT OTHER STATIONS

Since the previous report was published in 1920, many of the experiment stations have reported experimental results on the use of sunflower silage. Only a brief summary of them is possible in this bulletin. A study of these reports shows a wide difference in the results obtained. Several of the stations report that sunflower silage was equal or superior to corn silage for the production of milk, *(3)*, *(4)*, *(5)*, *(7)*. Others report that it was inferior to corn silage *(1)*, *(2)*, *(6)*, *(8)*. Among these Bechdel of the Pennsylvania Station *(1)* found that the cows fed sunflower silage produced only about 86.4 percent as much as those fed an equal amount of corn silage. Schafer and Westley of the Washington Station *(8)* found that sunflower silage was 92 percent as valuable as corn silage for milk and butterfat production. Nevens of the Illinois Station *(6)* obtained from 15 to 25 percent more milk when the cows were fed corn silage than when they were fed sunflower silage. Hicks of the Agassiz, B. C. Experiment Farm *(2)* obtained an average milk production with corn silage of 33.6 pounds and with sunflower silage 31.52 pounds.

*Submitted for publication April, 1926. At the time this experiment was conducted Mr. Gifford, the junior author, was a member of this Station staff. He resigned July 1, 1926, to join the faculty of the College of Agriculture, University of Missouri.

†West Virginia Experiment Station Circular 32.

In regards to palatability the reports also differ. Some of the stations *(4)*, *(5)* found that sunflower silage was palatable to livestock. Others, however, *(1)*, *(3)*, *(6)*, *(8)* found that sunflower silage showed a distinct lack of palatability as compared to corn silage. Nevens *(6)* found that the time of cutting had a great influence upon palatability, the earlier cuttings being more palatable than later ones. This was the most decisive factor in determining the value of the sunflower at the different stages of cutting.

THE PLAN OF THE EXPERIMENT

Two well balanced groups of cows were used in each of the three trials and are designated as Groups 1 and 2 in Trial I, Groups 3 and 4 in Trial II, and Groups 5 and 6 in Trial III. Care was taken to divide the groups in each trial so that they were as nearly uniform as possible in regard to breed, weight, stage of lactation, and amount of milk and butterfat which they were producing. The plan, however, was not to compare the two groups, but rather to compare the two feeding periods of the same group, using one group as a check against the other.

The different groups were fed for the period of the tests on a ration consisting of grain, hay, and silage. The ration was fed so that the cows were receiving an approximate nutritive balance of protein and energy as required by the Armsby Feeding Standard.

The grain ration in Trials I and III consisted of 200 pounds of cottonseed meal, 200 pounds of linseed meal, 300 pounds of wheat bran, and 100 pounds of ground barley, while that of Trial II consisted of 300 pounds of corn meal, 200 pounds of wheat bran, 200 pounds of gluten meal, 100 pounds of cottonseed meal, and 100 pounds of linseed meal.

The amount of grain fed depended upon the amount of milk produced. One pound of grain was fed to each three to four pounds of milk produced, the exact amount depending upon the percentage of fat in the milk. The amount of silage fed differed in the three trials. In Trial II, 30 pounds, Trial I, 35 pounds, and Trial III, 45 pounds were fed per day. It was thought best to feed as much as the cows would eat, so that the effects of the silages would be more pronounced.

The cows were placed on a week's preliminary feed in order to accustom them to the change of ration, after which the experiment was begun and continued for three weeks. The feeding was then changed so that the group which during the first three weeks was

getting corn silage was fed sunflower silage, and the group which was fed sunflower silage the first three weeks was then fed corn silage.

The weights of the cows in the different groups were taken on three consecutive days both at the beginning of the trial and at the end of each period. The average of these weights was taken as the weight for that particular time.

The milk from each cow was carefully weighed after each milking. A weekly composite sample was taken from each cow and tested for butterfat.

THE COWS AT THE BEGINNING OF THE TRIALS

Tables 1, 2, and 3 give the breed, weight, time of lactation, and average amount of milk produced by each cow for the seven days previous to the beginning of the trials.

TABLE 1.—Breed, Lactation, Production, and Weight of Cows in First Feeding Trial.

	Herd Number of Cow	Breed	Time in Lactation	Daily Milk Production in Pounds	Weight of Cows in Pounds
GROUP 1	22	Purebred Holstein	197 Days	25 8	930
	9	Grade Holstein	160 Days	21 6	1400
	21	Purebred Holstein	94 Days	28 6	1020
	5	Purebred Jersey	44 Days	34.6	760
	17	Grade Holstein	26 Days	41 6	1210
		Average	104 Days	30.4	1064
GROUP 2	7	Purebred Ayrshire	259 Days	16 3	1120
	6	Purebred Holstein	189 Days	32 1	1290
	16	Purebred Holstein	167 Days	43 7	1230
	23	Purebred Holstein	81 Days	32 5	970
	18	Purebred Ayrshire	44 Days	38 3	900
		Average	148 Days	32 6	1102

THE FIRST FEEDING TRIAL

In Trial I each cow in Group 1 was fed 35 pounds of sunflower silage and each cow in Group 2 was fed 35 pounds of corn silage for the first four weeks of the trial. The feeding of the groups was then changed so that during the second four week period Group 1 received corn silage and Group 2 received sunflower silage. Each cow received 10 pounds of mixed clover and timothy hay per day and one pound of grain for each 3.5 pounds of milk produced.

TABLE 2.—Breed, Lactation, Production, and Weight of Cows in Second Feeding Trial.

	Herd Number of Cow	Breed	Time in Lactation	Daily Milk Production in Pounds	Weight of Cows in Pounds
GROUP 3	48	Purebred Holstein	98 Days	21.2	1100
	4	Purebred Holstein	87 Days	39.7	1500
	50	Purebred Guernsey	65 Days	30.7	925
	43	Purebred Ayrshire	20 Days	41.3	1025
		Average	68 Days	33 2	1138
GROUP 4	47	Purebred Holstein	93 Days	29.0	1200
	16	Purebred Holstein	75 Days	41.2	1500
	52	Purebred Jersey	66 Days	20.9	670
	36	Purebred Holstein	13 Days	25.7	1200
		Average	62 Days	29.2	1143

TABLE 3.—Breed, Lactation, Production, and Weight of Cows in Third Feeding Trial.

	Herd Number of Cow	Breed	Time in Lactation	Daily Milk Production in Pounds	Weight of Cows in Pounds
GROUP 5	107	Purebred Guernsey	121 Days	17.9	1005
	132	Purebred Holstein	117 Days	16 3	1090
	106	Purebred Jersey	75 Days	14 5	795
	139	Purebred Ayrshire	67 Days	37.5	1145
	138	Purebred Ayrshire	57 Days	38 4	1060
		Average	87 Days	24 9	1019
GROUP 6	22	Purebred Holstein	291 Days	23.3	1120
	89	Purebred Jersey	205 Days	11.7	850
	100	Purebred Jersey	79 Days	16.3	1035
	137	Purebred Ayrshire	65 Days	41.1	1080
	136	Purebred Ayrshire	19 Days	34 7	972
		Average	132 Days	25.4	1012

Tables 4, 5, 6, and 7 give the production of the different cows by periods, a summary of the production by groups, the weight of each cow at the beginning and end of experiment, and a summary of the weights by groups. The production during the preliminary week is not included in these tables.

Tables 4 and 6 show that the five cows in Group 1, while being fed sunflower silage during a 21 day period, produced 3042.7 pounds of milk containing 121.27 pounds of butterfat, and lost a total of 140 pounds in weight. The same five cows, when fed corn silage

during a second 21 day period, produced 2865.6 pounds of milk containing 112.33 pounds of butterfat, and lost a total of 23 pounds in weight.

The five cows in Group 2, while being fed the sunflower silage, during a 21 day period, produced 2821.1 pounds of milk containing 98.64 pounds of butterfat, and lost a total of 47 pounds in weight. The same five cows when fed corn silage for a 21 day period, produced 3260.9 pounds of milk which contained 107.52 pounds of butterfat, and lost a total of 77 pounds in weight.

Bringing together the results of the two groups, Tables 5 and 7 show that the ten cows, while being fed sunflower silage during a 21 day period, produced 5863.8 pounds of milk and 219.91 pounds of butterfat, had an average butterfat test of 3.75 percent and lost a total of 187 pounds in weight. The same ten cows when fed corn

TABLE 4.—Production of Cows in First Trial.

	Herd Number of Cow	SUNFLOWER SILAGE			CORN SILAGE		
		Pounds of Milk	Percent of Butterfat	Total Pounds Butterfat	Pounds of Milk	Percent of Butterfat	Total Pounds Butterfat
GROUP 1	22	503.4	3.97	20 00	543 2	3.53	19 20
	9	439 5	3.53	15.53	397.1	3 23	12 83
	21	538 6	3 68	19 81	525.8	3.40	17.87
	5	684.9	5 07	34 71	612 7	5.78	35.39
	17	876.3	3.56	31.22	786 8	3.44	27.04
	Total	3042 7	3.99	121 27	2865.6	3 92	112 33
	Herd Number of Cow	CORN SILAGE			SUNFLOWER SILAGE		
GROUP 2	7	298.8	3 86	11.52	283.9	4.30	11 20
	6	692 4	3 17	21.92	625 4	3 31	20 68
	16	870 5	3.04	26.43	759.9	3.13	23.81
	23	692 7	2.97	20.55	554 6	3.40	18 86
	18	706.5	3 84	27 10	597 3	3 87	23 09
	Total	3260 9	3 30	107 52	2821.1	3.50	98.64

TABLE 5.—Summary of Production of Cows in First Trial.

Feeding Periods and Differences	Pounds of Milk Produced	Percent of Butterfat	Total Pounds of Butterfat
Sunflower Silage Period	5,863 8	3 75	219 91
Corn Silage Period	6,126.5	3 59	219 85
Difference in Favor of Corn Silage	262 7		
Difference in Favor of Sunflower Silage		0.16	0.06

TABLE 6.—Weight of Cows in First Trial.

	Herd Number of Cow.	SUNFLOWER SILAGE			CORN SILAGE		
		Weight at Beginning (Pounds)	Weight at End of First Period (Pounds)	Gain or Loss (—) in Weight During First Period (Pounds)	Weight at Begining of Second Period (Pounds)	Weight at End of Second Period (Pounds)	Gain or Loss (—) in Weight During Second Period (Pounds)
GROUP 1	22	930	900	—30	925	932	7
	9	1400	1390	—10	1385	1395	10
	21	1020	990	—30	990	975	—15
	5	760	730	—30	750	737	—13
	17	1210	1170	—40	1175	1163	—12
	Total	5320	5180	—140	5225	5202	—23
	Herd No. of Cow	CORN SILAGE			SUNFLOWER SILAGE		
GROUP 2	7	1120	1110	—10	1100	1112	12
	6	1290	1240	—50	1255	1225	—30
	16	1230	1210	—20	1215	1192	—23
	23	970	990	20	995	1007	12
	18	900	883	—17	880	862	—18
	Total	5510	5433	—77	5445	5398	—47

TABLE 7.—Summary of Weights of Cows in First Trial.

Feeding Periods and Difference	Weight of Cows at Beginning (Pounds)	Weight of Cows at End (Pounds)	Gain or Loss (—) in Weight (Pounds)
Sunflower Silage Period	10,765	10,578	—187
Corn Silage Period	10,735	10,635	—100
Difference in Favor of Corn Silage			87

silage for a period of similar length produced 6126.5 pounds of milk and 219.85 pounds of butterfat, had a butterfat test of 3.59 percent, and lost 100 pounds in weight.

THE SECOND FEEDING TRIAL

In Trial II, each cow in Group 3 was fed 30 pounds each of sunflower silage and those in Group 4 were fed 30 pounds of corn silage daily for the first four weeks.

The feeding of the groups was then changed so that Group 3 was fed corn silage and Group 4 was fed sunflower silage during the second four weeks of the trial. Each cow in both groups was fed eight pounds of alfalfa hay daily, and one pound of the grain ration to each 3.5 pounds of milk produced.

Tables 8, 9, 10, and 11 give the production of the different cows by periods, a summary of the production by groups, the weights at the beginning and end of the experiment, and a summary of the weights by groups.

Tables 8 and 10 show that the four cows in Group 3, while being fed sunflower silage during a 21 day period, produced 2664.5 pounds of milk and 99.6 pounds of butterfat and lost a total of 146 pounds in weight. The same four cows, when fed corn silage for a 21 day period, produced 2405.6 pounds of milk and 85.61 pounds of butterfat, and gained a total of 100 pounds in weight. The four cows in Group 4, when fed sunflower silage during a 21 day period, produced 2114.0 pounds of milk, 70.37 pounds of butterfat, and gained a total of 40 pounds in weight. The same four cows, when fed corn silage during a period of similar length, produced 2280.9 pounds of milk, 78.76 pounds of butterfat, and lost a total of 43 pounds in weight.

TABLE 8.—Production of Cows in Second Trial.

	Herd Number of Cow	SUNFLOWER SILAGE			CORN SILAGE		
		Pounds of Milk	Percent of Butterfat	Total Pounds Butterfat	Pounds of Milk	Percent of Butterfat	Total Pounds of Butterfat
GROUP 3	48	409 2	3 60	14 73	443 6	3 40	15 08
	4	795 8	3 28	26 13	746 8	3 08	23 03
	50	609 5	4 20	25 60	509 3	4 45	22 64
	43	850 0	3 90	33 14	705 9	3 52	24 86
	Total	2664 5	3 74	99 60	2405 6	3 56	85 61
	Herd No. of Cow	**CORN SILAGE**			**SUNFLOWER SILAGE**		
GROUP 4	47	558 3	3 83	21 36	525 1	3 23	16 97
	16	708 7	3 00	21 26	693 5	2 95	20 48
	52	402 1	4 07	16 36	337 7	4 41	14 88
	36	611 8	3 23	19 78	557 7	3 23	18 04
	Total	2280 9	3 45	78 76	2114 0	3 33	70 37

TABLE 9.—Summary of Production of Cows in Second Trial.

Feeding Periods and Difference	Pounds of Milk Produced	Percent of Butterfat	Total Pounds of Butterfat
Sunflower Silage Period	4,778 5	3 56	169 97
Corn Silage Period	4,686 5	3 51	164 37
Difference in Favor of Sunflower Silage	92 0	05	5 60

TABLE 10.—Weights of Cows in Second Trial.

		SUNFLOWER SILAGE			CORN SILAGE		
	Herd Number of Cow	Weight at Beginning (Pounds)	Weight at End of First Period (Pounds)	Gain or Loss (—) in Weight During First Period (Pounds)	Weight at Beginning of Second Period (Pounds)	Weight at End of Second Period (Pounds)	Gain or Loss (—) in Weight During Second Period (Pounds)
GROUP 3	48	1117	1060	—57	1050	1080	30
	4	1514	1470	—44	1460	1460	00
	50	960	960	00	980	1000	20
	43	1025	980	—45	980	1030	50
	Total	4616	4470	—146	4470	4570	100
	Herd No. of Cow	CORN SILAGE			SUNFLOWER SILAGE		
GROUP 4	47	1285	1180	—105	1240	1220	—20
	16	1510	1520	10	1490	1520	30
	52	678	700	22	680	700	20
	36	1170	1200	30	1190	1200	10
	Total	4643	4600	—43	4600	4640	40

TABLE 11.—Summary of Weights of Cows in Second Trial.

Feeding Periods and Difference	Weight of Cows at Beginning (Pounds)	Weight of Cows at End (Pounds)	Gain or Loss (—) in Weight (Pounds)
Sunflower Silage Period	9,216	9,110	—106
Corn Silage Period	9,113	9,170	57
Difference in Favor of Corn Silage			163

Bringing together the results of the two groups, Tables 9 and 11 show that the eight cows, while being fed sunflower silage during a 21 day period, produced 4778.5 pounds of milk, 169.97 pounds of butterfat, had an average butterfat test of 3.56 percent, and lost a total of 106 pounds in weight. The same eight cows, when fed corn silage, produced during the 21 days, 4686.5 pounds of milk, 164.37 pounds of butterfat, had an average butterfat test of 3.51 percent, and gained a total of 57 pounds in weight.

THE THIRD FEEDING TRIAL

In Trial III, each cow in Group 5 was fed 45 pounds of sunflower silage and each cow in Group 6 was fed 45 pounds of corn silage daily during the first four weeks of the trial. The rations were then changed so that the cows in Group 5 were fed corn silage and the cows in Group 6 were fed sunflower silage during the second four

weeks of the trial. Each cow in both groups was given eight pounds of alfalfa hay daily and one pound of grain for each 3.5 pounds of milk produced.

Tables 12, 13, 14, and 15 give the production of the different cows, their weights, a summary of the production of each group, and a summary of the weights of each group.

Tables 12 and 14 show that the five cows in Group 5, while being fed sunflower silage during a 21 day period, produced 2028 pounds of milk, 85 pounds of butterfat, and lost a total of 195 pounds in weight. The same five cows, when fed corn silage for a similar period, produced 1944.5 pounds of milk, 81.08 pounds of butterfat, and lost a total of 120 pounds in weight. The five cows in Group 6,

TABLE 12.—Production of Cows in Third Trial.

	Herd Number of Cow	SUNFLOWER SILAGE			CORN SILAGE		
		Pounds of of Milk	Percent of Butterfat	Total Pounds Butterfat	Pounds of Milk	Percent of Butterfat	Total Pounds Butterfat
GROUP 5	107	304 6	5.16	15.71	292.8	5 42	15 86
	132	273 6	3.85	10.53	263.5	3 46	9 13
	106	236 9	5.23	12.40	255.8	4 95	12 66
	139	600.8	3.94	23.69	560.7	4 06	22 78
	138	612.1	3.70	22.67	571 7	3 61	20.65
	Total	2028 0	4.19	85.00	1944.5	4 17	81 08
	Herd No. of Cow	CORN SILAGE			SUNFLOWER SILAGE		
GROUP 6	22	363.0	4.46	16.19	192.7	4 69	9 03
	89	233.8	3.93	9.18	169.8	4 20	7.14
	100	297.9	5.95	17.72	260.4	6.00	15.63
	137	672.1	4.17	28.01	544.4	4.30	23 41
	136	597 3	3 41	20.38	458.3	3.70	16 96
	Total	2164.1	4 23	91.48	1625.6	4.44	72 17

TABLE 13.—Summary of Production of Cows in Third Trial.

Feeding Periods and Differences	Pounds of Milk Produced	Percent of Butterfat	Total Pounds of Butterfat
Sunflower Silage Period	3,653.6	4.30	157 17
Corn Silage Period	4,108.6	4.20	172.56
Difference in Favor of Corn Silage	455.0		15.41
Difference in Favor of Sunflower Silage		0.10	

TABLE 14.—Weights of Cows in Third Trial.

	Herd Number of Cow	SUNFLOWER SILAGE			CORN SILAGE		
		Weight at Beginning (Pounds)	Weight at End of First Period (Pounds)	Gain or Loss (—) in Weight During First Period (Pounds)	Weight at Beginning of Second Period (Pounds)	Weight at End of Second Period (Pounds)	Gain or Loss (—) in Weight During Second Period (Pounds)
GROUP 5	107	990	990	00	990	970	—20
	132	1127	1070	—57	1077	1045	—32
	106	800	777	—23	795	800	5
	139	1150	1130	—20	1150	1087	—63
	138	1165	1070	—95	1075	1065	—10
	Total	5232	5037	—195	5087	4967	—120
	Herd No. of Cow	CORN SILAGE			SUNFLOWER SILAGE		
GROUP 6	22	1155	1130	—25	1165	1170	5
	89	865	870	5	875	880	5
	100	1005	1010	5	1010	1007	—3
	137	1090	1057	—33	1025	1080	55
	136	997	977	—20	977	970	—7
	Total	5112	5044	—68	5052	5107	55

TABLE 15.—Summary of Weights of Cows in Third Trial.

Feeding Periods and Difference	Weight of Cows at Beginning (Pounds)	Weight of Cows at End (Pounds)	Gain or Loss (—) in Weight (Pounds)
Sunflower Silage Period	10,284	10,144	—140
Corn Silage Period	10,199	10,011	—188
Difference in Favor of Sunflower Silage			48

when fed sunflower silage for a 21 day period, produced 1625.6 pounds of milk, 72.17 pounds of butterfat, and gained a total of 55 pounds in weight. The same five cows, when fed corn silage, produced 2164.1 pounds of milk, 91.48 pounds of butterfat, and lost a total of 68 pounds in weight.

Bringing together the results of the two groups, Tables 13 and 15 show that the ten cows, while being fed sunflower silage during a 21 day period, produced 3653.6 pounds of milk, 157.17 pounds of butterfat, had an average butterfat test of 4.3 percent, and lost a total of 140 pounds in weight. The same ten cows when fed corn silage produced 4108.6 pounds of milk, 172.56 pounds of butterfat, had an average butterfat test of 4.2 percent, and lost a total of 188 pounds in weight.

SUMMARY OF THE THREE FEEDING TRIALS

Tables 16 and 17 give a summary obtained by bringing the results of the three feeding trials together.

TABLE 16.—Summary of Production of the 28 Cows Used in the Three Trials.

Feeding Period and Difference	Total Pounds of Milk	Percent of Butterfat	Total Pounds of Butterfat
Sunflower Silage Period	14,295 9	3 83	547 05
Corn Silage Period	14,921 6	3 73	556 78
Difference in Favor of Corn Silage	625 7		9 73
Difference in Favor of Sunflower Silage		0 10	

TABLE 17.—Summary of Body Weights in the Three Trials.

Feeding Period and Difference	Weight at Beginning (Pounds)	Weight at) End (Pounds)	Loss in Pounds
Sunflower Silage Period	30,265	29,832	433
Corn Silage Period	30,047	29,816	231
Difference in Favor of Corn Silage			202

Table 16 shows that when twenty-eight cows were fed for a period of 21 days on sunflower silage, together with a basal ration of hay and grain, they produced 625.9 pounds of milk and 9.73 pounds of butterfat less than did the same twenty-eight cows when fed corn silage with the same basal ration for a period of similar length. Putting the results on a percentage basis, the groups fed sunflower silage produced 95.8 percent as much milk and 98.2 percent as much butterfat as did the groups fed corn silage. In all trials, the percentage of butterfat was slightly higher in the groups fed sunflower silage than in the groups fed corn silage. Table 17 shows that there was very little difference in the loss of weights of the cows when fed the different kinds of silage.

ANALYSES OF SUNFLOWERS

Samples were taken at different stages throughout one season from the time the sunflowers came into bud until they were mature. These samples were analyzed in order to determine their chemical composition at the various stages. The results of these analyses are given in Table 18.

These analyses, while limited in numbers, indicate that the sunflower plant does not reach its highest feeding value until about the dough stage. Results from the Illinois Station *(6)*, however, show that

TABLE 18.—Average Analyses of Sunflowers at Different Stages.

Stage Analyzed	Moisture (Percent)	Protein (Percent)	Carbohydrates (Percent)	Fiber (Percent)	Fat (Percent)	Ash (Percent)
Bud Stage	80.75	1.41	15.76	5.48	0.55	1 53
Full Blossom ..	86 69	1.21	10.01	3.90	0 50	1 59
Petals Dropping	83.97	1 12	12 47	5.56	0 66	1 78
Dough Stage ..	83.34	1.10	12 81	4.96	1.06	1 69
Mature	84.26	1.61	11.03	4.75	1 36	1 74
Silage	76 20	1 86	18.43	7.45	1.18	2 33

the sunflower plant becomes less palatable as it grows older, and that the best results were obtained when the crop was cut not later than the full blossom stage.

PALATABILITY OF SUNFLOWER SILAGE

In a few cases, in all of the groups, some of the cows refused to eat all of the sunflower silage at the beginning of the trial. All the cows, however, after they had been fed the sunflower silage for several days, ate it satisfactorily. They did not, however, seem to relish it as much as they did the corn silage.

There were no indications of ill health or digestive disarrangement from the feeding of sunflower silage. All the cows were in good health throughout the trials. The sunflower silage did not seem to be as laxative as the corn silage, but this was not noticeable to any great extent.

SUMMARY

The object of this investigation was to determine the relative feeding value of sunflower silage and of corn silage for the production of milk and butterfat, and for the maintenance of the weight of cows in milk.

Twenty-eight cows were used in the three trials. They were fed sunflower silage and a basal ration for a 21 day period, and corn silage plus a similar basal ration for another 21 day period. It was the plan, however, not to compare the two groups but rather to compare two feeding periods of the same group using one group as a check against the other.

Under the conditions of the experiment, the cows when fed sunflower silage produced 95.8 percent as much milk and 98.2 percent as much butterfat as they did when they were fed corn silage. In one trial, the cows when fed sunflower silage produced slightly more milk than they did when they were fed corn silage, but during the other two trials, the cows which were fed corn silage produced more milk. When the amounts of the silages fed were increased so that their effects would be more pronounced, the advantage of corn silage was increased.

The cows when fed sunflower silage maintained their weight almost as well as they did when they were fed corn silage.

Sunflower silage was slightly less palatable than corn silage, although most of the cows ate the sunflower silage very readily after they had become accustomed to it. Some of the cows, however, never did seem to relish it as well as they did corn silage.

In West Virginia, where sufficient good silage corn can be grown, there is no advantage in growing sunflowers for silage. In sections where sufficient corn cannot be grown, either because of short seasons or limited tillable acreage, the sunflowers will make a satisfactory substitute.

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APPENDIX

Experimental Data Records

TABLE 19.—Production of Group 1 Fed Sunflower Silage and Group 2 Fed Corn Silage by Week Periods During First Feeding Period of First Trial.

	Herd No. of Cow	Preliminary Week			First Week			Second Week			Third Week		
		Pounds Milk	Percent Fat	Pounds Fat	Pounds Milk	Percent Fat	Pounds Fat	Pounds Milk	Percent Fat	Pounds Fat	Pounds Milk	Percent Fat	Pounds Fat
GROUP 1	22	180.6	4 3	7.765	165.9	3.8	6.304	173.3	4.3	7.452	164.2	3 8	6.240
	9	151 2	3.6	5 443	146.8	3.3	4 844	145.7	3.8	5.537	147.0	3.5	5.145
	21	200.5	3 8	7 619	182 4	3.6	6.566	189.4	4 0	7.576	166 8	3.4	5.671
	5	242.5	5 2	12 610	229.7	5.0	11.485	230 4	5.2	11.981	224.8	5.0	11.240
	17	291 5	3 6	10 494	289 5	3 4	9.843	299.6	3.3	9 887	287 2	4 0	11 488
	Average	213 3	4.12	8 786	202.9	3.85	7.808	207 7	4.09	8.486	198 0	4 02	7.957
GROUP 2	7	114 0	4 2	4.788	95.4	4.4	4 198	101.3	3.2	3 242	102 1	4 0	4.084
	6	235 4	3.5	8 239	233.3	3.1	7.232	241 4	3 2	7 725	217.7	3.2	6.966
	16	305 8	3.0	9 174	299 6	3.2	9.587	284.8	3 1	8 829	286 1	2 8	8 011
	23	227.4	3.3	7.504	238 3	3.0	7.149	234 0	2 9	6 786	220 4	3.0	6 612
	18	267 8	3.8	10 176	247 5	3 8	9 405	238.1	4 0	9 524	220 9	3 7	8.173
	Average	230 1	3 47	7 976	222 8	3 37	7 514	219 9	3 28	7 221	209 4	3 23	6 769

TABLE 20.—Production of Group 1 Fed Corn Silage and Group 2 Fed Sunflower Silage During Second Feeding Period of First Trial.

	Herd No. of Cow	Preliminary Week			First Week			Second Week			Third Week		
		Pounds Milk	Percent Fat	Pounds Fat	Pounds Milk	Percent Fat	Pounds Fat	Pounds Milk	Percent Fat	Pounds Fat	Pounds Milk	Percent Fat	Pounds Fat
GROUP 1	22	179 4	4 2	7.535	189.8	3 6	6 833	170.0	3.5	5 950	183 4	3 5	6 419
	9	140.3	3.0	4 209	140.8	3.1	4 365	127.7	3 0	3.831	128 6	3 6	4 630
	21	183 8	3 6	6 617	183.4	3.4	6 236	170 3	3 6	6.131	172 1	3 2	5 507
	5	216 6	4 8	10 397	212 0	6 3	13.356	205.1	5 5	11 280	195 6	5 5	10 758
	17	277 9	3 8	10 560	266 6	3 9	10 397	254 4	3.2	8 141	265 8	3 2	8 506
	Average	199 6	3 94	7 864	198.5	4 15	8.237	185 5	3 8	7 067	189.1	3 78	7 164
GROUP 2	7	87 1	3 4	2 961	92 5	4.6	4.255	91 2	4.1	3 739	100 2	4 2	4 208
	6	208 0	3 0	6 240	221 6	3 5	7.756	205.5	3 2	6 576	198 3	3 2	6 346
	16	264.6	3 4	8.996	252 3	3.1	7 821	253 9	3.2	8 125	253.7	3 1	7 865
	23	206.0	3 5	7 210	197 5	3 3	6.517	170 7	3.3	5 633	186 4	3 6	6 710
	18	205 1	4 1	8 409	196 0	4 0	7 840	211.7	3 8	8 045	189 6	3 8	7 205
	Average	194 2	3 48	6 763	192 0	3 56	6 838	186 6	3.44	6 424	185 6	3 48	6 467

TABLE 21.—Production of Group 3 Fed Sunflower Silage and Group 4 Fed Corn Silage During First Feeding Period of Second Trial.

	Herd No. of Cow	Preliminary Week			First Week			Second Week			Third Week		
		Pounds Milk	Percent Fat	Pounds Fat	Pounds Milk	Percent Fat	Pounds Fat	Pounds Milk	Percent Fat	Pounds Fat	Pounds Milk	Percent Fat	Pounds Fat
GROUP 3	48	149 4	3 70	5 528	139 3	3 65	5 084	132 9	3 55	4 718	137 0	3 60	4 932
	4	255 2	3 40	8 677	266 6	3 50	9 331	257 3	3 20	8 234	271 9	3 15	8 565
	50	234 6	4 35	10 205	216 5	4 25	9 201	194 1	4 35	8 443	198 9	4 00	7 956
	43	294 8	3 85	11 350	292 9	4 05	11 862	270 1	4 00	10 804	287 0	3 65	10 475
	Average	233 5	3 83	8 940	228 8	3 88	8 869	213 6	3 77	8 050	223 7	3 57	7 982
GROUP 4	47	188 5	3 60	6 786	183 7	3 60	6 613	192 9	4 35	8 391	181 7	3 50	6 359
	16	257 3	3 00	7 719	224 2	3 00	6 726	247 9	3 00	7 437	236 6	3 00	7 098
	52	146 3	4 15	6 071	147 1	4 15	6 105	130 8	3 95	5 167	124 2	4 10	5 092
	36	179 7	4 20	7 547	207 5	3 30	6 847	202 2	3 20	6 470	202 1	3 20	6 467
	Average	193 0	3 64	7 031	190 6	3 45	6 573	193 4	3 55	6 866	186 1	3 36	6 254

TABLE 22.—Production of Group 3 Fed Corn Silage and Group 4 Fed Sunflower Silage During Second Feeding Period of Second Trial.

	Herd No. of Cow	Preliminary Week			First Week			Second Week			Third Week		
		Pounds Milk	Percent Fat	Pounds Fat	Pounds Milk	Percent Fat	Pounds Fat	Pounds Milk	Percent Fat	Pounds Fat	Pounds Milk	Percent Fat	Pounds Fat
GROUP 3	48	139 8	3 20	4 474	152 4	3 40	5 182	148.4	3 30	4 897	142 8	3 50	4 998
	4	260 9	3 40	8 871	250 9	3 05	7.652	252 9	3 10	7 840	243 0	3 10	7.533
	50	185 2	4 25	7 871	177.3	4 35	7.713	171 6	4 40	7 550	160 4	4 60	7 378
	43	263 0	3 20	8 416	257 2	3 60	9.259	232 8	3 55	8 264	215 9	3.40	7 341
	Average	212 2	3 49	7 408	209 4	3 56	7 451	201 4	3 54	7 138	190 5	3 58	6 812
GROUP 4	47	164 6	3 55	5 843	180 0	3 20	5 760	178 8	3 20	5 722	166 3	3 30	5 488
	16	215 6	3 00	6 468	227 1	3 00	6 813	242 7	3 05	7.402	223 7	2 80	6 264
	52	112 1	4 55	5 100	119 8	4 55	5 451	115.7	4 35	5 033	102 2	4 30	4 395
	36	190 1	3 25	6 178	191 0	3 30	6 303	188.1	3 20	6 019	178 6	3 20	5 715
	Average	170 6	3 46	5 897	179 5	3 39	6 082	181 3	3 33	6 044	167 7	3 26	5 465

TABLE 23.—Production of Group 5 Fed Sunflower Silage and Group 6 Fed Corn Silage During First Feeding Period of Third Trial.

	Herd No. of Cow	Preliminary Week			First Week			Second Week			Third Week		
		Pounds Milk	Percent Fat	Pounds Fat	Pounds Milk	Percent Fat	Pounds Fat	Pounds Milk	Percent Fat	Pounds Fat	Pounds Milk	Percent Fat	Pounds Fat
GROUP 5	107	115.3	5.6	6 457	97.2	5.6	5.443	103.9	5.3	5.507	103.5	4.60	4 761
	132	103 2	3 9	4 025	91.7	3.9	3.576	90.3	4.0	3.612	91.6	3 65	3.343
	106	92 1	5 6	5.158	78.1	5.4	4.217	81.4	5 2	4 233	77.4	5.19	3 947
	139	243 1	4 0	9 724	215.5	3.8	8.189	204 4	4 0	8.176	180 9	4 05	7 326
	138	247 3	3 9	9 645	217.8	3.7	8 059	207.5	3.8	7.885	186 8	3.60	6 725
	Average	160 2	4.37	7 002	140.06	4 21	5.897	137.5	4 28	5 883	128 04	4 08	5 220
GROUP 6	22	150 7	4 4	6.631	133.0	4.4	5.852	119.1	4.4	5.240	110.9	4.20	5.101
	89	86.9	4.0	3.476	79 9	3.7	2.956	78.9	3.9	3 077	75.0	4.60	3.150
	100	112.4	6.0	6.774	101.2	5.7	5.768	100.9	6.2	6.256	95.8	5.95	5.700
	137	270 2	4.1	11.078	254.5	4.2	10.689	218 0	4.1	8.938	199.6	4.20	8.383
	136	223.6	3 4	7.602	207.4	3.4	7.052	201.5	3.2	6 448	188.4	3.65	6.877
	Average	168 76	4 21	7 112	155 2	4.16	6.463	143 68	4.17	5 992	133.94	4.36	5 842

TABLE 24.—Production of Group 5 Fed Corn Silage and Group 6 Fed Sunflower Silage During Second Feeding Period of Third Trial.

	Herd No. of Cow	Preliminary Week			First Week			Second Week			Third Week		
		Pounds Milk	Percent Fat	Pounds Fat	Pounds Milk	Percent Fat	Pounds Fat	Pounds Milk	Percent Fat	Pounds Fat	Pounds Milk	Percent Fat	Pounds Fat
GROUP 5	107	101.4	4.80	4 867	97 8	5.3	5.183	100.1	5.40	5.405	94.9	5.55	5 267
	132	90.1	3.70	3.333	92 4	3.4	3.142	90.3	3.50	3.160	80 8	3 50	2 828
	106	80.4	5.05	4 060	87 5	4 8	4.200	84 2	5.05	4 252	84 1	5.00	4 205
	139	191 2	3.90	7 457	207.3	3.9	8.085	181.6	4 50	8.172	171 8	3 80	6 528
	138	199.3	3 60	7 175	213 9	3.7	7.914	189.2	3 70	7.000	168 6	3 40	5 732
	Average	132 48	4 06	5 378	139 78	4 08	5.705	129 08	4.34	5.598	120 04	4 09	4 912
GROUP 6	22	92.5	3 60	3.330	73.7	4.6	3.390	62.7	4.95	3.104	56 3	4.50	2 533
	89	64.6	3 60	2 326	58.8	4.2	2.470	59.1	4 25	2 512	51 9	4 15	2 154
	100	90 4	6 00	5 424	89 1	6 0	5.346	88.4	6.10	5.392	82 9	5 90	4 891
	137	199.9	4 20	8 396	194.1	4 3	8 346	178 8	4.30	7.688	171.5	4 30	7 374
	136	168 0	3 05	5.124	157 6	3.7	5.831	154.3	3.70	5.709	146.4	3.70	5 417
	Average	123 08	4 00	4 920	114 66	4 43	5 077	108.66	4 49	4.881	101 8	4 39	4 474


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