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KANSAS STATE AGRICULTURAL COLLEGE.

ALFALFA SILAGE.

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SUMMARY.

1. Alfalfa will make a fairly goodquality of silage, and it will be readily eaten by cattle if fed within a few months after being siloed.

2. Observations during the experiment indicate that when it is possible to make alfalfa into first-class hay it should not be put into the silo. During a rainy season it is almost impossible to get the hay up without some damage, and under such conditions siloing may be justified.

3. The addition of carbohydrate material, such as corn meal, blackstrap molasses, sweet-sorghum stover, and green rye, to alfalfa when put into the silo resulted in preserving it for a longer time than when the alfalfa was siloed alone.

4. Of the supplements used in these experiments blackstrap molasses proved to be the best, corn chop was next in order, followed by sweet-sorghum stover and green rye.

5. The mixture of alfalfa and blackstrap molasses was the most practical one used. Inasmuch as the addition of the molasses to alfalfa did not increase the bulk, it was possible to preserve large quantities of alfalfa within a comparatively small space.

6. There is as much acid produced in alfalfa silage as in kafir or cane silage. This would indicate that the acid content of silage is not always an index to the quality of the silage. Most of the acid developed in alfalfa silage was produced within the first two weeks.

7. Although the silage made from rye alone was not palatable in this experiment, it will make a fair quality of silage when preserved in large silos. The best time to cut rye for silage is when the grain is in the late milk and early dough stages.

Alfalfa Silage

By O. E. REED and J. B. FITCH.

THE demand for information relative to the making of silage from alfalfa is prompted by the fact that it is quite often impossible to harvest the first crop of alfalfa as hay. In Kansas there are more than a million acres of alfalfa, and thousands of tons of this material are either spoiled or made into a poor quality of hay each season because of damage by rain during the harvest period. Many farmers have sought to make silage from alfalfa. The experiences of this and other experiment stations, as well as of farmers, have shown that when alfalfa is put into the silo it will make a very good feed if used within a few months after it is siloed, but beyond this limit it deteriorates very rapidly in quality. It takes on a very offensive odor and is not relished by livestock.

The presence of acid is necessary in making silage. Lactic acid, the principal acid in sour milk, is the acid present in the greatest amount and is the most important acid in preserving silage. The acids are produced by the action of bacteria upon the sugars and other carbohydrate materials in the plants used for silage. Such plants as corn and sorghums make the very best quality of silage because they contain sufficient fermentable material to produce the amount of acid necessary to preserve silage. Sweet sorghum contains an abundance of sugar, and when cut at a certain stage of maturity and siloed it develops so much acid that the silage is too sour to be highly relished by stock.

When a legume like cowpeas is siloed alone a poor quality of silage is made, but when cowpeas are siloed with some other crop, such as corn, a first-class silage is produced.

The California experiment station reported an experiment in making silage from alfalfa, but the alfalfa used in this trial contained more than 50 percent of meadow foxtail. Foxtail contains a high percentage of carbohydrate material, which was probably responsible for the good quality of the silage reported.

Judging from the chemical composition of alfalfa and other legumes it does not appear that there is a shortage of carbo-

hydrate material in these plants. It is possible, however, that a portion of the carbohydrates that they contain are not in form to be available for the bacteria which produce lactic acid. As a consequence the bacteria may attack the protein instead, and produce products which are undesirable in silage making.*

In preliminary experiments carried on in coöperation with the chemistry department at this station it was found that the addition of materials such as molasses, corn chop and other supplements containing a high percentage of carbohydrate material was effective in preserving the alfalfa as silage. In the preliminary experiments the silage was put up in bottles. Later special silos were built, and the experiments reported at this time were carried on with these small silos.

Plan of Experiment.

Seven small silos were erected in the spring of 1914. The silos were 7 feet in diameter and 16 feet in height and were estimated to hold 10 tons of silage. They were made of ¾-inch tongue-and-groove yellow-pine flooring. The silos were built on a base 18 inches in height and 8 inches wide, and had a cement floor. The staves were held together by a cable formed by twisting two strands of No. 9 wire together. These cables were placed around the silo 2 feet apart. A 6-inch plate at the top of the silo and a wooden band half way up on the silo, in addition to the plate bolted to the cement base, held the silo firmly in place. An 18-inch continuous door form was made by putting two 2-by-4's on either side of the opening and holding them together by means of long bolts through ¾-inch pipes, which served as a ladder. The wire cables were also wound around the 2-by-4's on either side of the door. A roof was made for each silo. When ready to fill the silos were apparently as airtight as larger silos of heavier material.

The experiment was carried on for two years, the silos being filled for the first time in the spring of 1914 and again in the spring of 1915. During the first trial several difficulties, such as insufficient weight to insure proper packing and method of sampling, were encountered, but these were overcome during the second trial.

* Investigations on this subject are now being carried on by the bacteriology department at this station.

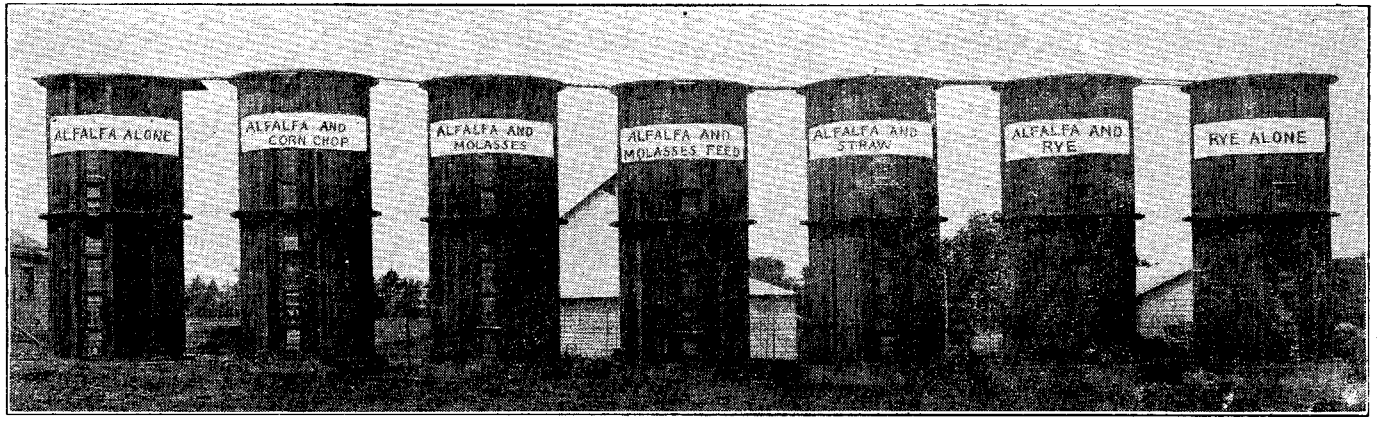

FIG. 1 Silos used in alfalfa silage experiments. Mixtures as shown here reported in first trial, 1913-1914

In the first year's work the following combinations of material were siloed:

Alfalfa alone.
Alfalfa and corn chop, 10 to 1.
Alfalfa and blackstrap molasses, 20 to 1.
Alfalfa and alfalfa-molasses feed, 10 to 1.
Alfalfa and straw, 4 to 1.
Alfalfa and green rye, 2 to 1.
Rye alone.

In the second year's work the following combinations of materials were used:

Alfalfa alone.
Alfalfa and blackstrap molasses, 20 to 1.
Alfalfa and blackstrap molasses, 10 to 1.
Alfalfa and corn chop, 10 to 1.
Alfalfa and sweet-sorghum stover, 6 to 1.
Alfalfa and green rye, 2 to 1.
Rye alone.

One silo was filled with rye each year, as it was planned to get some information in regard to this crop for silage. The results, however, were not entirely satisfactory.

A palatability test, conducted each year, obtained information as to how cattle would relish the various combinations. Chemical analyses were made of the silage by the chemistry department. Bacteriological study was also made of the silage by the bacteriology department. Some of the chemical analyses are reported in this bulletin, but a detailed report of the chemical and bacteriological studies will be made in separate reports.

Results for 1914-1915.

The silos were filled, beginning May 23, 1914, with the first cutting of alfalfa. The alfalfa was cut when about one-tenth in bloom, which is a very common practice in this locality. When sufficient alfalfa had been cut to start hauling, the alfalfa was raked into windrows, loaded on the racks and hauled to the silo. The alfalfa was run through a No. 19 Ohio silage cutter, elevated into the silo by means of a blower, and was tramped by two men using a distributor. Some difficulty was experienced in getting the material cut as short as desired on account of a great number of stems passing through the machine parallel to the knives. When there was no delay in getting the material to the silo the alfalfa contained sufficient

moisture to pack well in the silo. A third man was put into the silo to assist in tramping when the silo was two-thirds full. After the silo was filled it was rounded up well on top and well tramped.

Silo 1 was filled with alfalfa alone. The silage settled quite rapidly for the first two or three days, and at the end of the first week had settled about 3 feet from the top of the silo. After this it settled very gradually to a depth of 5 feet from the top of the silo. This silo contained 9 tons of silage.

Silo 2 was filled with alfalfa and corn chop. It was planned to mix the alfalfa and corn chop in the proportion of 10 parts of alfalfa to 1 part of corn chop, by weight, but the actual weights show the materials to be mixed in the proportion of 13 parts of alfalfa to 1 part of corn chop. Each load of alfalfa was weighed and an effort was made to add the corn chop in the proportion as previously mentioned. The dry corn chop was added to the alfalfa as it passed through the silage cutter. This silo contained 7.9 tons of the mixture.

Silo 3 was filled with alfalfa and blackstrap molasses. The plan was to mix the materials in the proportion of 20 parts of alfalfa to 1 part of molasses, but the actual proportion was 17 parts of alfalfa to 1 part of molasses. The molasses was weighed and poured over the alfalfa as it went through the cutter. In this way it was well distributed over the cut material. This silo contained 7.1 tons of the mixture.

Silo 4 was filled with a mixture of alfalfa and alfalfa-molasses feed. The actual proportion in this silo was 11 parts of alfalfa to 1 part of alfalfa-molasses feed, instead of 10 parts alfalfa to 1 part alfalfa-molasses feed as planned. The alfalfa-molasses feed was made by a local feed concern and consisted of a mixture of ground alfalfa hay and blackstrap molasses. The molasses made up about 30 percent, by weight, of the mixture. The molasses feed was added to the alfalfa as it passed through the cutter. This silo when full contained 7.4 tons of the mixture.

Silo 5 was filled with a mixture of alfalfa and wheat straw in the proportion of 4 parts of alfalfa to 1 part of straw. As with other mixtures, the alfalfa and straw were thrown together on the table of the silage cutter and were cut and mixed in passing through the cutter. The addition of the wheat straw made a bulky mixture which packed less readily

than the other mixtures used. When full this silo contained 6.9 tons. The material in this silo settled more rapidly than in the other silos, and was refilled with 1.5 tons of green rye in order to add weight.

Silo 6 was filled with a mixture of alfalfa and green rye. The actual weights show the alfalfa and rye to have been mixed in the proportion of 1.5 parts of alfalfa to 1 part of rye, instead of 2 parts of alfalfa to 1 of rye as originally planned. This rye was sown in the fall, pastured during the fall and winter, and allowed to grow out the following spring. It was cut when the grain was in the milk stage. The materials were mixed on the silage cutter and passed through the cutter together. There was some difficulty in getting the material finely cut and it was very difficult to pack. The silo when full contained 10.6 tons of the mixture. After settling overnight this silo was refilled with a ton of rye.

Silo 7 was filled with rye alone. The rye was difficult to cut and consequently did not pack readily. When filled this silo contained only 6.4 tons. After settling overnight it was refilled by adding a half ton of rye.

The silos were all treated alike in regard to filling, but the silage did not settle uniformly. After being tramped daily for the first week the roofs were placed on the silos. The silage at the surface rotted and sealed the top apparently the same as with the common silage crops.

The silos were opened in January, 1915, after standing seven months. In most cases the silage had settled five or six feet from the top of the silo and had drawn away slightly from the wall at the surface. The exceedingly dry, hot weather of 1914 perhaps caused more drying than would have occurred during a normal year. The upper two feet of silage was spoiled in all the silos. The silage made from alfalfa alone was very dark in color and it had a disagreeable odor, which is characteristic of alfalfa when preserved in the silo. The mixtures of alfalfa and corn chop, alfalfa and molasses, alfalfa and molasses feed, all showed a dark-green color. All of the mixtures had a strong odor. The moisture content of all mixtures except the alfalfa and rye was very low. This was due in part to the fact that there was not sufficient weight in the silo to cause thorough settling and packing, and also to the fact that the silos were not entirely airtight. There

was also a great deal of evaporation from the top of the silage. The mixtures of alfalfa and straw and alfalfa and molasses feed did not make a good quality of silage. On the whole, the results obtained in this trial were not satisfactory.

Palatability Test, 1914-1915.

In order to determine the palatability of the above mixtures of silage they were fed to a herd of forty beef cattle in the following manner: Six large feeding bunks were lined up, about one rod apart, across a feed lot and 150 pounds of each kind of silage was thrown into separate bunks daily. Throughout the entire palatability test the bunks were left in the same position and the mixtures were placed in the same bunks each day. The cattle had free access to these bunks at all times, and the test was continued for two weeks. For the first two or three days the cattle had little regard for the different mixtures, but as they became accustomed to them they began to discriminate, and it was apparent that there was a difference as shown by the number of animals around the different bunks and by the length of time they remained at these bunks.As shown in the accompanying pictures, the cattle showed their preference for the mixtures in the following order: alfalfa and molasses, alfalfa and corn chop, alfalfa alone, alfalfa and rye, alfalfa and molasses feed, alfalfa and straw, and rye alone. No attempt was made to ascertain the feeding value of the different silages.

TABLE I.

Percentage composition of silage as sampled. First trial, 1914-1915.

Material.	Moisture.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Ether extract.	Acidity.
Alfalfa	45.61	6.29	10.63	13.34	21.31	2.81	1.81
Alfalfa and corn chop	40.99	6.23	8.62	13.64	28.60	1.92	1.78
Alfalfa and molasses	46.93	7.23	10.04	12.14	21.62	1.83	1.87
Alfalfa and molasses feed	37.09	6.71	12.02	14.03	28.26	1.87	1.48
Alfalfa and straw	55.53	5.04	6.37	14.63	16.23	1.89	1.41
Alfalfa and rye	72.08	3.25	4.39	5.25	11.09	1.15	1.55
Rye	57.22	3.01	5.55	13.71	18.25	1.45	1.94

FIG. 2. This picture shows the result of the palatability test. Equal amounts of the several kinds of silage were placed in separate bunks. Forty head of cattle had access to all bunks. Their preference for each kind of silage was determined by the amount consumed.

Chemical Analyses, 1914-1915.

Analyses of the silage in different silos were made by the chemistry department and the results are given in Table I. The samples for these analyses were obtained by boring into the side of the silo with a 2-inch auger. The boring extended to about the center of the silo. A study of Table I shows that the moisture content of all silages is low with the exception of alfalfa and rye. Normal silage contains 60 percent or more of moisture. The mixtures containing the highest acid content were more palatable to the cattle than those containing a small amount of acid, with the exception of rye alone. It was decided that the high acid content of the rye silage was due to the immaturity of the crop when it was put into the silo, as it was cut when the grain was in the milk stage. Table II gives the composition of the various materials used in the silage mixtures.

TABLE II.

Percentage composition of materials used in mixtures before going into the silos.

Material.	Moisture.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Ether extract.	Acidity.
Alfalfa	42.79	6.99	11.00	13.55	23.98	1.69	.45
Rye	60.31	4.19	5.44	13.69	15.12	1.26	.48
Molasses feed	4.11	7.94	13.81	21.00	51.26	1.88	.....
Wheat straw	4.47	7.71	6.44	32.94	47.00	1.44	.....
Corn chop	8.14	1.41	11.25	2.39	75.17	1.64	.....
Blackstrap molasses	22.42	7.38	3.84	.....	66.36	.....	.....

Results for 1915-1916.

The plan of the second year's work was slightly changed. The mixture of alfalfa-molasses feed was discontinued and a mixture of 10 parts of alfalfa to 1 of molasses was substituted. The alfalfa-straw mixture was also discontinued and a mixture of 1 part of sweet-sorghum stover to 6 parts of alfalfa was used in its place. Prior to filling the second time the seven silos were painted on the inside with a thick asphalt paint and were also painted on the outside. In order to pack the silage more firmly and prevent such a large amount of silage from being spoiled, additional weight was obtained by placing bags of sand on top of the silage after they were filled.

The same general plan of filling the silos as used the first year was followed the second year.

Silo 1 was filled with alfalfa alone, beginning May 17, 1915. at noon. On this date 6.95 tons of alfalfa was run into this silo, which filled it about three-fifths full. On the following day it rained 3.2 inches and filling was not resumed until the second day afterward. A temporary cover was put on the silo during the rain. Most of the alfalfa put into the silo at this time had been raked into windrows previous to the rain and was very wet. Four and one-half tons of this wet alfalfa was added, making a total of 11.4 tons in this silo. Immediately after filling the surface was covered with a layer of spoiled kafir silage, and two days later it was weighted down by adding a ton of sand in bags distributed evenly over the top. This caused the silage to settle more rapidly, and at the end of the first week it had settled about 4 feet. After the sand had been placed on top of the silage another 3-inch rain fell before the roof had been put on. Much of the water was absorbed by the bags of sand.

Silo 2 was filled with a mixture of 20 parts of alfalfa to 1 part of blackstrap molasses. Filling began at noon May 19. Alfalfa was used which was cut on May 17 and rained on in the windrows on the 18th. As stated above, it was planned to mix the alfalfa and molasses in the proportion of 20 parts of alfalfa to 1 of molasses, but the actual weights of the material used were in the proportion of 23 : 1. After 4.5 tons had been run into this silo filling was stopped on account of rain. The silage was covered to keep out the water, and rain prevented filling until three days later, when the surface foot of silage, which had partly spoiled, was thrown off and filling was resumed. Seven and one-half tons were required to finish filling, making 12 tons in this silo, Before this silo was covered 1.5 inches of rain wet the surface. The following day a ton of sand was put on the top. The bottom 5 feet of this silage was very wet, as noted above, and for one day after filling water oozed out at the bottom of the silo.

Silo 3 was filled with a mixture of alfalfa and blackstrap molasses, in the proportion of 10 parts of alfalfa to 1 of molasses. The silo was filled with 11.4 tons of the mixture. One and a half inches of rain fell on the silage the following day,

and after settling more than a foot it was refilled with a ton or more of waste material and then weighted down.

Silo 4 was filled with a mixture of alfalfa and corn chop in the proportion of 10 parts of alfalfa to 1 part of corn chop. Instead of using dry corn chop, as was done the first year, the corn chop was soaked for an hour before being added to the alfalfa. When 8.2 tons of this mixture had been put into the silo continued rains stopped the filling for an entire week. When filling was resumed a foot of spoiled material was thrown off the top of the silage and five tons of very wet alfalfa were added. NO corn chop was mixed with this alfalfa. The silage was then weighted down and covered,

Silo 5 was filled with a mixture of alfalfa and sweet-sorghum stover in the proportion of 6 parts of alfalfa to 1 of stover. The actual proportion as shown by the weights of the materials used was 5.2 parts of alfalfa to 1 of sweet-sorghum stover. This stover was obtained from sweet sorghum that had been grown for seed and headed. The sorghum stover was stacked in the fall, and on account of poor stacking had deteriorated somewhat during the winter and was poor in quality, but was the only material of this kind available. The silo was filled with 7.6 tons of this mixture and weighted down.

Silo 6 was filled with a mixture of alfalfa and rye in the proportion of 2 parts of alfalfa to 1 part of rye by weight. This silo was filled with 7.5 tons of this mixture, and was refilled later with 1000 pounds of rye and weighted down. The rye used in this silo was mostly in the dough stage when cut.

Silo 7 was filled with 5.6 tons of rye and weighted down,

The silos were opened December 20, 1915, six and one-half months after they were filled. In opening the silos this year it was noticed that there was much less spoiled material than in the previous year, There was less than 8 inches of spoiled silage on the surface. The silage in all silos was in much better condition than in the previous year's experiment, and the results obtained in this trial are considered more valuable than those in the previous trial.

TABLE III.

Percentage composition of alfalfa silage. Second Trial 1915-1916.

Silo No.	Description of Sample.	Moisture.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Ether extract.	Acidity.	Sugar.
1	Alfalfa alone—								
	When filled	62.75	4.60	6.94	10.32	13.63	1.76	.450	1.039
	Taken out	67.23	4.17	5.51	9.75	12.23	1.11	1.483	.....
2	Alfalfa and molasses, 20:1—								
	When filled	70.83	3.21	4.75	6.93	13.10	1.18	.394	1.157
	Taken out	73.08	2.80	4.48	7.67	11.00	.97	2.413	.....
3	Alfalfa and molasses, 10:1—								
	When filled	64.85	4.95	5.31	7.53	16.07	1.29	.389	5.890
	Taken out	63.53	5.22	5.93	9.49	14.44	1.39	3.009	.....
4	Alfalfa and corn chop, 10:1—								
	When filled	66.80	3.25	5.25	7.21	16.02	1.47	.378	.900
	Taken out	67.08	5.23	5.10	8.59	12.79	1.20	2.242	.....
5	Alfalfa and sorghum stover, 6:1—								
	When filled	64.75	4.15	5.69	10.54	13.27	1.60	.387	.696
	Taken out	62.30	5.56	5.51	11.26	13.82	1.55	1.856	.....
6	Alfalfa and rye, 2:1—								
	When filled	63.25	5.36	6.00	9.23	9.18	1.58	.495	3.170
	Taken out	67.49	4.21	4.93	10.20	11.86	1.40	1.975	.....
7	Rye alone—								
	When filled	62.25	3.65	3.80	6.17	23.05	1.08	.450	1.870
	Taken out	62.27	3.72	3.83	13.17	15.67	1.34	1.917	.....

The first sample in each case was taken at the time the silos were filled. The second sample represents a composite of samples taken before the silos were opened.

Palatability Test, 1915-1916.

A palatability test, as previously described, was conducted for twelve days. The silage mixtures were preferred by the animals in the following order: alfalfa-molasses, 20-1; alfalfa-molasses, 10-1; alfalfa and corn chop; alfalfa and rye; alfalfa and sweet-sorghum stover; alfalfa alone. Very little difference was shown between the first five mixtures. In a few cases the alfalfa and sorghum stover seemed to be preferred to the alfalfa and corn chop and alfalfa and rye silage. The poor quality of the sorghum stover accounts for the fact that the alfalfa and sorghum stover silage was not relished at times. The cattle ate very little of the alfalfa silage alone. No attempt was made to determine the feeding value of the different mixtures used.

Chemical Analyses, 1915-1916.

The chemical analyses as made by the chemistry department are reported in Table III. Two analyses are given for each kind of silage. The first analysis in each case represents the composition of the mixture as it was run into the silo. These samples were taken as the cut materials were blown into the silos. The samples for the second analysis given were composites taken several times during the process of silage making and represent the finished product. A study of the analysis of the silage in connection with the palatability test shows that the silages containing the highest percent of acid were most palatable to the cattle, with the exception of the rye alone.

As already pointed out, the production of acid in the silo is necessary in preserving any crop as silage. These acids are obtained by the action of the bacteria upon the carbohydrate material, and more particularly upon the sugar. Table No. IV shows the sugar and acid content of the silage at different stages of fermentation. Samples were taken for this analysis by boring into the side of the silo as previously mentioned. It will be noticed that all silage mixtures contained sugar when first siloed and there was a trace of acid in all the silage, The sugar was gradually lost and was practically all used up within the first three weeks, while the acid content gradually increased in all silos.

To obtain a further check upon the several analyses as made by the chemistry department, samples of silage from each silo were placed in telescoping cans at the time the silos were filled. These cans were placed near the bottom of the silo and remained there until the silos were empty. The telescoping cans were so arranged that they could be filled with about 50 pounds of material and placed in such a position that the top cover

TABLE IV.

Sugar and acid content of silage at different stages.

SILO No. 1. Alfalfa alone.			SILO No. 2. Alfalfa and molasses, 20:1.			SILO No. 3. Alfalfa and molasses, 10:1.		
Days after filling.	Per cent lactic acid.	Per cent sugar.	Days after filling.	Per cent lactic acid.	Per cent sugar.	Days after filling.	Per cent lactic acid.	Per cent sugar.
5-17-15	.450	1.039	5-20-15	.374	.293	5-22-15	.389	.....
1	.531	.765	1	.927	Lost.	1	.702	5.890
2	.621	.710	5-22-15	.414	2.020	2	2.394	.900
3	.797	.820	2	.333	1.940	3	2.056	.600
4	.936	.629	3	.720	1.560	5	2.808	.410
5	.963	.....	4	1.724	.286	7	2.808	.477
7	1.174	.300	6	1.886	.164	9	3.015	.205
9	1.062	.820	8	2.466	.....	12	3.123	.273
11	1.714	.....	11	2.403	.....	14	3.204	.437
14	1.629	.259	13	2.443	.....	17	3.042	.114
16	1.476	.396	15	2.470	.....	21	3.172	.442
18	.633	.....	18	2.241	.....	25	2.965	.321
21	1.279	.314	22	2.538	.....	29	3.069	.340
25	1.152	.242	26	2.808	.....	33	3.024	.....
29	1.845	.....	32	2.443	.....	38	3.172	.850
35	1.431	.....	34	2.448	.....	68	2.813	.....
37	1.183	.....	39	2.704	.....	112	3.745	.....
42	1.260	.....	69	2.444	.....	158	3.348	.....
72	1.935	.....	112	2.452	.....	206	3.556	.....
115	1.674	.....	160	2.241	.....	can	2.853	.....
163	1.562	.....	208	2.898	.....			
211	1.728	.....	can	3.411	.....			
can	1.557	.....						

SILO No. 4. Alfalfa and corn chop, 10:1.			SILO No. 5. Alfalfa and sweet-sorghum stover, 6:1.			SILO No. 6. Alfalfa and rye, 2:1.		
Days after filling.	Per cent lactic acid.	Per cent sugar.	Days after filling.	Per cent lactic acid.	Per cent sugar.	Days after filling.	Per cent lactic acid.	Per cent sugar.
5-24-15	.378	.900	5-31-15	.387	.696	6-1-15	.495	3.170
1	1.210	.133	1	.618	.423	1	.859	.629
2	1.283	.164	2	.972	.....	2	1.395	.368
3	1.521	.....	3	1.161	.....	3	1.885	.....
4	1.836	.....	4	1.584	.123	5	1.863	.....
7	1.809	.....	6	1.273	.....	7	1.845	.....
10	1.755	.....	8	1.768	.....	9	1.777	.....
12	1.791	.....	10	1.521	.....	11	2.097	.....
15	1.954	.....	12	1.498	.....	14	1.759	.....
19	1.827	.....	15	1.728	.....	18	2.106	.....
23	2.173	.....	19	1.949	.....	22	2.133	.....
27	2.254	.....	23	1.890	.....	27	1.585	.....
31	2.250	.....	28	1.759	.....	57	2.021	.....
36	2.286	.....	58	1.913	.....	91	2.455	.....
66	2.376	.....	92	2.412	.....	150	1.971	.....
110	3.357	.....	150	2.648	.....	198	2.502	.....
156	3.078	.....	198	2.196	.....	can	2.646	.....
204	3.366	.....	can	1.485	.....			
can	2.988	.....						

would press down over the bottom part and in this way subject the sample to the same pressure as the other silage. The analysis for sugar and acid of the sample contained in these cans are given for each silo in the table. The silage in these cans was of decidedly better quality than in the silos. This is explained by the fact that these cans were practically airtight, while the silos were not. Where silage is stored in an ordinary silo the results would compare favorably with the results obtained in these cans.

TABLE V.

Composition of alfalfa, corn, kafir and sweet-sorghum silage.

Silage.	Moisture.	Ash.	Crude protein.	Crude fiber.	Nitrogen-free extract.	Ether extract.	Acidity.
Alfalfa	67.23	4.17	5.51	9.75	12.23	1.11	1.483
Corn	74.30	1.78	3.00	5.90	14.34	.80	2.000
Kafir	66.60	2.16	2.86	7.39	20.03	.96	1.360
Sweet sorghum	69.10	1.91	2.54	6.84	18.57	.93	1.420

Table V gives the analysis of corn kafir and sweet sorghum silage for comparison with the analysis of alfalfa silage. It will be noticed that the alfalfa silage has more acid in it than any other, except corn silage, which fact suggests that the amount of acid developed in the silage is only one of the factors in making good silage. Alfalfa mixtures that make good silage contained a very much higher percentage of acid than ordinary silage. It is believed that the development of a large percent of acid in alfalfa silage is necessary to keep down unfavorable fermentations.