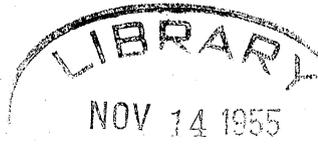


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AGRICULTURAL EXPERIMENT STATION of The Alabama Polytechnic Institute, Auburn, Ala.

E. V. SMITH, Director

CALEY PEA SILAGE and JOHNSONGRASS HAY in the RATION of DAIRY COWS



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Good quality roughage is of primary importance to the success of dairy farming. Dairy cows should be provided a liberal allowance of good quality roughage at all times. When pastures are short or cannot be grazed because of weather conditions, it is essential that cows be fed harvested roughage in the form of hay, silage, or a combination of both. Therefore, where economically possible, all surplus forage should be harvested and stored.

Caley peas (Lathyrus hirsutus), a common crop in the Black Belt Area, make surplus growth in the spring. Research results at experiment stations in other states indicate that surplus spring growth of forage may be preserved satisfactorily as silage. Conversely, hay-making conditions are generally poor during the spring. It would appear, therefore, that the surplus growth of Caley peas should be preserved as silage.

Since there was a lack of information concerning the nutritive quality of Caley pea silage, an experiment was conducted during the winter of 1954-55 to compare Caley pea silage with Johnsongrass hay in the ration of lactating dairy cows. Johnsongrass hay was used as the comparative forage because it is the most common hay crop in the Black Belt Area.

Procedure

The Caley pea silage fed in this study was harvested with a field forage harvester and stored in an upright silo during the spring of 1954. Sodium metabisulfite, at the rate of 8 pounds per ton, was added to the Caley pea forage as a preservative. This silage, which was green in color and had a pleasant aroma, contained 74 per cent moisture when fed. The Johnsongrass hay fed during the experiment was harvested in the summer of 1954 and was of good quality. This hay was field-cured and made with a hay conditioner, which cracks the stems to hasten curing.^{2/}

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^{2/} Mimeographed report, "Report of Results from Testing Hay Crushing Machines." J. L. Butt, W. B. Kelley, C. M. Martin, and L. A. Smith. Issued May 1953.

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The apparent digestible dry matter contents of the Caley pea silage and the Johnsongrass hay were determined by feeding these roughages to yearling steers that weighed approximately 500 pounds. The average apparent digestibility of dry matter in Caley pea silage was 55.0 per cent, and that of Johnsongrass hay was 59.4 per cent. The digestible protein contents on dry matter basis were: Caley pea silage, 6.99 per cent; Johnsongrass hay, 3.24 per cent.

The experimental animals were Jersey cows from the Black Belt Substation herd. During the 2 weeks preceding the experimental period, the cows were fed Caley pea silage and Johnsongrass hay free choice. Immediately preceding the experiment, they were assigned, according to level of milk production, to three groups of eight cows each. The average daily levels of milk production of cows in the three groups were 30.7, 30.7, and 30.8 pounds. During the 6-week experimental period, one group was fed Caley pea silage, a second group was fed Caley pea silage plus Johnsongrass hay, and the third group was fed Johnsongrass hay.

Concentrate feeding was equalized among the three groups of cows; therefore, any differences between groups with respect to milk production may be attributed to the roughage. The concentrate was fed twice daily while the cows were in the stanchions at milking time, and the amounts fed were adjusted at 2-week intervals. The concentrate mixture consisted of 100 parts ground oats, 20 parts cottonseed meal (41 per cent protein), and 1.2 parts salt. This mixture was calculated to contain approximately 17 per cent crude protein.

Silage and hay were fed free choice to the cows in individual stalls. Hay and silage were weighed out twice daily in order to keep fresh roughage before the cows at all times. The refused roughage was weighed back once daily.

Twice daily the cows were turned out of the stalls for water, exercise, and milking. The amount of milk produced at each milking was weighed and recorded. Butterfat content of the milk was determined bi-weekly from daily composite samples, and the milk was corrected to 4 per cent butterfat for comparison.

In determining the economic aspects of feeding the forages, prices charged for silage and hay were actual costs of producing, harvesting, storing, and feeding the forages. These costs were determined in a previous study at the Black Belt Substation.^{3/} Since two of the ingredients in the concentrate mixture were purchased and production costs were not available on the oats, the third ingredient, the concentrate was charged at the prevailing retail price.

Results and Discussion

The average daily intakes of Caley pea silage and Johnsongrass hay per cow, by weekly periods, are given in Table 1. Changes in the average consumption of forages throughout the experimental period are shown in Figure 1. The cows fed Johnsongrass hay alone and those fed a combination of hay and silage consumed approximately the same amount of dry matter. Cows fed Caley pea silage as the only roughage consumed less forage dry matter than cows in the other groups.

^{3/} Mimeographed report, "The Cost of Producing, Harvesting, Storing, and Feeding Caley Pea Silage, 1954." W. B. Kelley and L. A. Smith. Issued April 1955.

Table 1. Average Daily Consumption of Caley Pea Silage and of Johnsongrass Hay, by Weekly Periods, Black Belt Substation, 1954-55

Period	Consumption per cow per day			
	Silage group*	Silage-plus-hay group		Hay group**
	Pounds	Pounds (Silage)	Pounds (Hay)	Pounds
1st week	36.7	14.3	12.8	16.9
2nd week	47.3	19.0	13.4	20.1
3rd week	46.6	19.5	13.0	19.7
4th week	49.7	17.8	12.9	18.3
5th week	48.9	15.7	12.9	19.4
6th week	47.0	16.8	13.2	19.3
AVERAGE	46.0	17.2	13.0	19.0

* Silage averaged 26 per cent dry matter.

** Hay averaged 92.7 per cent dry matter.

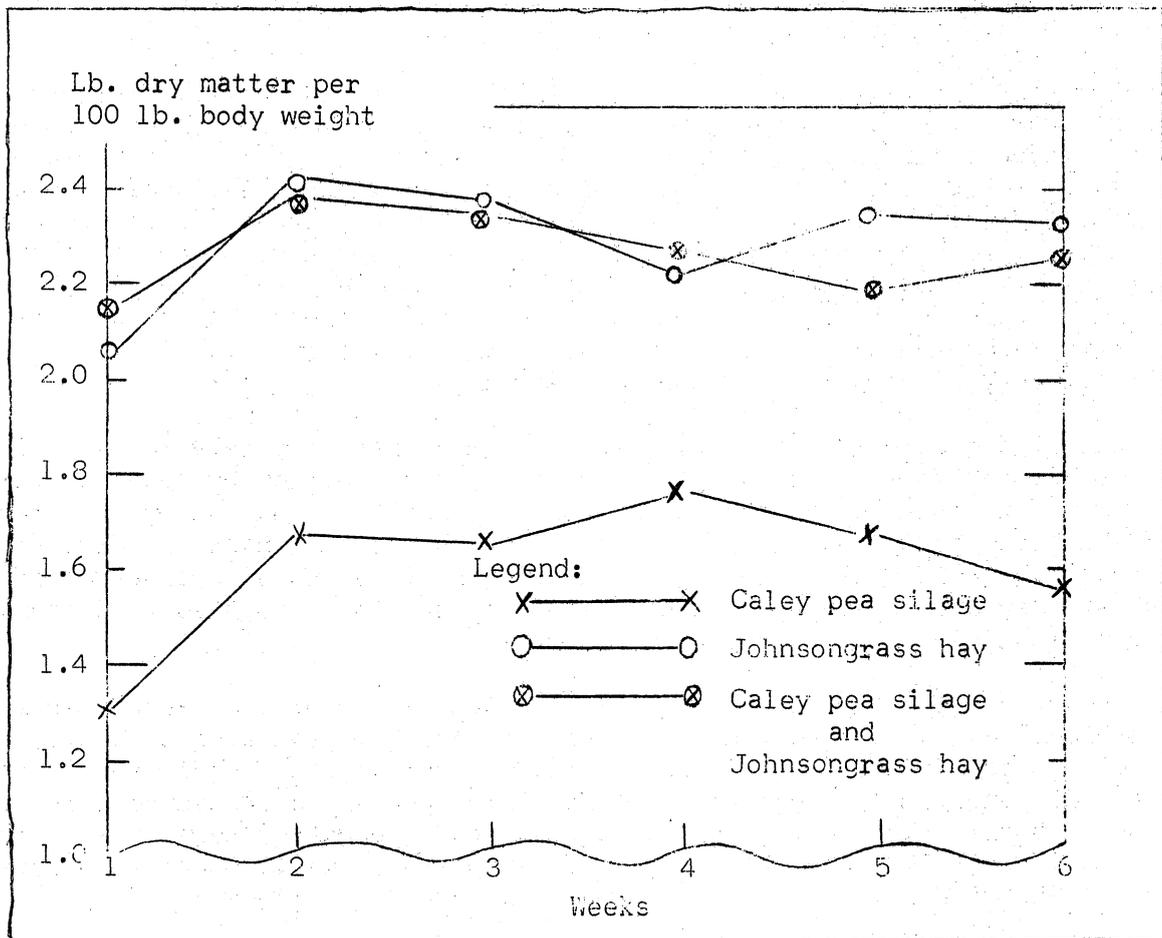


Figure 1. Average intake by weeks of dry forage per 100 pounds of body weight.

The maximum daily level of intake of Caley pea silage by cows in this study was 49.7 pounds, which is similar to the 53.3 pounds of Johnsongrass silage consumed by cows in a previous study.^{4/} Nevertheless, the maximum consumption of Caley pea silage dry matter was approximately 25 per cent less than the maximum consumption of Johnsongrass silage. These results suggest that cows weighing approximately 800 pounds may be expected to consume between 45 and 55 pounds of fresh silage daily and that the nutrient intake from silage will vary with moisture content and digestibility of the silage.

The quality of the Johnsongrass hay fed during this study appeared to be similar to that of Johnsongrass hay fed during the winter of 1953-54 in another study.^{5/} The average daily consumption of hay was 19.0 pounds per cow for the present study, however, as compared with 14.1 pounds per cow during the 1953-54 study. Therefore, it is evident that difference in quality between forages may not be apparent to the feeder.

The relationship between the type of roughage fed to the cows and the average daily production of milk is shown in Table 2. The average daily milk production for the entire experiment was slightly greater for cows in the Johnsongrass hay group than for cows in the other roughage groups. Statistically, however, the differences in milk production between roughage groups were not significant. The variation within groups was relatively large.

Analysis of the milk production by weeks reveals significant differences between roughage groups. In every week except the second, the cows on Johnsongrass hay produced more milk than did the cows on Caley pea silage or those on a combination of Caley pea silage and Johnsongrass hay. The levels of production of the cows fed Caley pea silage as the only roughage and those fed Johnsongrass hay as the only roughage dropped rapidly during the first 2 or 3 weeks. Thereafter, changes in production by cows in these groups were small. The level of production of cows fed the silage and hay combination decreased at a rapid rate during every week except the second; this rate of decline was significantly greater than that of cows fed Johnsongrass hay only.

Intake of digestible protein by cows on Johnsongrass hay only was very low and probably accounts for the rapid decline in milk production by cows fed this roughage. On the other hand, the rapid decline in milk production by cows fed Caley pea silage only probably was the result of inadequate intake of digestible nutrients. The rapid decline in milk production by cows fed a combination of Johnsongrass hay and Caley pea silage does not appear to be related to dietary inadequacy of either protein or energy.

The cows in all roughage groups lost body weight during the 6-week experimental period. Average losses in weight per cow for all groups were: Caley pea silage, 60 pounds; Johnsongrass hay and Caley pea silage, 50 pounds; and Johnsongrass hay, 59 pounds. Although the cows fed Caley pea silage consumed less dry matter than cows in the other groups, losses in body weight by cows in all groups were similar. This indicates that nutrients supplied by Caley pea silage were efficiently assimilated.

^{4/} Mimeographed report, "Johnsongrass Silage and Johnsongrass Hay Feeding Experiment with Dairy Cows, Black Belt Substation." W. B. Kelley, L. A. Smith, and George E. Hawkins, Jr. Issued February 1955.

^{5/} J. L. Butt et al., op. cit.

Table 2. Average Daily Production of 4 Per Cent Fat Corrected Milk by Cows Fed Caley Pea Silage, Johnsongrass Hay, or the Two Forages Combined, by Weekly Periods, Black Belt Substation, 1954-55

Period	Forage groups		
	Silage	Silage-plus-hay	Hay
	<u>Pounds</u>	<u>Pounds</u>	<u>Pounds</u>
Pre-experimental	30.7	30.7	30.8
1st week	29.3	29.5	29.7
2nd week	27.8	29.1	28.2
3rd week	26.4	27.4	28.0
4th week	26.0	26.3	27.5
5th week	25.7	25.4	27.5
6th week	25.7	24.5	27.6
AVERAGE	26.8	27.0	28.1

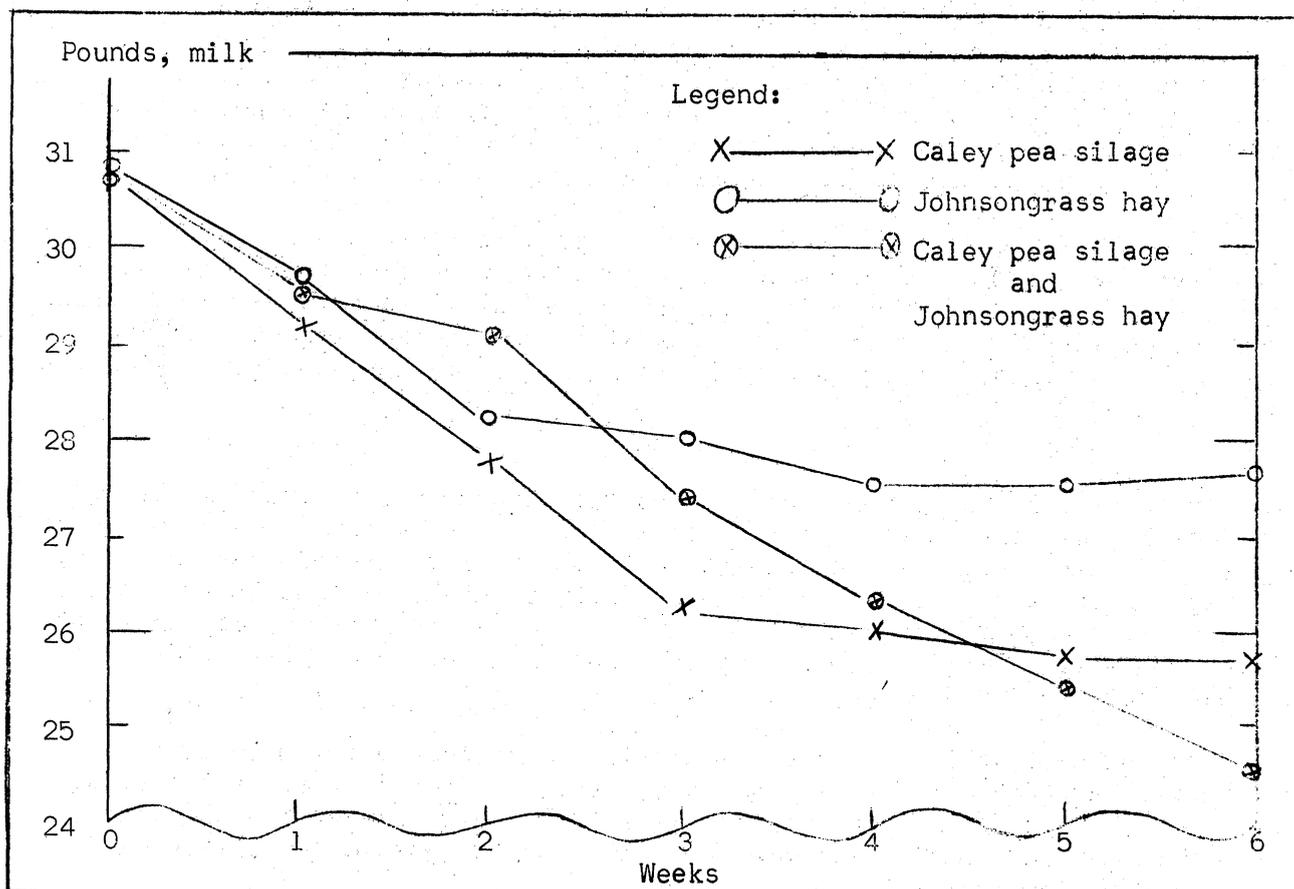


Figure 2. Relationship between forage fed and average daily production of milk corrected to 4 per cent butterfat, by weeks.

Table 3. Costs and Returns for Milk Produced by Cows Fed Caley Pea Silage, Johnsongrass Hay, or the Two Forages Combined, Black Belt Substation, 1954-55

Item	Roughage groups		
	Silage	Silage-plus-hay	Hay
4% FCM per cow, pounds	1,126	1,134	1,180
Value of milk per cow*	\$64.18	\$64.64	\$67.26
Feed costs per cow:**			
Caley pea silage	\$ 5.46	\$ 2.04	----
Johnsongrass hay	----	3.99	\$ 5.88
Concentrates	10.83	10.83	10.83
Total	\$16.29	\$16.86	\$16.71
Feed cost per 100 pounds of milk	\$1.45	\$1.49	\$1.42
Value of milk per cow above feed cost	\$47.89	\$47.78	\$50.55

* Milk was evaluated at \$5.70 per 100 pounds.

** Costs were figured on basis of silage at \$5.64 per ton, hay at \$13.05 per ton, and concentrates at \$60 per ton. The hay cost includes 12.5 per cent allowance for wastage.

A summary of the results of the feeding trial is presented in Table 3. The Johnsongrass hay group returned \$2.66 more per cow above feed cost than the Caley pea silage group, and \$2.77 more per cow than the Caley pea silage--Johnsongrass hay group. Costs of making silage and hay will vary from farm to farm. Therefore, the small variations in returns between groups are not considered significant.

Summary

Results of this experiment and the results of a previous study involving the harvesting of Caley peas as silage show that this crop can be made into good quality silage.^{6/} A dairyman may expect satisfactory results from feeding Caley pea silage to dairy cattle provided the dry matter intake by cows is sufficient to meet their energy requirements. In this investigation, the dry matter intake of Caley pea silage was low, resulting in slightly lower total milk production than that from feeding Johnsongrass hay.

There was no advantage in milk production from feeding a combination of Johnsongrass hay and Caley pea silage over feeding either the hay or the silage alone. This result was due to some peculiarity of Caley pea silage and Johnsongrass hay fed in combination and might not be expected when other silages and hays are fed in combination.

^{6/} Progress Report Series No. 55. "Summary of a One-Year Test on Cost of Producing, Harvesting, Storing, and Feeding Caley Pea Silage, Black Belt Substation, 1954." W. B. Kelley and L. A. Smith. Issued April 1955.