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FORAGE CONSUMPTION AS SOILAGE BY HOLSTEIN, NATIVE AND HOLSTEIN-NATIVE CROSSBRED COWS

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INTRODUCTION

Feeding good-quality roughage to dairy cows is one of the major managerial problems confronted by the dairy industry in the Tropics, especially where the intensive system is used. In Puerto Rico, as in other tropical countries, larger amounts of concentrates have to be fed in order to meet the deficiency of the roughage, thus increasing the cost of milk production. This deters the low-income families from consuming adequate amounts of this essential food.

Duckworth (1)[2], while studying the same problem in Trinidad, stated the following: "The difficulty of providing tropical dairy cows with an adequate supply of green herbage of good nutritive value is widely recognized as being one of the main obstacles in the economic production of milk in many parts of the tropics." He also observed that "the degree of supplementary feeding was much greater than would have been expected from the difference in roughage consumption." In a herd whose average weight was 825 pounds, with an average production of 14 pounds of milk, he found that the average consumption of freshly chopped Elephant grass was 51 pounds per head daily, which is approximately, 10.1 pounds of dry matter. This was equivalent to about 6.2 pounds of grass or 1.22 pounds of dry matter per 100 pounds of live weight. In Hawaii (3) the average consumption of chopped Napier grass for a group of cows averaging in weight 996 pounds was 54.2 pounds or an average of 5.44 pounds per 100 pounds of live weight. Harrison (2), in his digestibility trials with European and Zebu cattle, found that animals under trial consumed an average of 1.6 pounds of dry matter per 100 pounds live weight. Morrison (5), in his feeding recommendations, states that the amount of silage fed per head daily to dairy cows usually ranges from 20 to 40 pounds per 1,000 pounds of live weight. When cows are fed twice a day all the silage and good legume

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[2] Numbers in parentheses refer to Literature Cited p. 96–7.

hay that they can consume, amounts of about 3 pounds of silage and 1 pound of hay per 100 pounds of live weight, in addition to the usual amount of concentrate mixture are fed. Cows given silage as the only roughage, will eat as much as 6 pounds of silage daily per 100 pounds of live weight. In experiments carried out in New Jersey (7), cows receiving grass silage as the only roughage lost weight, but the milk production was maintained, thus indicating that the roughage alone was not sufficient for both maintenance and production. It was found impossible to maintain the intake of grass silage or grass silage and corn silage at the calculated intake levels. In Minnesota (8), researchers had the same difficulty in getting the cows to consume enough silage. Milk production declined during silage periods when compared to hay periods.

This study was undertaken in order to determine the daily roughage (soilage) intake and also to compare the Holstein, Native, and Holstein-Native crossbreds feeding under conditions of the Island. For the purpose of the experiment the crossbreds will be called a breed. All animals used for the experiments were selected from the Station's herd.

SOURCE OF DATA

Six groups of cows totaling 59 animals were used. Each group included the three breeds mentioned above. The experimental periods were of 18 to 81 days, during October 1947 to August 1949. Almost all the cows were included in more than one experimental period. Because of this, the number of experimental days varied from 22 to 269 days.

The forage used was Merker grass (*Pennisetum purpureum* var. Merkerii), a strain of Elephant grass. The quality of the grass fed was comparable to that of the grass commonly fed in local dairies under the intensive system in the Island, that is, grass 80 or more days old, quite mature. Young grass was used only for a very few days, due to transportation difficulties.

The grass was brought from the field and chopped in a silage chopper. Trial cows were fed in the morning and the afternoon. The roughage given, which was more than sufficient, as well as the left-overs, was carefully weighed daily for each animal.

Cows were weighed for three consecutive days: at the beginning and at the end of each experimental period, and once a week during the experimental periods.

Chemical analyses of the roughage samples were made according to A.O.A.C. official methods. The number of samples taken for analysis varied from 2 to 6 depending on the length of the experimental period. A total of 21 samples were analyzed.

RESULTS AND DISCUSSION

Dry-matter and crude-protein contents, together with the digestion coefficient for protein and total digestible nutrients for Merker grass, are given in table 1. The digestion coefficient and TDN figures were taken from unpublished data from digestion trials with the same kind of roughage previously performed at this Station.

The averages by breeds of the data studied are presented in table 2.

Neither the differences in the amount of roughage and dry matter consumed per hundred pounds live weight between breeds nor the regressions

TABLE 1.—*Dry matter, crude protein, digestion coefficient for protein and total digestible nutrients for Merker grass (dry basis)*

Samples	Dry matter	Crude protein	Digestion coefficient for protein	Total digestible nutrients
Number	*Percent*	*Percent*		*Percent*
21	25.52	5.07	52.4	50.00

TABLE 2.—*Average weight, roughage, and dry-matter consumption, digestible protein, and TDN per group*

Breed	Cows	Average weight	Soilage eaten daily	Soilage per 100 pounds live weight	Dry matter per 100 pounds live weight	Daily intake of digestible protein	Daily intake of TDN
	Number	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Holstein	10	962	66.60	6.92	1.76	0.4515	8.49
Grades	30	832	59.45	7.14	1.82	.4031	7.58
Natives	19	783	64.84	8.28	2.11	.4397	8.27

of the amount of roughage on weight of animal within breeds were significant. The difference between the daily intakes of digestible proteins and total digestible nutrients were not significant, either.

In studying the data it was observed that the smaller cows ate somewhat more roughage per 100 pounds of live weight. This trend of relation between weight and roughage consumption was studied, but the regression was not significant.

Although a little higher, the roughage consumption of the Holstein group (table 2) agrees with the findings of Henke in Hawaii (3) with chopped Napier grass. The difference may be attributed to a difference in palatability as Merker grass is not as thick and hard-stemmed as Napier.

In table 3 the maintenance requirements of digestible proteins and

total digestible nutrients (5) for adult cows within which the average weights for our animals fall are presented.

As shown by the above figures the group of Native cows was the only one almost getting the necessary amount of protein; the Holstein and the crossbreds were on the deficient side, but all three groups received enough total digestible nutrients for maintenance. Results in table 2 show that the smaller animals were getting the largest relative amount of dry matter, equivalent to larger amounts of digestible proteins and total digestible nutrients. This might be an important fact to consider in breeding dairy cattle for the tropics.

The amount of dry matter intake is important, but the quality of the same is still more important in the nutrition of dairy cows. Harrison (2) considered 1.6 pounds low-intake of dry matter per 100 pounds of live weight. The fodders used were too high in moisture and the animals were

TABLE 3.—*Digestible-protein and TDN requirements for maintenance of adult cows of 700 and 1,000 pounds live weight*

Weight of cows	Digestible protein	TDN
Pounds	*Pounds*	*Pounds*
700	0.45	6.00
1000	.60	8.00

unable to eat enough bulk to obtain all the required dry matter. In spite of being low, the dry-matter intake reported was enough for maintenance. Wilting of the grass was recommended, so that the animals could consume larger amounts of dry matter. Hay materially increases the dry-matter intake, but in regions where weather makes the curing of hay difficult or impossible, soilage or silage must be fed as source of roughage, when cows are not on pasture. Because of the intrinsic characteristics of the grass soilage itself, it is difficult to increase the daily dry-matter intake to a point where a minimum amount of concentrates has to be supplemented; this is especially true for big cows like the Holsteins. Otherwise, the amount of nutrient intake from the roughage can be materially improved and increased by the use of legumes, either alone or in combination with grasses.

Table 4 shows the nutrient intake of a 700-pound cow consuming the kind of roughage described in this report and also consuming a good quality legume-grass mixture like Merker-Kudzu. It also indicates the amount of concentrate supplement needed to produce 25 pounds of 4-percent-fat milk.

When consuming the lower quality roughage this cow will need 9 pounds of the usual commercial 20-percent-protein dairy feed (17.7 percent of the

protein being digestible and 76.1 percent TDN) to meet the deficiency of the roughage for maintenance and to produce the 25 pounds of milk. This same cow consuming the higher quality roughage will need only around 8 pounds of a 14-percent-protein concentrate, (assuming the same digestibility of the protein and TDN as for the 20 percent). This 14-percent-protein feed could be a mixture of Island-produced ingredients like yeast, molasses, bagasse, corn, coconut meal, etc. plus salt and minerals. Another important fact to consider when a good-quality roughage is fed is that of palatability.

TABLE 4.—*Comparisons between the requirement and consumption of nutrients by 700-pound cows producing 25 pounds of 4-percent-fat milk and consuming poor and good quality roughages*

Weight of cow	Maintenance		Production		Total	
	Digestible protein	TDN	Digestible protein	TDN	Digestible protein	TDN
Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
700	0.45	6.00	1.12	8.00	1.57	14.00

NUTRIENT INTAKE WHEN CONSUMING POOR QUALITY ROUGHAGE

Roughage consumed per 100 pounds of live weight	Total roughage consumed	Crude protein	Digestible protein consumed	TDN consumed
Pounds	*Pounds*	*Percent*	*Pounds*	*Pounds*
8	56	5.07	0.38	7.14

NUTRIENT INTAKE WHEN CONSUMING GOOD LEGUME-GRASS ROUGHAGE

Pounds	*Pounds*	*Percent*	*Pounds*	*Pounds*
8	56	10.0	0.75	8.00[1]

[1] Assuming 55 percent TDN.

If the dry-matter intake is increased upon a larger consumption, the amount of supplemental feed needed can be reduced considerably.

Ordinarily, both Merker and Para grasses (the latter is another of the common soilage grasses used) are low in protein and higher in fiber, when fertilizers are applied immediately after cutting, and when cut from 80 to 100 days old. The crude-protein percentage is usually not higher than 5, dry basis. Tropical Kudzu has been planted for some years in this Station together with Merker or Para grass, but especially with the latter. This legume nearly always has more than 17 percent of crude protein on the dry basis, and when planted together with the grass the mixture has a crude

protein content of 10 percent or more, depending on the amount of Kudzu included in the mixture.

Although, as stated by Huffman (4) "it is generally recognized that the total digestible nutrients (TDN) that cattle receive from an all roughage ration are not as efficient for milk production as when roughage is supplemented with concentrate," it is true that when good-quality roughage is being fed, the amount of concentrate supplement needed to meet the requirements for production can be reduced, thus lowering the cost of milk production. For the type of high-milk-producing cow developed, concentrates are needed to supplement the roughage ration and still more so now that their milk-stimulating effects are known (4).

SUMMARY AND CONCLUSIONS

A study was undertaken to determine the daily roughage (soilage) intake of the Holstein, Native, and Holstein-Native crossbred cows of the Station's herd and to check on probable differences between them.

The apparent consumption of the largest amounts of soilage or dry matter per hundred pounds of live-weight by the Native cows, 8.29 pounds soilage and 2.11 pounds dry matter, as against 7.14 and 1.82 pounds respectively for the crossbreds; and 6.92 and 1.76 pounds respectively, for the Holsteins, was found to be not significant. Neither were the regressions of the amounts of roughage consumed on weight of animal significant within breeds.

The kind of roughage usually fed as soilage to dairy cows in the Tropics makes it difficult to increase consumption over the amounts shown above, but the quality of the same can be improved by the use of legumes. This will increase the amount of digestible nutrients ingested which will compensate, in part, for the reduced dry-matter intake.

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