NR 20. SUPPLEMENTATION OF GRASS SILAGE TO LACTATING HOLSTEIN COWS GRAZING A TROPICAL GRASS

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Resumen

Suplementación de ensilaje de gramínea a vacas lactantes consumiendo pasturas de gramínea tropical

Ocho grupos de seis vacas lactantes de la raza Holstein fueron asignados a los tratamientos de acuerdo con un diseño experimental de cuadrados latinos (4 x 4) replicado (2). Se compararon los siguientes tratamientos: 1) consumo de concentrado 2x/día 2) consumo de concentrado 3x/día 3) suplementación con ensilaje de gramínea bajo sombra y concentrado 3x/día 4) suplementación con ensilaje de gramínea bajo sol y concentrado 3x/día. Todas las vacas se mantuvieron confinadas durante el día y se permitió un período de apacentamiento (16:30 y 03:30). El alimentar el concentrado 3x/día resultó en un aumento moderado (3 %) en la producción de leche integra. Esta diferencia fue observable principalmente en las vacas en etapa temprana de lactancia (cuadrado x tratamiento; P=.03). El alimentar la tercera comida de concentrado resultó en una reducción en el porciento de grasa en la leche (P = .03) y la suplementación con ensilaje evito esta reducción (P = .02). Basado en los resultados de esta investigación, la suplementación con forraje a vacas bajo pastoreo solo debe considerarse cuando se pueda proveer forraje de superior calidad o cuando el ganadero se enfrente a una insuficiencia de pastura.

Palabras claves: ensilaje de gramínea, vaca lactante, apacentamiento.
Key words: grass silage, lactating cows, grazing.

Introduction

The traditional system of feeding lactating cows in the majority of the farms in Puerto Rico consists of grazing grass pastures and parlor feeding of pelleted concentrate. However an important fraction of the farms in Puerto Rico, especially those in the Northern milkshed, have very high stocking rates with low levels of fertilization and management. To substitute grazed forage more and more farmers are feeding increasing amounts of high fiber concentrates outside the parlor. An important limitation to pasture consumption is stress caused by high temperature, humidity and by solar energy. Therefore, aur objectives were to investigate the effect of silage supplementation under confinement, shade and increasing concentrate feedings on milk production and milk composition.

Materials and methods

Eight groups of six lactating Holstein cows blocked according to stage of lactation (early and mid) at the beginning of the experiment, were assigned to treatments according to a 4 x 4 Latin Square Design. Experimental treatments were as follows: 1) no silage; concentrate fed 2x/day 2) no silage; concentrate fed 3 x 3) silage fed under cover; concentrate fed 3x/day 4) silage fed in the open; concentrate fed 3x/day. Each of the four experimental periods consisted of 21 days of adaptation and 7 days of data collection. All cows remained on concrete during the day and grazed at the rate of 4.5 cows/ha during the hours 16:30 and 03:30. A by-product commercial concentrate high in fiber was allotted to all experimental cows at the rate of .55 kg/ kg of milk produced. Grazed pastures were mostly guinea (*Panicum maximum*) and star grass (*Cynodon nlemfuensis*). Supplemental silage was mostly guinea grass with approximately 15 % of various native legumes. Forage and concentrate were sampled weekly and a composite sample of each period was analyzed at the Northeast DHIA Forage Lab (table 1). Cows were weighed for two consecutive days at the beginning and end of each experimental period. Milk production was recorded daily with a sample taken during 4 consecutive milkings for butterfat and milk protein analysis. Data were analyzed by least squares ANOVA using the general linear models procedure of SAS (SAS, 1985). The mathematical model used to analyzed the data was $Y_{ijk} = \mu + a_i + b_j + g_k + e_{ijk} + Y_{ijk}$, where, μ = overall mean; a_i =effect of period i; b_j =effect of treatment j; g_k =effect of cow k; e_{ijk} =residual effect of i j and k; and Y_{ijk}= response variable in period i in treatment j for cow k. Main effects were separated and analyzed by

the use of contrast. These contrasts were Treat. 1 vs. Treat. 2 for comparison between feeding concentrate 2x or 3x per day, Treat. 2 vs. Treat. 3 and Treat. 4 to investigate the effect of supplementing grass silage and Treat.3 vs. Treat.4 to study the effect of feeding silage supplement under shade.

Table 1. Chemical composition of the grass silage, grass pasture and commercial concentrate fed to experimental cows. [1]

	Grass Pasture	Grass Silage	Concentrate
Crude Protein	13.4	7.8	19.9
ADF	41.2	46.3	18.1
NDF	69.3	68.1	39.1
TDN[2]	59.5	59.0	74.7
% Ca	0.38	0.53	1.03
% P	0.32	0.14	0.91
% Mg	0.23	0.55	0.39
% K	3.17	2.00	1.30
% Na	0.135	0.128	0.128

[1] Samples were analyzed at the Northeast DHIA Lab. (1). [2] Estimates based on NDF concentration (2).

Results and discussion

Feeding concentrate 3x/day resulted in a moderate increase ($P > .02$) in milk production over feeding 2x a day. The supplementation with silage resulted in a 3 % reduction ($P > .01$) in yield compared with no silage supplementation. These yield differences were higher for early lactation higher producing cows (interaction square x treatment; $P = .03$). In spite of the increase in milk yield, increasing the number of concentrate meals to 3x/d resulted in a reduction ($P > .03$) in milk fat percent. The reverse was true for milk protein; feeding 3x/d resulted in an increase ($P > .03$) in milk protein percent. Silage supplementation resulted in lower milk protein percent when compared with no silage supplementation.

Since concentrate dry matter (DM) intake averaged about 10 kg/cow/d it could be assumed that forage consumption did not increase when cows were supplemented with grass silage. Perhaps, a substitution of grass silage for the higher quality pasture could have contributed to the decrease in milk yield when silage was supplemented. Feeding grass silage under a shade did not result in an increase silage DM consumption (all cows averaged about 2.0 kg/cow/day), milk production or any change in milk composition.

Table 2. Least square means values of milk yield, 3.25% fat-corrected-milk (FCM), milk fat (MF) and milk protein (MP) percent.

	Experimental treatments					
	1	2	3	4	Std. Err.	P=
Milk Yield, kg	18.3	18.8	18.0	18.4	0.12	0.01
FCM, kg	18.6	18.5	18.4	18.5	0.18	0.72
MF, %	3.38	3.17	3.37	3.31	0.05	0.057
MP, %	3.26	3.32	3.27	3.24	0.02	0.03

1. Northeast Dairy Herd Improvement Laboratory (DHIA). 730 Warren Road, Ithaca, 14850.

Conclusion

Based on the results of this trial it can be said that supplementation of forage under partial confinement should only be considered when feeding forage of higher quality than pasture or when the farmer has insufficient pasture such as in a drought or when stocking rates are excessively high. Reducing meal size and increasing feeding frequency appears a good strategy to increase milk production.

Literature cited

SAS. 1985. SAS® User's Guide: Statistics, Version 5 Edition. SAS Inst. Inc., Cary, N.C.