Effects of Type of Concentrate Feed and Timing of Supplementation on Performance of Lactating Dairy Cows Grazing an Alfalfa-rye-grass Sward in the Peruvian Highlands

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Introduction

Alfalfa is an important forage source for grazing dairy cattle in the Peruvian highlands. Moderate metabolisable energy contents and high concentrations of rapidly rumen degradable protein in alfalfa necessitate the supplementation of concentrates rich in nonstructural carbohydrates.

Objective

To evaluate the effects two different cereal grains differing in ruminal starch degradation and timing of supplementation on milk yield, milk quality, and rumen microbial crude protein synthesis (MCP) in dairy cows grazing a mixed alfalfa-rye-grass sward.

Materials and Methods

- Feeding trial conducted in the Peruvian Andes at 3350 m above sea level
- Twenty-four lactating Brown Swiss cows (mean ± standard deviation) 458 ± 48.4 kg live weight (LW), 141 ± 52 days in milk, and 15.3 ± 1.8 kg/d milk yield.
- All cows grazed an alfalfa-rye-grass sward for 8 h/d.
- 4 x 3 Youden Square with four dietary treatments and three experimental periods (14 days of adaptation and 7 days of measurements).

Figure 1. *Experimental Brown Swiss cows grazing in an alfalfa-rye grass sward (left), same cows in the milking parlor (right).*

- Dietary treatments included a concentrate mixture of 3.0 kg/d (as-fed basis) of either ground corn (C) or oat meal (O) along with 0.5 kg/d (as-fed basis) of corn cobs.
  - **Cpm:** 2.5 kg supplemented in the afternoon milking and 1.0 kg in the morning.
  - **Cam:** 1.0 kg supplemented in the afternoon milking and 2.5 in the morning.
  - **Opm:** 2.5 kg supplemented in the afternoon milking and 1.0 kg in the morning.
  - **Oam**: 1.0 kg supplemented in the afternoon milking and 2.5 in the morning.
- Feed, feces and milk samples were collected for analyses of nutrients composition (AOAC,1990; VDLUFA 2007); urine samples were collected for determination of purine derivatives excretion and MPS (Chen and Gomes, 1992).

Results

Table 1. *Chemical composition of the two concentrate mixtures and pasture offered to Brown Swiss lactating dairy cows in three experimental periods (arithmetic means ± one standard deviation).*

Parameter	Corn concentrate mixture (C)	Oat concentrate mixture (O)	Pasture herbage
DM	948 ± 5.8	952.8 ± 12.7	226.0 ± 5.2
OM	945 ± 7.3	944.2 ± 13.0	916.9 ± 2.4
CP	85.3 ± 2.9	90.6 ± 2.3	233.1 ± 32.2
NDF	119 ± 4.0	313.3 ± 27.3	363.7 ± 22.2
ADF	26.6 ± 1.1	132.4 ± 13.9	212.8 ± 17.1
Starch	625 ± 13.6	407.6 ± 14.0	Na

Table 2. *Body weight change, milk yield, chemical composition of milk and microbial* crude *protein (MCP) flow to the small intestine of Brown Swiss lactating dairy cows grazing a mixed alfalfa-rye-grass sward per treatment.*

	Treatments				SEM	P value
	Cpm	Cam	Opm	Oam		
Live weight (kg)	471.8	473.5	483.0	485.8	5.59	0.89
Milk yield (kg)	15.5	14.7	14.1	15.1	1.27	0.29
Milk composition (g/kg of milk)						
Milk fat	33.5	35.9	37.7	37.5	1.67	0.83
Milk protein	38.6	39.4	39.2	39.2	1.33	0.12
MUN[1]	37.6	36.2	37.4	36.6	1.26	0.92
MCP (g N/day)	186.6[a]	154.9[c]	155.6[c]	174.2[b]	5.97	0.01

[1]MUN= milk urea nitrogen

[a,b,c] Means within the same row without a common superscript differ (P<0,005)

Conclusion

Timing of supplementation and carbohydrate source did not affect performance of Brown Swiss lactating cows grazing an alfalfa-ryegrass sward; however, the rumen fermentation was affected for carbohydrate source enhancing the MCP synthesis depending on the time of supplementation.

References

AOAC.1990. Official methods of analysis. 15th ed. Arlington, VA, USA: Association of Official Analytical Chemists.

Chen, X.B., Gomes, M.J.1992. Estimation of microbial protein supply to sheep and cattle based on urinary excretion of purine derivatives: an overview over technical details. International Feed Resources Unit, Aberdeen, United Kingdom.

VDLUFA. 2007. Verband Deutscher Landwirtschaftlicher Untersuchungs- und Forschungsanstalten. Handbuch derLandwirtschaftlichen Versuchs- und Untersuchungsmethodik (VDLUFA-Methodenbuch), Bd. III. Die Chemische Untersuchung von Futtermitteln. VDLUFA-Verlag, Darmstadt, Germany

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