



# Milk production and N excretion of dairy cows fed on different forage types

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## INTRODUCTION

- Italian dairy cows are typically fed on a forage system based upon corn silage and alfalfa hay.
- Corn grain and silage represent more than 50% on DM basis of the diet.
- Partial replacement of corn silage with autumn-winter cereals or hay has no effect on milk yield and composition (Brito et al., 2006; Ahvenjarvi et al., 2006).
- Non-structural carbohydrates (NSC) as starches, are the main source of energy for lactating dairy cows (NRC, 2001).
- Studies that compared different forage starch sources with differing digestibilities gave variable results on lactational performances and N excretion depending on starch level of intake, forage system and protein source degradability.

## AIM

- To evaluate the effects of three different forage systems, based upon alfalfa hay (AH), barley silage (BS) and corn silage (CS) providing different sources and/or amounts of starch, on dairy cows lactational performances and efficiency of dietary nitrogen capture.

## MATERIALS AND METHODS

- Twenty four multiparous Italian Friesian cows divided into three groups according to parity, DIM (165±93) and milk production, were fed diets with 17% CP (on DM basis) (Table 1)
- Chemical composition and nutrition characteristics of the diets are in Table 2.
- Experimental design was a Latin square (3x3) with three treatments and three periods of four weeks. The first two weeks were for adaptation, whereas the last two were sampling periods.
- N excretion was estimated on the difference between N intake and N milk, utilizing DMI, CP dietary, milk yield and protein content.

## RESULTS

- No difference in milk protein and fat yield.
- No difference in milk chemical – physical parameters between treatments.
- Higher milk fat content in BS than in AH (P<0.05).
- Higher milk urea content in CS and BS than in AH (P<0.001).
- No difference for average DMI and BCS among groups (Table 3)
- Estimate N excretion was reduced by 10% and 5% in BS compared to CS and AH respectively (Table 4)

## CONCLUSIONS

- Partial substitution of corn silage with alfalfa hay or barley silage does not influence milk production.
- Although its highest protein rumen degradation, barley silage does not increase N excretion probably because of its highest protein digestibility.

## ACKNOWLEDGMENTS

RENAI PROJECT: Research financed by MiPAF

Table 1: Experimental diets on DM % basis

Ingredient	Treatments		
	AH	BS	CS
Alfalfa hay	32.9	8.3	16.0
Corn silage	23.5	21.7	41.9
Barley silage		23.9	
Mix soybean meal-flakes	8.3	15.0	12.6
Mix corn meal-flakes	22.8	18.9	17.5
Whole cotton seed	4.0	4.0	3.9
Distillers	6.1	5.8	5.7
Wheat bran	0.7	0.7	0.7
Mineral salts	1.7	1.7	1.7

Table 2: Treatments chemical-physical characteristics

	Treatments		
	AH	BS	CS
CP (% DM)	16.8	16.8	16.7
RUP (% CP)	40.9	34.0	37.0
RDP (% CP)	59.0	65.9	62.9
NDF (% DM)	36.0	36.2	36.5
starch (% DM)	26.2	26.3	26.1
NE <sub>L</sub> (Mcal/kg of DM)	1.62	1.64	1.66
MP (% DM)	10.8	10.5	10.7

Table 3: Experimental treatments results

	Treatments			
	AH	BS	CS	SEM
DMI (kg/day/group)	175	166	182	
BCS*	2.91	2.97	2.95	
Milk yield (kg/day)	28.30	28.30	28.50	1.15
Milk fat content (%)	3.80 <sup>a</sup>	4.10 <sup>b</sup>	3.90 <sup>ab</sup>	0.15
Milk protein content (%)	3.62	3.54	3.58	0.05
Milk urea content (mg/dl)	29.50 <sup>d</sup>	38.60 <sup>c</sup>	35.70 <sup>c</sup>	1.7
pH	6.71	6.71	6.71	0.02
Titrateable acidity (°SH/100 ml)	6.02	5.94	5.87	0.15
NCN (%)	0.130	0.129	0.131	0.13
NPN (%)	0.040	0.039	0.036	0.004
CN (%)	2.53	2.47	2.51	0.06
Milk fat yield (Kg/day)	1.03	1.11	1.08	0.04
Milk protein yield (kg/day)	1.01	0.98	1.00	0.04

<sup>a,b</sup>within row with different superscript are significantly different (P < 0.05)

<sup>c,d</sup>within row with different superscript are significantly different (P < 0.001)

\* Edmonson et al., 1989

Table 4: N balance estimation and efficiency

	Treatments		
	AH	BS	CS
N intake (g/day/group)	4731	4505	4922
Milk N (g/day/group)	1132	1087	1123
N losses (g/day/group)	3598	3418	3799
NUE (%)	23.9	24.1	22.8
N losses (kg/cow/year)	164	155	173