

# Milk yield and N excretion of dairy cows fed diets with carbohydrates of different fermentescibility

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## INTRODUCTION

- Energy availability for lactating cows primarily depends on rapidly hydrolyzed carbohydrates and cell wall components availability.
- Dietary carbohydrates fractions (NSC + NDF) represent 65-75% on DM basis of diets fed lactating cows.
- An adequate NSC:RDP ratio positively affect milk yield by increasing total carbohydrates digestion and microbial N efficiency. (Hoover and Stokes JDS, 1991)
- Fat content of milk is increased by dehydrated sugar beet pulpes supplementation directly attributed to the increase in fiber intake by cows. (Mansfield et al., JDS, 1994)

## AIM

- Aim of this study was to assess the effect of carbohydrate fermentescibility on milk yield and N excretion.

## MATERIALS AND METHODS

- Twenty four multiparous Italian Friesian cows were divided into three groups according to parity, DIM (103±49) and milk production, were fed three diets (Table 1) with 14.7% CP (on DM basis).
- 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.
- Effects of treatment and group were determined by ANOVA using the MIXED procedure of SAS. Cow is used as a random effect.
- N excretion was estimated according to Jonker et al., (JDS, 1998) utilising milk urea content, milk yield and protein content.

**Table 2 – Feedstuffs and chemical composition of experimental diets on DM % basis**

	Treatments		
	HF	LF	HFNDF
Corn silage	36.2	37.3	36.2
Alfalfa hay	12.3	12.7	10.3
Straw hay	10.4	10.7	8.3
Soybean meal flakes mix	8.0	8.4	8.1
Flaked barley – corn mix	24.5		20.4
Corn meal		22.2	
Dehyd sugar beet pulpes			8.2
Wheat distillers	5.6	5.7	5.5
Bran	0.5	0.5	0.5
Mineral salts	2.2	2.2	2.2
RP – Lys	0.2	0.2	0.2
RP – Met	0.1	0.1	0.1
CP (DM %)	14.7	14.5	14.9
NDF (DM %)	42.7	40.8	43.4
NSC (DM %)	32.7	32.8	32.8
Starch (DM %)	24.8	27.1	23.5
EN <sub>L</sub> (Mcal/kg)	1.59	1.59	1.60

**Table 3 – Experimental results**

	Treatments			SE
	HF	LF	HFNDF	
DMI (kg/day/group)	189	195	194	
BCS	2.62	2.55	2.67	
Milk yield (kg/day)	33.4	33.4	33.8	0.63
FCM 4%(kg/day)	29.6	29.6	30.7	0.82
Milk fat content (%)	3.29 <sup>ab</sup>	3.16 <sup>a</sup>	3.39 <sup>b</sup>	0.10
Milk protein content (%)	3.34	3.34	3.38	0.039
Milk urea content (mg/dl)	19.7	19.3	19.9	0.75
Milk casein content (%)	2.56	2.59	2.63	0.029
Milk solids content (%)	12.0	12.1	12.1	
SCC (*1000/ml)	324	226	201	63.3
Milk fat yield (kg/day)	1.08 <sup>ab</sup>	1.06 <sup>a</sup>	1.14 <sup>b</sup>	0.037
Milk protein yield (kg/day)	1.10	1.12	1.13	0.025
Milk casein yield (kg/day)	0.85	0.87	0.88	0.019

<sup>a,b</sup> within row with different superscript are significantly different (P≤0.10)

**Table 4 – Nitrogen balance estimation and efficiency**

	Treatments			SE
	HF	LF	HFNDF	
N intake (g/cow/day)	453	459	465	6.7
Milk N (g/cow/day)	165	172	174	4.3
Urinary N (g/cow/day)	113	112	115	3.85
Faecal N (g/cow/day)	174	175	176	1.14
N excretion (g/cow/day)	287	286	291	
N excretion (kg/cow/yr)	105	105	106	
NUE (%)	36.4	37.5	37.4	0.69

## CONCLUSIONS

A partial substitution of flaked barley – corn mix (HF) with dehydrated sugar beet pulpes (HFNDF) increases milk fat content and yield probably due to an higher fermentescibility of the diet.

Carbohydrates of different fermentescibility made no difference on N excretion because of treatment types have the same CP content.

**Table 1 – Treatments**

HF	High fermentable starch
LF	Low fermentable starch
HFNDF	High fermentable starch with NDF high degradability

## RESULTS

- No difference was found in average DMI and BCS between treatments.
- No difference was found in FCM and milk N fraction (protein, caseins and urea).
- Milk yield and fat content were higher in HFNDF than in LF (Table 3).
- No difference was observed in Friesian cows N balance and efficiency (Table 4)

These results were obtained in the context of "RENAI" project financed by MiPAAF and were applied in LIFE+ project AQUA, coordinated by CRPA, (<http://aqua.crpa.it>) financed by European Commission area Environment. The study involves 4 demonstrative dairy farms placed in the North Italy District: Lombardia (Grana Padano DOP District) Emilia Romagna (Parmigiano Reggiano DOP District) Veneto and Friuli Venezia Giulia (high quality milk District). Aim of LIFE+ project AQUA is to reduce N excretion without penalise animal performances using feeding techniques with high N efficiency based on low CP content diets.