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Poster 16

In Vitro Effect of Non-Fiber Carbohydrate Content of High Forage Dairy Cow Diets on Ruminal Acid Load Values

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Introduction

The primary goal of nutritional management of dairy cows is metabolic adaptation of the animals receiving high non-fiber carbohydrate (NFC) content diets. A concept that has been proposed through the scientific literatures is that diets with high NFC content must be fed to the animals after calving. One consequence of feeding excessive amounts of rapidly fermentable carbohydrates in conjunction with inadequate fiber to ruminants is subacute ruminal acidosis, characterized by periods of low ruminal pH. Rustomo *et al.* (2006) evaluated the acidogenicity value (**AV**) of feeds using an *in vitro* laboratory technique. The AV varied with the protein, starch, NFC, and fiber contents of feedstuffs, being highest for NFC rich feeds, intermediate for forages, and lowest for feeds high in protein. The rate at which rumen fluid pH changed followed a pattern similar to changes in the AV (Rustomo *et al.*, 2006), and the differences in AV and pH changes likely were associated with the fermentability of the feeds. The aim of this present study was to evaluate the *in vitro* effect of the NFC content of high forage dairy cow diets on acidogenecity values.

Materials and Methods

High forage commercial dairy diets containing different levels of NFC were provided. Diets based on their NFC levels were high NFC (HNFC), medium NFC (MNFC), low NFC (LNFC) and very low NFC (VLNFC). The diets are shown in the Table 1. The acidogenicity values of the diets were determined using the procedure as described by Wadhwa *et al.* (2001). Samples were oven-dried (48 h, 68 °C) and ground to pass through a 1-mm screen on a laboratory mill. One-gram (DM) sample were weighed and incubated, in triplicate, with 30 ml of buffered rumen liquor comprising 60% buffer and 40% rumen liquor. The buffer was made up at 20% of the strength of the Tilley-Terry (1963) buffer. Cysteine hydrochloride monohydrate (0.025% w/v) was added just prior to incubations. The rumen fluid was collected, 3 h after morning feeding, from four fistulated sheep that was maintained on alfalfa hay and concentrates (70 : 30% in the DM). The incubations were carried out in 100-ml bottles held in a water bath at 38.7 °C. Samples (2 ml) were withdrawn from bottles after 24 h and transferred to 2-ml micro tubes containing 50 mg (excess) of $CaCO_3$ powder. The mixture was shaken manually for 5 s and then centrifuged at 4000 rpm for 10 min before analysis of Ca content of the supernatant using Atomic Absorption. The AV was calculated as the product of Ca concentration (from the analysis) and fluid volume (30 ml) divided by the sample weight. Data were analyzed using completely randomized design of GLM procedure of SAS (1999).

Results and Discussion

The AV of HNFC, MNFC and LNFC were significantly higher than VLNFC (11.9, 11.2, 11.1 and 10.1, respectively). Although the amount of the forage was almost constant among the diets, with increasing NFC the AV was increased. Rustomo *et al.* (2006) indicated that the rate and extent of pH declined after increased feeding with high AV diets. The present data showed that the AV is directly influenced by the NFC concentration, and it is independent of the amount of forage included in the dairy diets.

Table 1. Composition (%DM) of the experimental high forage dairy cow diets with different NFC content

	Diets			
Items	HNFC	MNFC	LNFC	VLNFC
Corn silage	28	28	28	28
Alfalfa hay	18.4	19.9	19.9	15.9
Wheat straw	12	8.0	12	19.9
Wheat bran	4.3	4.6	4.6	4.6
Barley grain	8	8.6	8.6	8.6
Corn grain	8	8.6	8.6	8.6
Wheat grain	7.4	7.9	3.9	0.0
Soybean meal	4.3	4.6	4.6	4.6
Cottonseed meal	5.3	5.3	5.3	5.3
Rape seed meal	2	2.2	2.2	2.2
Phosphate dicalcium	0.5	0.5	0.5	0.5
Vitamin & mineral premix	0.4	0.4	0.4	0.4
Protected fat	1.4	1.4	1.4	1.4
ME, Mj/kg DM	10.8	11.2	10.9	10.3
CP, g/kg DM	13.1	13.9	13.5	12.3
NDF, g/kg DM	39.1	35.1	38.2	43.3
NFC, g/kg DM	37.1	36.6	33.6	29.5

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