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Efficiency of the use of nitrogen parameters in dairy cows fed sugar cane-based with different levels of sunflower oil

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Introduction Lipid supplementation the diet of dairy cows aims to increase the energy density of the diet, however, considerable amounts can affect the performance of the animal. Milk composition can be changed when providing lipids in ruminant diets. A major deleterious effect of the inclusion of high concentrations of lipids in the diet of ruminants is the reduction in ruminal fiber digestion. Thus, the amounts and proportions of volatile fatty acids produced in the rumen can be negatively altered, especially the acetate:propionate ratio, promoting the reduction of milk fat. In addition milk protein is reduced due to reduction of microbial synthesis, since lipids are not energy sources for microbial growth or reduction in the availability of amino acids in the mammary gland.The purpose of this study was to assess diets based on sugarcane with different concentrations of sunflower oil (SFO) with respect to nitrogen use efficiency parameters in dairy cattle.

Material and methods Four multiparous Holstein x Gir cows in lactation for 107±10 days with average milk production of 15±5 kg/d) fitted with rumen cannulas received four dietary treatments (levels of SFO inclusion as % of diet DM) in a 4 x 4 Latin Square design composed of 19-day experimental periods (10 days for adaptation and the last 9 days for data collection). The treatments were: 1) Control: diet containing no SFO; 2) SFO1: diet containing 1.5% SFO; 3) SFO2: diet containing 3.0% SFO and 4) SFO3: diet containing 4.5% SFO. Diets were isoproteic (14.5% CP) and fed *ad libitum* once a day as total mixed rations (TMR) composed of whole sugarcane plant and a concentrate mixture (60:40, % of diet DM). The production of faecal DM was estimated from samples collected over six consecutive days using indigestible NDF as an internal indicator. Milk samples were collected at the morning and afternoon milking (6:00 and 14:00 h, respectively) during the last 9 days of each experimental period and analyzed for urea and alantoin content. Spot urine samples were acquired on day 13 of each experimental period four hours after the morning feeding during spontaneous urination .The allantoin, cratinine and acid uric in urine and milk was measured by the colorimetric method in accordance with Fujihara *et al.* (1987), whereas the urea content was measured using an enzymatic colorimetric method with an equivalence point reaction (Bergmeyer, 1985). The total levels of purine derivatives (PD) excreted were calculated by Verbic *et al.* (1990) and ruminal N compound synthesis was calculated based on Chen & Gomes (1992). The results were analysed by regression with the *Statistical Analysis System* software (SAS, 2002) at a 5% probability.

Results A linear decreasing effect of different levels of SFO on the excretion of purine derivatives was found (Table 1). This decrease reflected in lower intestinal absorption of purines, lower production of microbial protein in the rumen and lower microbial efficiency.

Table 1 Means of N use efficiency parameters in lactating cows fed different levels of SFO

Items	SFO levels				MSE	Effect (P value)	
	0.0	1.5	3.0	4.5		L	Q
N intake (g/day)	296.4	312.9	318.7	287.3	14.623	ns[2]	ns
Faecal N (g/day)	90.3	100.6	97.3	86.3	7.834	ns	ns
Urinary N (g/day)	118.9	120.8	116.9	113.4	2.833	ns	ns
Milk N (g/day)	79.3	80.6	85.1	84.4	3.872	ns	ns
N balance (g/day)	8.0	10.9	19.4	3.2	9.029	ns	ns
N balance (% of N intake)	1.7	2.5	6.0	0.18	2.971	ns	ns
Urine urea N (mg/dL)	134.8	106.6	97.4	109.9	2.583	ns	ns
Milk urea N (mg/dL)	12.2	13.1	10.8	11.1	1.154	ns	ns
Serum urea N (mg/dL)	10.8	14.1	11.8	10.4	1.039	ns	ns
Total purines (mmol)	280.6	248.9	244.2	230.5	3.561	<0,001	ns
Absorbed purines (mmol)	283.6	246.2	240.6	225.2	4.143	<0,001	ns
Ruminal microbial N (g/day)	206.2	179.0	174.9	163.7	3.014	<0,001	ns
Microbial efficiency (g BW/kg TDN)	123.1	97.9	91.5	83.0	4.332	<0,001	ns
Regression equations							r^2
Total purines (mmol)	$\hat{y} = 274.267 - 10.319xX$						0.63
Absorbed purines (mmol)	$\hat{y} = 276.044 - 12.057xX$						0.77
Ruminal microbial N (g)	$\hat{y} = 200.696 - 8.765xX$						0.96

[1]MSE = Mean standard error; [2]ns = not significant (P>0.05); r^2 = coefficient of determination

Conclusions Inclusion of up to 4.5% SFO in sugarcane-based diets had no effect on nitrogen metabolism, however there was a in decrease production of microbial protein in the rumen resulting in the lower microbial efficiency in Holstein x Gir.

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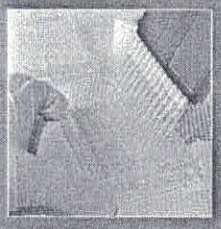
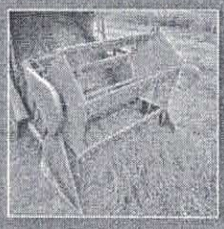


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