Proc. Aust. Soc. Anim. Prod. 2014 Vol. 30

Enteric Methane Emission by Crossbred (Holstein x Gyr) Steers Under Different Feeding Levels

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Methane (CH_4) is an important greenhouse gas, and is related to the efficiency of rumen fermentation and consequent loss of energy in dairy and beef production systems. Methane emission by cattle may vary with the type of animal and level of consumption. The aim of this trial was to evaluate the effects of feeding level on enteric CH_4 emission in crossbred (Holstein x Gyr) steers using the sulphur hexafluoride (SF6) tracer technique.

Eighteen crossbred (Holstein x Gyr) steers (body weight, 203 ± 37.8 kg; age, 10.5 ± 0.8 months) were housed in tie-stall barn at Embrapa Dairy Cattle experimental station. Animals were randomly assigned to three treatments: fed at 1.2% of body weight (BW, dry matter [DM] basis), fed at 1.9% of BW or fed *ad libitum*. The same diet was offered during 56 days (60% corn silage and 40% concentrate, DM basis; 140 g of crude protein per kg of DM). Animals were weighted every 28 days. The sulphur hexafluoride (SF_6) tracer technique was used to measure enteric CH_4 emission (Johnson *et al* 1994), assessed throughout the last 5 days of the experimental period, every 24 h, after the morning meal. Concentrations of CH_4 and SF_6 were determined by gas chromatography. Data were submitted to analysis of variance, the means were compared using Tukey's test ($P < 0.05$) and a correlation study was done using the Pearson's correlation coefficient.

Table 1. Main effect means ± SE to methane emission measurements from crossbred (Holstein x Gyr) steers on different feeding level.

Parameter	Ad libitum	1.9% BW	1.2% BW	*P*-value
Dry matter intake, kg/d	8.22 ± 0.44 a	3.83 ± 0.40 b	2.13 ± 0.40 c	<0.001
Body weight gain, kg/d	1.13 ± 0.06 a	0.47 ± 0.56 b	0.02 ± 0.56 c	<0.001
Methane emission, g/d	138.06 ± 9.46 a	75.29 ± 8.64 b	50.40 ± 8.64 b	<0.001
Methane emission, g/kg of MBW	2.18 ± 0.11 a	1.42 ± 0.10 b	1.07 ± 0.10 b	<0.001
Methane emission, g/kg of DMI	16.92 ± 1.69 a	19.95 ± 1.54 ab	23.74 ± 1.54 b	0.03
Methane emission, g/kg of BWG	122.95 ± 3.67 a	169.36 ± 335.10 a	2366.77 ± 410.41 b	0.002

Means within rows followed by the same letter are not significantly different (P≥0.05).

Dry matter intake (DMI) and body weight gain (BWG) differed ($P < 0.001$) among treatments: 8.22, 3.83 and 2.13 kg DM/d, and 1.13, 0.47 and 0.02 kg BW/d for animals fed *ad libitum*, at 1.9% of BW and at 1.2% of BW, respectively. DMI was positively correlated to CH_4 emission (g/d) (r=0.92, P < *0.01*). Elis *et al* (2009) also reported high correlation of production of CH_4 with daily DMI. Animals fed *ad libitum* consumed 3.48% of BW, DM basis, and presented higher ($P < 0.001$) daily CH_4 emission, as g/d and as g/d per unit of metabolic weight (138.06 g/day and 2.18 g/d/MBW). However, animals fed at 1.9% and at 1.2% of BW were similar (75.29 and 50.40 g of CH_4/day and 1.42 and 1.07 g of CH_4/d/MBW, respectively). Animals fed at maintenance level (1.2% of BW) showed higher ($P = 0.03$) CH_4 emission per kg of DM consumed (23.74 g CH_4/kg DMI) and higher ($P = 0.002$) CH_4 emission per kg of BWG (2.37 kg CH_4/kg BWG) than animals fed *ad libitum* (16.94 g CH_4/kg DMI and 0.12 kg CH_4/kg BWG). Animals fed *ad libitum* presented higher daily CH_4 emission; however, they achieved higher productivity and the CH_4 emission per unit of product was lower than animals fed at maintenance level.

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This work was funded by Fapemig, CNPq and Embrapa

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ANIMAL PRODUCTION IN AUSTRALIA

Proceedings of the 30th Biennial Conference of the Australian Society of Animal Production

Volume 30

Harnessing the Ecology and Physiology of Herbivores

Edited by
S. Hatcher, G.L. Krebs and B.W.B. Holman

National Convention Centre, Canberra, Australian Capital Territory
8-12 September 2014