Effect of crude glycerin on performance and methane emission of Nellore young bulls finished in feedlot

J F Lage[1], E San Vito[1], I P C Carvalho[1], R A Silva[1], A F Ribeiro[1], A Berndt[2], R T S Friguetto[3], R A Reis[1], T T Berchielli[1]
[1]Universidade Estadual Paulista "Julio de Mesquita Filho", Jaboticabal, Sao Paulo, Brazil, [2]EMBRAPA Pecuaria Sudeste, Sao Carlos, Sao Paulo, Brazil, [3]EMBRAPA Meio Ambiente, Jaguariuna, Sao Paulo, Brazil *Email:josilage@gmail.com*

Introduction Crude glycerine (CG) is a by-product of biodiesel industry and has been considered as a viable energy source for cattle, particularly when it is included in up to 10% of total diet dry matter (Drouillard, 2012).This trial aimed to evaluate the effects of feeding CG - 80% glycerol - included on 10% of DM diet, replacing corn or soybean hulls in different concentrate level (CL) 40 or 60% on enteric methane (CH_4) production of young bulls finished in feedlot.

Material and Methods Thirty six young bulls (Nellore), with 374.11 ± 24.77 initial BW, were randomly assigned to six treatments, with six replicates. The diets were: without CG plus corn (Cn); association of CG and corn (CGc), association of CG plus soybean hulls (CGsh). These three diets were combined with two CL (40 or 60%), resulting in six diets isonitrogenous. Corn silage was used as the only source of roughage and concentrates were composed of grounded corn or soybean hulls, soybean meal, urea/ammonium sulphate·and mineral mixture. The urea was used for adjusted the crude protein in diets - maximum 1% of diet DM. Diets were fed as total mixed ration and cattle were fed twice daily (at 0700 and 1500) allowing for up to 10% of orts. Animals were assigned in individuals pens and after 94 days of feeding, the animals were slaughtered with average of 495.50 kg BW. The average daily gain (ADG) was obtained at the beginning and end of the experimental period. Ruminal CH_4 was measured after 87 d of feed using a sulphur hexafluoride (SF_6) gas tracer every 24 h during five consecutive days in one experimental period with 15 prior adaptation days according to the method described by Johnson and Johnson (1995). CH_4 flux produced by animals was calculated in relation to the SF_6 tracer gas flux from a permeation capsule lodged in the rumen minus the basal CH_4 concentration in the air (Westberg *et al.*, 1998). Following equation was used: $Q_{CH4} = Q_{SF6} \times ([CH_4]_y - [CH_4]_b) / [SF_6]$, where Q_{CH4} = CH_4 emission tax by animal; Q_{SF6} = know SF_6 emission tax from capsule in rumen; $[CH_4]_y$ = CH_4 concentrations in collection apparatus; $[CH_4]_b$ = basal CH_4 concentration; and $[SF_6]$ = SF_6 concentration in collection apparatus. CH_4 outputs (g/d) proportional to DM intake DMI (kg/d) and organic matter intake OMI (kg/d) were calculated by dividing the daily CH_4 output of each animal by their daily DMI, OMI (during CH_4 sampling) and ADG (throughout the entire experimental period). The experiment was conducted according to a completely randomized design in a factorial arrangement 2x3 (two CL x three feeding regimes; FR). Data were analyzed by the GLM procedure of SAS, and the Tukey test used considering 5% probability.

Results There was no interaction ($P > 0.05$) between CL and FR for any of the variables evaluated. There was no effect ($P > 0.05$) of CL on ADG, CH_4 emitted per day (g CH_4.day^{-1}), CH_4 per kilogram of ADG (g CH_4.kg ADG^{-1}), CH_4 per kilogram of DM intake (g CH_4.kg DMI^{-1}) and CH_4 per kilogram of organic matter intake (g CH_4.kg OMI^{-1}). The inclusion of CG in diets did not affect ($P > 0.05$) the ADG, g CH_4.day^{-1}, g CH_4.kg ADG^{-1}, g CH_4.kg DMI^{-1} and g CH_4.kg OMI^{-1}. However, on FR there was a tendency ($P = 0.0959$) to increase g CH_4.kg DMI^{-1} in diets with CG plus corn.

Table 1 Average daily gain and methane emission of Nellore young bulls finished in feedlot

Item[1]	Concentrate Level (CL)			Feeding regimes (FR)[3]				CL x FR
	60:40	40:60	P^2	Cn	CGc	CGsh	P^2	P^2
ADG, kg	1.27±0.05	1.32±0.04	0.4922	1.25±0.08	1.36±0.04	1.29±0.06	0.4511	0.9334
CH_4, g/d	171.30±10.31	171.17±7.73	0.9920	162.11±10.18	183.05±13.83	168.55±7.82	0.4113	0.4897
CH_4, g/kg ADG	138.75±7.72	127.74±4.82	0.2560	131.48±7.47	134.55±10.62	133.71±5.52	0.9625	0.5910
CH_4, g/kg DMI	20.83±0.91	21.18±0.86	0.7597	19.32±0.84	22.32±1.25	21.38±0.94	0.0959	0.0671
CH_4, g/kg OMI	30.08±1.38	27.64±1.19	0.1512	26.51±1.43	30.60±1.87	29.47±1.29	0.1264	0.0823

[1]/ADG = average daily gain; DMI = dry matter intake; OMI = organic matter intake; [2]/Probability ($P < 0.05$); [3]/Cn = without crude glycerin; CGc = crude glycerin plus corn; CGsh = crude glycerin plus soybean hulls.

Conclusion Animals fed with low or high level of concentrate showed similar performance and methane enteric emissions. Animals fed with crude glycerin in 10% of DM showed similar methane enteric emissions than animals fed without crude glycerin on the diet.

Acknowledgements Bellman® Animal Nutrition; FAPESP

References

Drouillard, J.S. 2012. In Makkar, H.P.S. (Ed.), Biofuel co-products as livestock feed - Opportunities and challenges (p.155-161). Rome.
Johnson, K.A. and Johnson, D.E., 1995. Journal of Animal Science. 73, 2483–2492.
Westberg, H. H., Johnson, K. A., Cossalman, M. W. 1998. Report, Revision2. Pullman-Washington, p. 40.