Documentos

ISSN 1983-974X
Outubro, 2016 **216**

II SIGEE – Second International Symposium on Greenhouse Gases in Agriculture – Proceedings

Embrapa

ISSN 1983-974X
outubro, 2016

Empresa Brasileira de Pesquisa Agropecuária
Embrapa Gado de Corte
Ministério da Agricultura, Pecuária e Abastecimento

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Embrapa
Brasília, DF
2016

Exemplares desta publicação podem ser adquiridos na:

Embrapa Gado de Corte
Av. Rádio Maia, 830, Zona Rural, Campo Grande, MS, 79106-550
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Foto da capa: Luiz Antônio Dias Leal

1ª edição
Versão online (2016)

Dados Internacionais de Catalogação na Publicação (CIP)
Embrapa Gado de Corte.

Anais - 2º Simpósio Internacional Sobre Gases de Efeito Estufa na Agropecuária [recurso eletrônico] / Roberto Giolo de Almeida et al. - Campo Grande, MS : Embrapa Gado de Corte, 2016.
502 p. ; 21cm. - (Documentos / Embrapa Gado de Corte, ISSN 1983-974X ; 216).

Sistema requerido: Adobe Acrobat Reader, 4 ou superior.
Modo de acesso: <http://www.cnpgc.embrapa.br/publicacoes/doc/DOC216.pdf>
Título da página da Web (acesso em 16 de outubro de 2016).

1. Gases de efeito estufa. 2. Agropecuária. 3. Emissões de GEE. 4. Embrapa Gado de Corte. I. Almeida, Roberto Giolo de. II. Oliveira, Patrícia Perondi Anchão. III. Saito, Maurício. IV. Soares, Cleber Oliveira. V. Galvan, Lucas. VI. Chiari, Lucimara. VII. Alves, Fabiana Villa. Bungenstab, Davi José.

CDD 636.213

Methane emissions per area from Holstein and Holstein/Jersey dairy cows in two different grazing systems –preliminary results

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Introduction

The increase in greenhouse gases in the atmosphere is a widely discussed topic, with methane (CH_4) generally mentioned as a gas with a global warming potential 25 times greater than carbon dioxide (CO_2) (IPCC, 2006).

In Brazil, CH_4 emission from enteric fermentation in the dairy sector is estimated to produce 12% of total CH_4 emission from agriculture (MCTI, 2014). Suggestions to reduce CH_4 emissions per area include the adoption of cultivated pastures and the improvement of native pastures, increasing the carrying capacity of grazing areas with the consequent increase of stocking rates and productivity in animal production systems (Oliveira et al., 2015).

Therefore, the aim of this study was to estimate CH_4 emissions per ha from **Holstein and Holstein/Jersey** lactating dairy cows in two grazing systems..

Material and Methods

The experiment was conducted at Embrapa Southeast Livestock, using 24 lactating dairy cows (12Holstein and 12Jersey-Holstein cross) in a 2 x 2 factorial design with two pasture systems: extensive with low stocking rate - EXT - and intensively managed and irrigated with high stocking rate - IIR. Evaluations were carried out during the total lactation period of the cows (270 d).

Cows received a dietary supplement formulated according to the NRC (2001), in a rate of 1 kg of concentrate per 3 kg of milk produced. The EXT system consisted of two paddocks of 3.0 ha each, containing a misture of *Brachiaria spp*. and *Cynodon nlemfuensis* Vanderyst, managed as continuous grazing systems. The IIR system was cultivated with *Panicum maximum* Jacq cv. Tanzânia and overseeded with *Avena byzantina* cv. São Carlos and *Loliun multifloram* Lan. cv. BRS Ponteio, in autumn. The IIR system consisted of two similar 1.6 ha areas managed as rotational grazing systems. Each area was divided in 27 padocks, with 600 m^2 each, intermittently grazed, with a day of occupation and 26 days of rest.

All of the grazing systems were submitted to stocking rate adjustments using the “put and take” technique (Mott and Lucas, 1952) and visual evaluation of forage availability.

The sulfur hexafluoride tracer technique, as described by K. A. Johnson and D. E. Johnson (1995), adapted by Primavesi et al. (2004) and improved by Berndt et al. (2014), was used for determination of enteric methane from the cows,. Measurements were performed three times during the lactating period (in winter, spring and summer).

Total CH_4 emissions were calculated per hectare (kg CH_4 ha^{-1} per 270 d lactation), according to genotypes and grazing system. The CH_4 emission factors for total milk yield (MY) and 3.5% fat corrected milk

(FCM) per ha were calculated by dividing the total CH_4 emission per ha by MY and FCM, respectively. Data were analyzed by the SAS® (SAS Institute, 2002) program, using Mixed Procedure.

Results

Annual average stocking rates were 1.9 and 2.1 animals ha^{-1} in EXT and 6.6 and 7.9 animals ha^{-1} in IIR, for Holstein and Jersey-Holstein breeds, respectively. Milk yield did not differ between breeds (mean of 34.7 kg d^{-1}). Total methane emission per ha was higher in IIR (379.4 kg ha^{-1}) compared to EXT (97.7 kg ha^{-1}) ($P<0.0001$), however, CH_4 emissions per milk yield (mean of 18.0 g kg MY^{-1})) and fat corrected milk production (mean of 18.8 g kg FCM^{-1})), did not differ between the grazing systems. The CH_4 emissions per hectare (kg ha^{-1}) were not affected by genotype ($P=0.2160$). However, Jersey-Holstein cows emitted less CH_4 per MY^{-1} ($P=0.0307$) and per FCM^{-1} ($P=0.0949$) than Holstein cows (Figure 1).

In the winter, CH_4 emissions per ha (147.62 kg ha^{-1}, P=0,0004), per MY (14.39 g kg MY^{-1}, P=0,0003) and per FCM (14.47 g kg FCM^{-1}, P=0,0004) were lower than in spring (323.95 kg ha^{-1}, 19.33 g kg MY^{-1} and 20.51 g kg FCM^{-1}, respectively) and summer (244.09 kg ha^{-1}, 20.28 g kg MY^{-1}, 21.47 g kg FCM^{-1}, respectively). It was observed interaction between season and grazing system for total CH_4 emissions per ha ($P=0.0023$). The total emission was higher in IIR system than in EXT in all seasons but the difference was smaller during the winter.

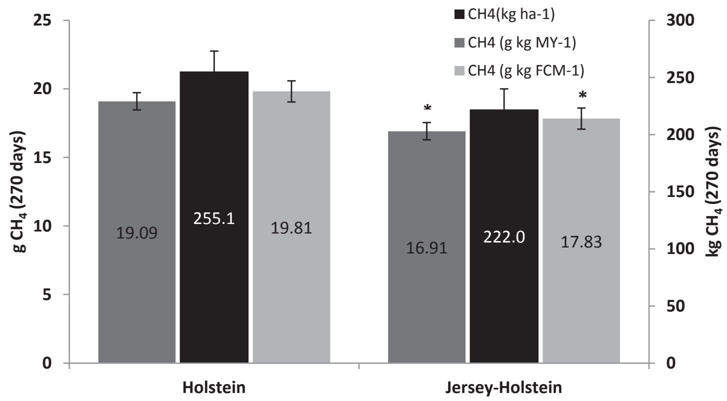

Figure 1. CH4 emissions from lactating dairy cows according to genotype (Holstein vs Jersey- Holstein) during 270 days of lactating.

Conclusions

It may be concluded that the higher methane emission per area in intensively managed grazing systems is compensated by the higher milk productivity in these systems, resulting in CH4 emission per kg of milk produced not different compared to less intensive systems. In that sense, intensifying milk production may attend the growing demand for milk without the opening of new areas, avoiding deforestation.

Additionally, Jersey-Holstein cows seem to be an alternative to reduce CH4 emissions, emitting less CH4 per kg of milk produced than Holstein cows.

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Acknowledgements

CNPq for the financial support for the project 562861/2010-6
EMBRAPA for financing the Pecus network (01.10.06.0001.05.00).
CAPES x EMBRAPA (15/2014) for the scholarship and financial support for the project (15/2014).