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Methane emission efficiency on integrated crop- livestock- systems at southern Brazil

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Introduction Methane (CH_4) emissions related to rumen fermentation is an important contributor to anthropogenic greenhouse gas (GHG) emissions into the atmosphere. Recent studies have demonstrated that reducing GHG emissions are related to the optimization of feed efficiency, this is to improve the quantity of product output while reducing environmental footprint (Hristov et al., 2013). On Integrated Crop-Livestock Systems (ICLS), in areas with the presence of trees, the shade-response in grass communities could be considered an emergent propriety. Shading may increase the N use efficiency of the understory plant leading to higher crude protein content in the dry matter and, when ingested, to a better conversion into the rumen, which would allows less CH_4 emission.

Material and Methods

We investigated the effects of the i) presence of trees and ii) N fertilization rate over the enteric methane emission of cattle grazing cool-season pastures on ICLS systems, over three grazing cycles corresponding to 2012,2013 and 2014in a long-term ICLS protocol. The field experiment was a complete randomized block design, with four treatments [(i) presence or absence of trees and, (ii) Nitrogen fertilization rates -90 and 180 kg per ha] three replications (12 paddocks of 0.99±0.231 ha) carried out at the Agronomic Institute of Paraná at Ponta Grossa-PR (25°07'22''S; 50°03'01''W). The mixed tree component - eucalyptus (*Eucalyptus dunnii)*, pink pepper (*Schinus molle)* and silver oak (*Grevillea robusta*)- was planted in 2006 (237 trees/ha), on six paddocks. The forages were black oats + annual ryegrass (*Avena strigosa* + *Lolium multiflorum*), sown annually, and grazed by Purunã beef breed heifers (total of 24 animals- LW, 313.2 ± 41.57 kg). The forage was managed maintaining post grazing sward height at 20 cm. Gas collections were performed in each grazing cycle, over 5 consecutive days, by SF_6 technique, on two animals per paddock.

Results and Conclusions

CH_4 emission rate per kg live weight gain was calculated to study the relationship between the methane emission per unit animal product and the proposed treatments. There wasn't difference between treatments ($P>0.05$) with a mean CH_4 emission efficiency of 249.1 ±115.6374 g CH_4 kg ADG^{-1}. Other analysis and modelizations must be done, aiming to estimate CH_4 balance and other approaches using life cycle assessment, for example. Furthermore, on ICLS, single productivity doesn't must be considered due to the huge potential to mitigate CH_4 emissions by C fixed in soil, tree and forage components. Therefore, these integrated systems could be a key form of sustainable intensification needed for achieving future food security.

References cited Hristov et al. (2013) J. Anim. Sci. 91:5095–5113

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