58ª REUNIÃO DA SBZ
ZOOTECNIA PARA SEGURANÇA ALIMENTAR
E SUSTENTABILIDADE CLIMÁTICA

August 12th to 16th,

Enteric methane emissions expressed by carcass productivity of *Nellore* cattle raised in consortium pasture

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The increase in greenhouse gas emissions (GHG) is considered one of the main causes of global warming, with enteric methane (CH_4) from beef cattle being an important emission source in the agricultural sector. This study aimed to assess enteric methane emissions per carcass productivity of *Nellore* cattle raised in a consortium pasture system. The experiment was conducted between October 2020 and September 2021 at Embrapa Pecuária Sudeste, São Carlos, São Paulo, Brazil. Twenty-seven steers, initially weighing 221 ± 7 kg body weight and aged 15 - 16 months, were distributed into three treatments with three grazing units (1.3 hectares each): degraded pasture containing *Urochloa spp*. (DEG), recuperated pasture containing *Urochloa spp*. fertilized with 200 kg of $N.ha^{-1}$ (REC), and consortium pasture with pigeon pea (*Cajanus cajan* cv. BRS Mandarin) and *Urochloa spp*. (MIX). Enteric CH_4 emissions were determined using the sulfur hexafluoride (SF_6) tracer gas technique. Enteric CH_4 was sampled during the rainy (January) and dry (June) seasons. Carcass yield was estimated at 50% of body weight after 16 hours fast from solids and 4 hours fast from liquids. The data were subjected to analysis of variance using SAS PROC MIXED and mean comparison by Tukey's test (5%). There was an interaction between treatments and seasons (P = 0.0281). For DEG, REC, and MIX during the rainy season, the CH_4 emission values per kilogram of carcass were, respectively 0.82^{Aa}, 0.69^{Aa} and 0.72^{Aa} (kg CH_4 kg car. eq^{-1}). During the dry season, the values were 5.18^{Ab}, 4.68^{Ab} and 1.76^{Ba} (kg CH_4 kg car. eq^{-1}) for DEG, REC, and MIX, respectively [Capital letters differentiate treatments and lowercase letters differentiate seasons]. Although emissions were lower during the rainy season, no difference was observed between grazing systems. During the dry season, the MIX treatment was able to reduce enteric CH_4 emissions by 34% when compared to DEG. The absence of fertilizer use and the reductions in enteric methane emissions per kilogram of carcass produced in the dry season, made the MIX system (pigeon pea + *Urochloa* spp. consortium) an efficient strategy to mitigate CH_4, which optimizes the livestock production on tropical pastures even in shortage of feed.

Keywords: beef cattle farming, greenhouse gases, pigeon pea, sustainability

Acknowledgments: This research was funded by São Paulo Research Foundation (FAPESP), grant numbers 2017/20084-5 and 2022/08165-8, and by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Funding code 001.

The study was approved and followed the guidelines of the Committee for the Use and Care of Institutional Animals (CEUA) of Embrapa (nº 05/2016) and College of Veterinary Medicine and Animal Science of University of São Paulo (nº 6228200521).