Correlations between Methane Emissions and Production Traits in Australian Merino Sheep

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Variability of methane (CH_4) emission in sheep and impact of selecting low emitting individuals are investigated as part of greenhouse gas mitigation strategies. This study aimed to estimate the correlations between CH_4 and different production traits in Australian Merino. Using portable accumulation chambers, data of CH_4 emissions of 863 animals born between 2018 and 2020, sired by 19 rams was collected. Animal solutions for CH_4 (g/d) were generated using a repeated measure model including sex-pen-trial as fixed effect, and animal and date-hour of the measure fitted as random effects. For estimating correlations with CH_4, the traits selected were related to feed efficiency (feed intake, residual feed intake - RFI), growth (average daily gain - ADG, metabolic weight - MWT, yearling body weight - BW), carcass quality (rib-eye area - REA, fat thickness - FT), feeding behavior (number of meals); fecal egg count (Log_e FEC), and wool production (staple length - SL, greasy fleece weight - GFW, fiber diameter - FD). Residuals of the mentioned traits were estimated using a model including age, type of birth and sex-pen-trial as fixed effects, with the exception of RFI. The coefficients of correlation indicated that CH_4 was not associated with GFW and FD residuals ($p>0.05$). Significant ($p<0.05$) but low correlations were estimated for SL, Log_e FEC traits, RFI, FT and number of meals, with values ranging from 0.09 to 0.15. Higher correlations were found between CH_4 and REA and BW (0.23 and 0.29, respectively). The strongest associations were with ADG (0.36), feed intake (0.45) and MWT (0.46). In agreement with the correlations with growth and feed intake, a positive correlation (0.14) between CH_4 and RFI, indicates that high emitters may present lower feed efficiency.