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In vitro Ruminal Fermentation, Methane Production, and Nutritional Value of Different Tropical Feedstuffs

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Abstract

In vitro gas production (GP), methane (CH_4) production, metabolisable energy (ME), and digestibility of organic matter (dOM) from 18 tropical feedstuffs were determined using the Hohenheim Gas Test (HGT) described by Menke and Steingass (Anim. Res. Develop. 1988, 7–55). In short, approximately 200 mg of feed sample (crop residues: Rice straw, urea molasses treated straw, Maize stover; common grasses: Napier grass, German grass, Para grass; silages: Maize silage, Napier silage; leguminous fodder: Ipil Ipil, Gliricidia, Alfalfa hay, *Moringa* tops; concentrates: maize, wheat, wheat bran, kashari bran, rice bran, mustard oil cake) were incubated with a rumen fluid buffer solution for 72 h to measure GP. The ME and dOM were calculated using equations 12f and 43f (Menke and Steingass, 1988). Additionally, 120 mg of feed samples were incubated for 24 h to determine the CH_4 concentration in the produced gas. Among the roughages, CP concentration of leguminous fodder (166–314 g kg^{-1} DM) was the highest, followed by the common grasses (52–147 g kg^{-1} DM) and the silages (94–106 g kg^{-1} DM), but their ADF, NDF, and ADL concentration were the lowest. The crop residues showed the lowest CP (44–70 g kg^{-1}DM) and the highest cell wall concentrations. The dOM and ME of wheat (87.8 % and 14.4 MJ kg^{-1} DM), maize (90.3 % and 13.8 MJ kg^{-1} DM), wheat bran (77.3 % and 11.4 MJ/kg DM), and kashari bran (71.5 % and 9.84 MJ/kg DM) were significantly ($p < 0.05$) higher than those of other feedstuffs. The same trend was perceived ($p < 0.05$) for CH_4 concentration (% of GP) and CH_4 production (L kg^{-1} dOM). Within roughages, dOM and ME of German grass (61.6 % and 7.4 MJ kg^{-1} DM) and Ipil Ipil (58.8 % and 8.2 MJ kg^{-1} DM) were higher ($p < 0.05$), whereas the CH_4 concentration (15.7 % and 14.7 %) and CH_4 production (42.9 L kg^{-1} dOM and 34.8 L kg^{-1} dOM) were lower compared to crop residues and other common grasses. In conclusion, these results support the formulation of balanced rations for ruminants with higher digestibility and less CH_4 production when using commonly available feed resources. This may enhance animal productive performance while reducing the impact of animal production on the environment.

Keywords: Chemical composition, Feedstuffs, *In vitro* digestibility, Methane emission, Tropical

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