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Microbial nitrogen synthesis and amino acid metabolism in growing steers fed diets with different sources of forage and cereal

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Abstract This experiment was carried out to evaluate the effects of 2 sources of forage (37.5% corn silage, Cs and 37.5% rice silage, Rs) and 2 sources of cereal (35% steam-flaked corn, Cg and 35% steam-flaked rice, Rg) on microbial nitrogen (MN) synthesis, amino acid (AA) metabolism and N utilization. Four Holstein steers (490 ± 46 kg of initial BW), each fitted with ruminal and duodenal cannulas, were used in a 4×4 Latin square design with four 21-d periods and a 2×2 factorial arrangement of dietary treatments. Ruminal digestibilities of OM, NFC and starch were greater for steers received the Rs diets than for those received the Cs diets ($P<0.05$). Starch digested in the rumen and total tract, digestibility of starch in the rumen were higher for Rg than Cg ($P<0.05$), digestion of NFC also showed similar changes, indicating that rice starch was fermented and digested more easily in the rumen for rice starch compared with corn starch. But duodenual flow and synthesis efficiency of MN were not affected by treatments ($P>0.10$). No significant relationship between flow and plasma concentration of essential AA was observed ($r2 = 0.027$, $P = 0.545$). Reduction rates of plasma concentration of Lys for CsCg (32.6%), RsCg (22.3%) and RsRg (28.8%), Leu (22.4%) and Met (21.0%) for CsRg, were relatively high, suggesting that these amino acids could be obsorbed and utilized to a greater exetent, and likely become limiting AAs for those diets. N retention tended to be greater for Cs diets than Rs diets ($P<0.10$). The results showed that based on the same energy available, rice silage or rice grain can be used as a substitution of corn silage or corn grain for feeding animals, respectively. When steers are provided amino acids supplementation, different limiting AA must be considered for different dietary treatment combinations.

Keywords growing steer;forage;cereal;microbial nitrogen synthesis;nitrogen utilization