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不同NFC/NDF饲料和硫胺素对奶牛瘤胃代谢的影响

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Effects of Different Dietary NFC/NDF and Thiamine on Rumen Metabolism in Dairy Cows

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摘要 本试验旨在研究不同非纤维性碳水化合物和中性洗涤剂纤维比(NFC/NDF)饲料和硫胺素对荷斯坦奶牛瘤胃代谢的影响。选用3头健康状况良好且安装永久性瘤胃瘘管的荷斯坦奶牛,采用3×3完全拉丁方试验设计。试验分3期进行,每期23 d,每期中预试期20 d,正试期3 d;3个试验组分别饲喂NFC/NDF为1.41(精粗比5:5)、NFC/NDF为2.01(精粗比7:3)、NFC/NDF为2.01(精粗比7:3)+180 mg/kg硫胺素的试验饲料。结果表明:提高饲料NFC/NDF,瘤胃液pH显著降低($P<0.05$),氨态氮($\text{NH}_3\text{-N}$)浓度显著或极显著上升($P<0.05$ 或 $P<0.01$),乳酸浓度显著或极显著升高($P<0.05$ 或 $P<0.01$),乙酸比例($P<0.05$)、乙酸/丙酸($P<0.05$ 或 $P<0.01$)显著或极显著降低,丙酸、丁酸比例显著或极显著上升($P<0.05$ 或 $P<0.01$)。高NFC/NDF饲料添加硫胺素后,瘤胃液pH有升高趋势,差异不显著($P>0.05$), $\text{NH}_3\text{-N}$ 浓度显著降低($P<0.05$),乳酸浓度显著或极显著降低($P<0.05$ 或 $P<0.01$),乙酸比例和乙酸/丙酸显著或极显著降低($P<0.05$ 或 $P<0.01$),丙酸比例显著或极显著升高($P<0.05$ 或 $P<0.01$)。由此可见,饲料NFC/NDF的增加能够诱导瘤胃产生亚急性瘤胃酸中毒,添加180 mg/kg硫胺素能够缓解这一现象。

关键词: NFC/NDF 硫胺素 亚急性瘤胃酸中毒 瘤胃发酵

Abstract: This experiment was conducted to study the effects of different dietary non-fiber carbohydrates to neutral detergent fiber ratios (NFC/NDF) and thiamine on rumen metabolism in Holstein dairy cows. Three healthy Holstein dairy cows equipped with rumen fistulous were used in a 3×3 Latin square design experiment. The experiment was carried out for 3 periods with 23 days (20-day pre-trial period and 3-day trial period) per period. The cows were fed three different diets, which were NFC/NDF=1.41 (concentrate to forage 5:5), NFC/NDF=2.01 (concentrate to forage 7:3) and NFC/NDF=2.01 (concentrate to forage 7:3)+180 mg/kg thiamine, respectively. The results showed as follows: with the increase of dietary NFC/NDF, rumen fluid pH was significantly decreased ($P<0.05$), the $\text{NH}_3\text{-N}$ concentration of rumen fluid was significantly increased ($P<0.05$ or $P<0.01$), and the lactic acid concentration of rumen fluid was also significantly increased ($P<0.05$ or $P<0.01$), while the acetic acid proportion ($P<0.05$) and acetic acid/propionic acid ($P<0.05$ or $P<0.01$) of rumen fluid were significantly decreased, and the proportions of propionic acid proportion and butyric acid of rumen fluid were significantly increased ($P<0.05$ or $P<0.01$). The dietary supplementation of thiamine tended to increase rumen fluid pH ($P>0.05$), while rumen fluid $\text{NH}_3\text{-N}$ concentration was significantly decreased ($P<0.05$), lactic acid concentration was decreased significantly ($P<0.05$ or $P<0.01$), and acetic acid proportion and acetic acid/propionic acid of rumen fluid were significantly decreased ($P<0.05$), while propionic acid proportion was significantly increased ($P<0.05$ or $P<0.01$). These results indicate that the increase of dietary NFC/NDF can induce subacute ruminal acidosis, and the alternative dietary supplementation of thiamine at 180 mg/kg can release the rumen acidosis.

Keywords: NFC/NDF, thiamin, subacute ruminal acidosis, rumen fermentation

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