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丙酸钙对高精料底物瘤胃体外发酵产气量、发酵参数和干物质降解率的影响

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Effects of Calcium Propionate on *in Vitro* Ruminal Gas Production, Fermentation Parameters and Dry Matter Degradation Rate of Substrate with High Concentrate

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摘要 本试验旨在研究丙酸钙对高精料底物瘤胃体外发酵产气量、发酵参数和干物质降解率的影响。选取3头体重为350 kg左右,装有永久性瘤胃瘘管的西门塔尔阉牛作为瘤胃液供体牛,在基础发酵底物中分别添加0(对照组)、2.5%、5.0%、7.5%和10.0%的丙酸钙(干物质基础),采用瘤胃体外产气法发酵,并测定产气量、发酵参数和干物质降解率。结果表明:丙酸钙对高精料底物理论最大产气量、产气速率均没有显著影响($P>0.05$)。随着丙酸钙添加量的提高,氨态氮和异丁酸浓度没有显著变化($P>0.05$);乙酸、丙酸、丁酸、戊酸、异戊酸和总挥发性脂肪酸浓度均呈现先降低后增加的二次曲线规律;发酵液pH有先增加后降低的二次曲线变化($P_Q<0.05$),且10.0%组与对照组数值接近;干物质降解率呈现先降低后增加的二次曲线变化($P_Q<0.05$)。在本试验条件下,高精料底物中添加丙酸钙不能改善瘤胃体外发酵和提高干物质降解率,对提高营养物质利用率没有显著效果,但是提高了发酵液pH,可以作为防止瘤胃酸中毒的饲料添加剂。

关键词: 丙酸钙 产气量 发酵参数 降解率

Abstract: This experiment aimed to study the effects of calcium propionate on *in vitro* ruminal gas production, fermentation parameters and dry matter degradation rate of substrate with high concentrate. Donor animals of rumen fluid were three 350 kg Simmental steers with permanent rumen fistulas. The basal fermentation substrate was supplemented with 0 (control group), 2.5%, 5.0%, 7.5% and 10.0% calcium propionate (dry matter basis), respectively. Gas production, fermentation parameters and dry matter degradation rate were determined after *in vitro* rumen fermentation by the method of *in vitro* gas production. The results showed as follows: calcium propionate had no significant influences on theoretical maximum gas production and gas production rate ($P>0.05$). With the increase of calcium propionate supplemental level, ammonia nitrogen and isobutyric acid concentrations were not significantly changed ($P>0.05$); the concentrations of acetic acid, propionic acid, butyric acid, valeric acid, isovaleric acid and total volatile fatty acid, as well as dry matter degradation rate showed the same quadric curve response, which were decreased at first and then increased ($P_Q<0.05$); fermentation fluid pH showed an opposite quadric curve response, which was increased at first and then increased ($P_Q<0.05$), and the values in 10.0% group and control group were close. Under conditions in the experiment, the supplementation of calcium propionate in substrate with high concentrate can't improve rumen fermentation, increase dry matter degradation rate and increase nutrients utilization, but can increase fermentation fluid pH and be used as feed additive to prevent rumen acidosis.

Keywords: calcium propionate, gas production, fermentation parameter, degradation rate

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