**Grape seed tannin extract and polyunsaturated fatty acids affect *in vitro* ruminal fermentation and methane production**

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Objectives of this study were to investigate potential interactions of condensed tannins (CT) and polyunsaturated fatty acids (PUFA) on ruminal fermentation, biohydrogenation (BH), and methane production. Ruminal fluid obtained from lactating Holstein Friesian cows was used. All experiments were carried out as a completely randomized design with the same mixed diet: control (60:40 forage:concentrate) without supplement (CON), 2.5% soybean oil (SBO), and SBO + grape seed tannin extract (GSTE) at 0.2%, 0.4%, 0.6%, or 0.8% dietary DM (ST0.2, ST0.4, ST0.6, and ST0.8, respectively). Compared with CON (84.7 mM), total VFA concentration was not affected by SBO, but decreased (P < 0.001) with ST0.8 vs. ST0.6 (75.3 vs. 78.3 mM). Relative to CON, methane production was depressed (P < 0.001) by 17.7% and 28.0% in ST0.4 and ST0.8. The highest (P < 0.001) mean concentrations of *c*9,*t*11 CLA and C18:1 *t*11 were observed with ST0.4 compared with CON. Concentrations of *c*9,*t*11 CLA with supplemental SBO and ST0.8 nearly peaked (P < 0.001) at 2 h incubation, but this fatty acid peaked (P < 0.05) at 6 h incubation and remained higher (P < 0.001; 15.9–17.0 µg/mL) at 24 h incubation with ST0.2, ST0.4, and ST0.6 compared with other diets (13.5–14.5 µg/mL). Compared with CON (50.6 µg/mL), concentration of C18:1 *t*11 with SBO and CT-containing diets reached a peak (P < 0.001; 241–265 µg/mL) at 12 h incubation. Combined data suggests that PUFA in SBO are more effective in modulating ruminal BH and CH4 production when combined with CT. However, high doses of added CT can reduce ruminal VFA concentration. Thus, a level of 0.4% GSTE added to diets containing 2.5% PUFA from plant origin might be suitable for optimizing ruminal fermentation and BH of C18:2 *c*9,*c*12 to fatty acid intermediates that could have beneficial effects to human health.

**Keywords**: biohydrogenation, condensed tannins, methane, rumen, soybean oil

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