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Effects of dietary supplementation with enriched olive cake on growth, rumen fermentation, and metabolic status in Limousine bulls

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Inclusion of olive cake (OC) into animal diet is an opportunity for circular economy, animals' health, and animal products quality. The aim of this study was to evaluate the effects of dietary polyphenols enriched OC (EOC) supplementation on performance, inflammometabolic response, and rumen metabolism of Limousine bulls. Thirty bulls were blocked by body weight (BW) and then randomly assigned to 1 of 2 dietary treatments for 80 d: concentrate without inclusion of EOC (CTR) and concentrate with 13% inclusion of EOC (EOC). BW measures and blood samples were collected at 0, 40 and 80 d of treatment, whereas rumen fluid samples were collected after slaughtering. Data were analyzed with the GLIMMIX procedure of SAS. EOC bulls had greater rumen propionate and lower acetate, isobutyrate, and isovaleriate content, as well as lower acetate:propionate and acetate+butyrate:propionate ratio than CTR bulls. EOC group showed greater levels of blood urea, γ-glutamyl transferase, and alkaline phosphatase, and lower levels of fructosamine, albumin, ferric reducing antioxidant power, calcium, and zinc than CTR group. Although no differences between groups were achieved for performance, the inclusion of 13% of EOC in the concentrate could result in a worsen feed efficiency (high content of low-degradable NDF and ADF) and lower liver functionality due probably to high level of organic peroxides of the enriched OC supplement. However, the lower rumen acetate and the greater propionate concentration in the EOC bulls could be indicative of a positive modulation of rumen metabolism towards lower methane production.

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In vitro rumen fermentation of forage-based diets supplemented with hydroxytyrosol extracts

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Dietary polyphenols may modify rumen fermentation pathways. In vitro gas production and fatty acids (FA) were analyzed after adding an hydroxytyrosol (HT) extract (0 vs. 178±36 mg/kg) to forage-based total mixed rations (TMR) (50% neutral-detergent fiber; 11.4% crude protein; 2.1% ether extract with 37.1% of C18:2 n-6 and 9.7% of C18:3 n-3). Rumen fluid was collected from twelve slaughter cows and each sample (n=8 per treatment) was incubated in triplicate in three separate runs. The dried matter (DM) samples were incubated with rumen fluid (pH set at 6.9±0.11) in a water bath at 39 °C for 48 h. Data were analyzed with mixed models including diet as fixed effect and incubation run as random effect. The final pH did not differ between diets (6.64 vs. 6.67±0.035, in control and HT, respectively; $p>0.10$). Gas production after 24 h incubation tended to increase by HT addition (79.8 vs.84.1±5.54 ml/g incubated DM; $p=0.10$), but it did not differ after 48 h (99.2 vs. 100.7±4.41 ml/g incubated DM; $p=0.76$). Both in vitro DM disappearance and true DM digestibility were enhanced by HT addition (25.7 vs. 33.2±2.15% and 34.7 vs. 42.5±1.93%, respectively; $p<0.01$). Total FA content in residues did not differ across treatments (70.3 vs.72.5±7.57 mg/g DM; $p>0.10$). Biohydrogenation of C18:2 n-6 and C18:3 n-3 was similar across treatments (96.4 vs. 94.7±2.27% and 98.3 vs. 97.1±0.98%, respectively; $p>0.10$). The only differences in lipid composition were observed in the sum of dimethylacetals, which were higher by adding HT (0.29 vs. 0.31±0.042%; $p<0.05$). Adding HT to TMR increased rumen degradability of structural carbohydrates but had minor effects on unsaturated FA hydrogenation. Funded by PID2020-113617RR-C21.