Abstracts

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Supplementation with EUG had no effect on ruminal pH, concentrations of total VFA and NH₃-N, and protozoa numbers. The effect of EUG on VFA profile was only limited to BCFVA proportion, which was higher in cows fed EUG as compared to those fed diets without EUG (2.19 vs. 1.93%). Ruminal degradation of hay DM was lower (45.1 vs. 53.7%) and that of soybean meal DM tended to be lower (71.1 vs. 76.7%); P = 0.08) for H than for L. Ruminal degradation of corn DM was unaffected (68.9%) by the concentrate level. Supplementation with EUG had no effect on ruminal degradation of any of the feed ingredients tested. Results from this study show that at the concentration evaluated (50 mg/kg of dietary DM), eugenol supplementation had minor effects on fermentation, protozoa numbers, and feed degradation in the rumen of cows fed high- or low-concentrate diets.

Key Words: essential oil, concentrate level, rumen

T254 Effects of eugenol supplementation on feed intake, nutrient digestibility, nitrogen retention, milk production, and milk composition of dairy cows fed high- or low-concentration diets. C. Benchaa*, W. Z. Yang**, H. V. Petit†, and P. Y. Chouinard§, Agriculture and Agri-Food Canada, Dairy and Swine R&D Centre, Sherbrooke, QC, Canada, Agriculture and Agri-Food Canada, Lethbridge, AB, Canada, Université Laval, Départements des Sciences Animales, Québec, QC, Canada.

Four ruminally primiparous lactating cows (BW = 568 kg; DM = 67) were used in a 4 × 4 Latin square design (28-d periods) with a 2 × 2 factorial arrangements of treatments to determine the effects of eugenol (EUG) supplementation (0 vs. 50 mg/kg of DM) and concentrate level (high: H vs. low: L; 65% vs. 35%, DM basis) on nutrient digestibility, N retention, milk production, and milk composition. Orthogonal contrasts (MIXED procedure; SAS Inst., Inc., Cary, NC) were used to test the main effects of EUG supplementation, concentrate level (CON) and their interaction (CON × EUG). Significance was declared at P ≤ 0.05. No interaction of CON × EUG was observed for any of the variables measured. Intake of DM was higher for H than for L (20.0 vs. 16.9 kg/d). Apparent total tract digestibilities of DM (66.8 vs. 69.4%), OM (68.2 vs. 70.8%), N (66.0 vs. 68.8%), and ADF (57.3 vs. 60.6%) were lower for H than for L. Retention of N was not affected by concentrate level (59 g/d; 11% of N intake). Milk production (32.2 vs. 30.8 kg/d) and milk protein content (3.31 vs. 3.02%) were higher whereas milk fat content was lower (3.64 vs. 3.92%) and milk lactose concentration tended to be lower (4.67 vs. 4.61; P = 0.08) for cows fed H than for those fed L. Milk urea N was unaffected by concentrate level (9.52 mg/dL). Yield of 4% FCM was similar for H and L diets (30.1 kg/d). Yield of milk fat was not affected by concentrate level (1.17 kg/d) whereas yields of milk protein (1.05 vs. 0.93 kg/d) and lactose (1.51 vs. 1.37 kg/d) were higher for cows fed H than for those fed L. Feed efficiency (kg 4% FCM/kg DM) was lower for cows fed H than for those fed L (1.51 vs. 1.79). Neither DM nor nutrient apparent total tract digestibility, N retention or milk performance was affected by EUG supplementation. Results of this study show that adding EUG at the concentration of 50 mg/kg of dietary DM to a high- or low-concentrate diet had no effects on nutrient digestibility, N retention, milk production and milk composition of dairy cows.

Key Words: plant extract, milk fatty acid profile, dairy cow

T255 Assessment of the potential of cinnamaldehyde, condensed tannins, and saponins to modify milk fatty acid composition of dairy cows. C. Benchaa*, P. Y. Chouinard†, Agriculture and Agri-Food Canada, Dairy and Swine Research and Development Centre, Sherbrooke, QC, Canada, Université Laval, Départements des Sciences Animales, Québec, QC, Canada.

Recently, plant secondary metabolites such as essential oils have been suggested as potential means to manipulate bacterial populations involved in ruminal biohydrogenation of unsaturated fatty acids and modify the fatty acid composition of ruminant-derived food products such as milk. This study was conducted to determine whether feeding cinnamaldehyde (CIN; main component of cinnamon bark essential oil; Cinnamomum cassia), condensed tannins from quebracho trees (QCT; Schinopsis balansae) or saponins from Yucca schidigera extract (YSE) alters milk fatty acid profile of dairy cows. For this purpose, four lactating cows (BW = 730 kg; DM = 87) were used in a 4 × 4 Latin square design (28-d periods) and fed a total mixed ration containing no additive (control), or supplemented with CIN (1 g/d), QCT (150 g/d; 70% of tannins), or YSE (60 g/d; 10% of steroidal saponins). The fatty acid profile was determined on milk pooled samples collected from four consecutive milkings (d 22 to 23). Data were analyzed as a 4 × 4 Latin square design (MIXED procedure; SAS Inst., Inc., Cary, NC). Differences between treatments and the control were determined using the Dunnett’s comparison test. Significance was declared at P ≤ 0.05 and tendency at 0.05 < P ≤ 0.10. Results revealed no effects of feeding CIN or QCT on milk fatty acid profile. Supplementation with YSE resulted in some modifications of milk fatty acid profile as suggested by the reduced proportions of C6:0 (2.71 vs. 2.95%); P = 0.10), C8:0 (1.66 vs. 1.89%; P = 0.08), and trans-11 C18:1 (0.92 vs. 1.01%; P = 0.05). Results show that at the feeding rates used in this study, the potential of cinnamaldehyde, condensed tannins, and saponins to alter ruminal biohydrogenation process and modify the fatty acid profile of milk fat is low.

Key Words: plant extract, milk fatty acid profile, dairy cow

T256 Screening the activity of medicinal plants or spices on in vitro ruminal methane production. H. Jahani-Azzabadi‡, M. Danesh Megasaran§, A. R. Vakili†, A. R. Heravi Moussavi*, and M. Hashemi², University of Mashhad, Mashhad, Khorasan Razavi, Iran, Research and Petroleum Engineering Center of Kermanshah, Kermanshah, Iran.

The objective of the present study was to evaluate the in vitro effect of medicinal plants or spices powder on ruminal methane and total gas production. In vitro incubation was carried out based gas production method. Approximately 300 mg of dried alfalfa hay (as control) (NDF= 537 and CP= 150 g/kg DM) or plus 12 mg of garlic, cinnamon, cumin, nutmeg or rosemary powder as treatments were placed in a 100 ml glass syringes (n = 3) containing 40 ml of buffered rumen fluid (ratio of buffer to rumen fluid was 2:1), and incubated for 24 h at 38.5°C. Rumen fluid was obtained from three adult ruminally fistulated sheep (49.5 ± 2.5 kg body weight), before the morning feeding, and immediately strained through four layers of cheesecloth. After 24 h of incubation, gas which was accumulated in the headspace of each syringe was measured, and a sample of the gas was collected into a 10 ml vacuum tube. Methane content of the produced gas was determined using gas chromatography procedure (GC, SRI 8610, and Column: 6% cyanopropylphenyl, 94% dimethyloxilane). Volumes of gas and methane (ml) were converted to mmol assuming one mol is equivalent to 22.4 L of gas (Table). Data were applied to the completely randomized design model of SAS.
(V. 9/1) and Duncan test was used to compare the means (P < 0.05). The results of the present study indicated that all medicinal herbs or spices, except Nutmeg, reduced significantly (P < 0.05) in vitro methane and total gas production from alfalfa hay compared with the control. These findings confirmed the ability of Rosemary to decrease methane production, which may help to improve the efficiency of energy used in the rumen.

<table>
<thead>
<tr>
<th>Items</th>
<th>alfalfa + alfalfa + alfalfa + alfalfa + alfalfa + alfalfa + alfalfa + alfalfa +</th>
<th>Cinnamon</th>
<th>Cumin</th>
<th>Nutmeg</th>
<th>Rosemary</th>
<th>SE</th>
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<tr>
<td>Total gas</td>
<td>11.97 ± 0.03 a</td>
<td>11.13 b</td>
<td>12.72 c</td>
<td>10.81 b</td>
<td>12.00 a</td>
<td>10.17 b</td>
</tr>
<tr>
<td>Methane</td>
<td>3.59 a</td>
<td>3.34 b</td>
<td>3.82 c</td>
<td>3.24 b</td>
<td>3.63 a</td>
<td>3.05 b</td>
</tr>
</tbody>
</table>

Table 1. Effect of medicinal herbs or spices on in vitro methane and total gas production (mmol/g DM incubated for 24 h)

Key Words: methane, gas production, medicinal herbs

T257 Effects of cinnamaldehyde on in vitro methane production and ruminal fermentation of medium and high-concentrate diets.

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The effects of five doses (0 (control), 20, 60, 180 and 540 mg/L incubation medium) of cinnamaldehyde (CIN) on in vitro fermentation of a medium concentrate (MC; 50:50 alfalfa hay:concentrate) or a high concentrate (HC, 15:85 barley straw:concentrate) diet were evaluated in batch cultures of mixed rumen micro-organisms from the rumen of sheep fed the same diets. Previous in vitro studies have shown that CIN supplementation leads to reduced rumen ammonia levels but since this effect depends on microbial populations, it may be expected to relate to the incubated diet and the diet fed to donor sheep. After 16 h of incubation, the main fermentation variables were determined. Differences among treatments were declared at P < 0.05. CIN at 20 mg/L did not modify rumen fermentation, and at 60 mg/L only decreased ammonia-N concentrations for MC diet. For both diets, the 540 mg/L dose inhibited rumen fermentation, as indicated by the decrease in the production of volatile fatty acid (VFA), gas and methane, with the effects being more pronounced for HC diet than for MC. In addition, CIN at 540 mg/L increased total lactate concentrations by 22 and 11 times compared to control for MC and HC diets, respectively. The 180 mg/L dose increased acetate proportions and acetate:propionate ratio without reducing VFA production, decreased ammonia-N concentrations, and tended (P = 0.06) to reduce methane production for the MC diet, whereas only a reduction in acetate proportion and a tendency (P = 0.10) to lower ammonia-N concentrations were observed for the HC diet. These results would indicate that CIN dietary supplementation does show effects on lowering ammonia-N but that responses may differ depending on the administered dose and the diet composition and microbial populations in the inoculum, which could help to explain the controversial results obtained in different studies.

Key Words: cinnamaldehyde, microbial fermentation, methane

T258 Evaluation of plant extracts in natural-fed finishing cattle. N. A. Pyatt1, D. Bravo2, and P. H. Doane1, 1ADM Research, Decatur, IL, 2Pancosma Research, Geneva, Switzerland.

Performance data from British-cross steers (n = 35) were used to evaluate the effects of a blend of plant extracts (XT) in natural-fed feedlot diets without ionophores. Steers were adapted to a high-energy diet prior to allotment to the finishing trial. The basal diet consisted of 62% cracked corn, 25% wet distillers grains with solubles, 10% hay, and 3% supplement (DM basis). Cattle were blocked by weight to one of two treatments (2 pens per treatment; 8 or 9 head per pen); 1) negative control (CON) or 2) CON + XT (266 mg steer−1·d−1 eugenol + cinnamaldehyde and 133 mg steer−1·d−1 capisicum, XT 6965 and XT 6933, respectively; Pancosma). Steers were fed ad libitum using the GnowSafe automated feeding system (one unit per pen). Steers (initial BW 398.2 kg) were fed (on average) 103 d and harvested in two groups based on weight and condition. The model included treatment and animal nested within pen as fixed variables. There were no differences (P > 0.05) in animal performance or carcass merit parameters. Cattle fed XT tended to have greater cumulative ADG (P = 0.20; 1.74 vs. 1.88 kg/d, respectively) and feed efficiency (P = 0.16; 16.24 vs. 17.47 kg x 100 kg/d, respectively). Similarly, cattle fed XT tended to have greater HCW (P = 0.20; 364.2 vs. 379.8 kg, respectively), LMA (P = 0.09; 86.3 vs. 91.3 cm², respectively), and less KPH fat (P = 0.12; 2.0 vs. 1.8%, respectively). Cattle fed XT tended to have a greater proportion of YG 2 carcasses, while CON cattle had more (P = 0.13) YG 3 carcasses. Resulting carcass value was $27.10/hd greater for steer fed XT ($1010.13 vs. $1027.23/hd, respectively). Rumen fluid was collected by rumenocentesis from five animals per treatment on d 100. Total VFA (mM), acetate, and butyrate concentrations were lower for cattle fed XT. However, steers consuming XT had numerically greater propionate (%) and lower acetate:propionate ratio. These data suggest XT improved feedlot ADG (8.1%), feed efficiency (7.5%), HCW (4.3%), and carcass leanness. Including a blend of eugenol, cinnamaldehyde, and capisicum in natural-fed beef finishing diets without ionophores may increase finishing performance and profit potential.

Key Words: beef cattle, plant extracts, performance

T259 Effect of yellow mustard glucosinolates on ruminal fermentation in vitro. R. A. Hristova1, A. N. Hristov2, S. Zaman1, and V. Borek1, 1Pennsylvania State University, University Park, 2University of Idaho, Moscow.

The objective of this study was to evaluate the effect of glucosinolates from mustard meal on ruminal fermentation, total gas and methane production, and protozoal counts in vitro. Ruminal inoculum was incubated with 1% (w/v) ground alfalfa hay and 0, 0.1, 0.2, and 0.4% (w/v) of cold-pressed yellow mustard (Brassica juncea, variety Pacific Gold) meal (NM). The meal contained 236 µmol/g total glucosinolates (97% of which was 2-propenyl glucosinolate). Aportion of the meal was incubated with deionized water at room temperature for 48 h to inactivate the glucosinolates (IM). Momeninski-Na was used as a positive control at 5 ppm final medium concentration. Incubations were continued for 24 h and repeated 3 times (n = 3). Gas pressure within the incubation vessels was recorded at 6, 12, 18, and 24 h. Gas samples for methane and carbon dioxide analyses were collected at 6 and 12 h. Compared with the blank (0% mustard meal), monensin is slightly decreased (by 4%; P = 0.01) 24-h cumulative gas production. Increasing the inclusion of mustard meal linearly increased (P < 0.001) gas production, but there was no difference (P = 0.58) between NM and IM. Cumulative gas production per gram of substrate linearly decreased (P < 0.001) with