

Effect of red osier dogwood extract on in vitro digestibility and fermentation characteristics of high-grain diet

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Introduction

Red osier dogwood (ROD) is native shrub plant in Canada and rich in bioactive phenolic compounds. The phenolics in ROD have antimicrobial and antioxidant properties, and the antioxidants of phenolics are particularly used as stress reducers to provide natural alternatives to antibiotics commonly used in the livestock industry.

Objective

The objective of this study was to evaluate the effects of ROD extract supplementation on gas production (GP), DM disappearance (DMD) and fermentation characteristics of high grain (HG) diet in batch cultures with varying media pH.

Materials and methods

- **Design:** Completely randomized design with 4 doses of ROD extract (0, 1, 3 and 5% of substrate) × 2 media pH (5.8 and 6.5) in a factorial arrangement.
- **Substrates:** 10% silage and 90% barley grain (1 mm)
- **Inoculum:** Rumen fluid was obtained from three heifers and mixed 1:3 with Menke's buffer.
- **Incubation:** Incubation was conducted at 39°C for 24 h for measuring GP, DMD, and fermentation characteristics.



Results and discussion

Effect on GP kinetics and DMD (Table 1)

- There was no interaction of pH level with dose of ROD on GP and DMD.
- Increased media pH (5.8 vs 6.5) increased (P<0.01) GP and DMD
- Increasing ROD extract did not affect GP, but linearly decreased DMD at pH 5.8 (P<0.02) and at pH 6.5 (P<0.06).

Table 1. Effects of media pH and ROD dosage on GP kinetics (asymptotic gas volume, a; rate constant, c) and DMD of HG diet

| Item | Dosages of ROD, % DM | | | | SEM | P- Value | | |
|------------|----------------------|------|------|------|------|----------|------|------|
| | 0 | 1 | 3 | 5 | | pH | L | Q |
| A, mL/g DM | | | | | | | | |
| 5.8 | 203 | 198 | 187 | 204 | 48.5 | 0.01 | 0.98 | 0.58 |
| 6.5 | 374 | 401 | 389 | 391 | | | 0.74 | 0.63 |
| c, %/h | | | | | | | | |
| 5.8 | 3.19 | 3.09 | 3.09 | 2.63 | 0.56 | 0.10 | 0.28 | 0.73 |
| 6.5 | 3.83 | 3.47 | 3.27 | 2.95 | | | 0.10 | 0.74 |
| DMD | | | | | | | | |
| 5.8 | 56.2 | 52.3 | 51.2 | 45.6 | 2.73 | 0.01 | 0.02 | 0.93 |
| 6.5 | 68.5 | 65.5 | 63.7 | 60.7 | | | 0.06 | 0.73 |

L, Q = linear and quadratic effect, respectively, of ROD dose (0, 1, 3, 5%)

Effect on GP kinetics and DMD (Table 2)

- No interaction of pH level with dose of ROD on fermentation variables.
- Increasing ROD extract linearly (P<0.01) increased the proportion of acetate.
- Acetate to propionate ratio linearly increased and NH₃ N linearly decreased at both pH levels.

Results and discussion

Table 2. Effects of media pH and ROD dosage on fermentation variables

| Item | Dosages of ROD, % DM | | | | SEM | P- Value | | |
|------------------------|----------------------|------|------|------|------|----------|------|------|
| | 0 | 1 | 3 | 5 | | pH | L | Q |
| Total VFA, mM | | | | | | | | |
| 5.8 | 76.9 | 74.5 | 74.4 | 69.8 | 3.12 | 0.01 | 0.11 | 0.88 |
| 6.5 | 83.2 | 81.9 | 86.6 | 80.6 | | | 0.67 | 0.36 |
| Acetate (A), % | | | | | | | | |
| 5.8 | 43.3 | 44.2 | 45.3 | 46.5 | 1.53 | 0.01 | 0.01 | 0.57 |
| 6.5 | 46.9 | 47.7 | 48.5 | 49.7 | | | 0.01 | 0.85 |
| Propionate (P), % | | | | | | | | |
| 5.8 | 27.1 | 26.7 | 26.4 | 25.6 | 4.35 | 0.52 | 0.12 | 0.97 |
| 6.5 | 26.6 | 26.4 | 26.0 | 25.5 | | | 0.25 | 0.96 |
| A:P | | | | | | | | |
| 5.8 | 1.68 | 1.76 | 1.81 | 1.93 | 0.36 | 0.01 | 0.02 | 0.91 |
| 6.5 | 1.90 | 1.93 | 2.00 | 2.10 | | | 0.04 | 0.92 |
| NH ₃ -N, mM | | | | | | | | |
| 5.8 | 31.7 | 31.4 | 31.0 | 29.6 | 1.27 | 0.94 | 0.01 | 0.47 |
| 6.5 | 32.4 | 31.4 | 30.6 | 29.9 | | | 0.01 | 0.53 |

L, Q = linear and quadratic effect, respectively, of ROD dose (0, 1, 3, 5%)

Conclusions

The decreased DMD along with increased acetate to propionate ratio with addition of ROD extract suggests ROD extract may be beneficial to HG fed cattle for reducing risk of rumen acidosis without negatively impacting fiber digestion.

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