

Effects of high-fat oats, rapeseed cake, and 3-NOP on milk production and methane emissions in dairy cows

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CONCLUSIONS

High-fat oats, cold-pressed rapeseed cake, and 3-NOP decreases enteric CH₄ emissions and CH₄ intensity in dairy cows when fed alone or in combination.

Moreover, high-fat oats improves production performance.

RESULTS

Production performance is shown in Table 1. An interaction ($P < 0.05$) was observed between energy and protein source regarding CH₄ emissions (g/d), CH₄ yield (g/kg DMI), and CH₄ intensity (g/kg ECM). Feeding high-fat oats + rapeseed meal or barley + rapeseed cake decreased CH₄ intensity compared with barley + rapeseed meal, but feeding high-fat oats + rapeseed cake did not result in any major further reductions (Figure 1). Feeding 3-NOP decreased both CH₄ yield and intensity by 31%.

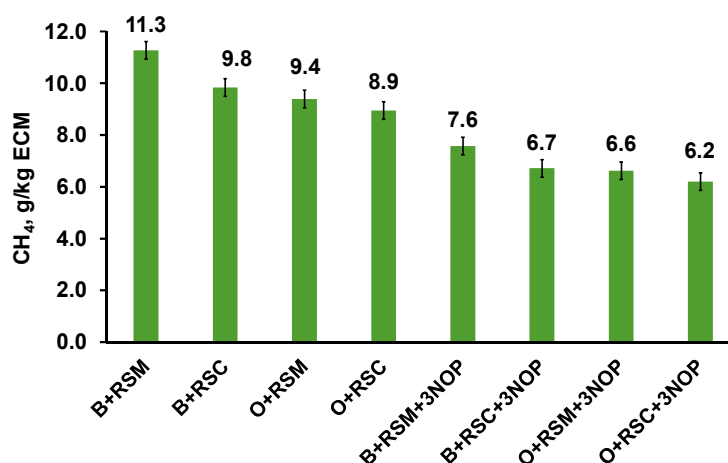


Figure 1. Methane intensity (g/kg ECM) from dairy cows fed barley (B) or high-fat oats (O), rapeseed meal (RSM) or rapeseed cake (RSC), without and with 3-NOP supplementation. B vs. O, $P < 0.01$; RSM vs. RSC, $P < 0.01$; Control vs. 3-NOP, $P < 0.01$; B/O × RSM/RSC, $P = 0.05$; B/O × Control/3-NOP, $P = 0.07$; Other two-way and three-way interactions, $P > 0.42$.

Table 1. Effects of energy source, protein source, and 3-NOP supplementation on DM intake and milk production in dairy cows (n = 96).

	Barley				High-fat oats				<i>P</i> -value ¹			
	Rapeseed meal		Rapeseed cake		Rapeseed meal		Rapeseed cake					
Item	Control	3-NOP	Control	3-NOP	Control	3-NOP	Control	3-NOP	SEM	Energy	Protein	3-NOP
DM intake, kg/d	24.4	23.7	23.8	23.7	25.6	24.5	24.3	23.7	0.69	0.11	0.11	0.13
Milk yield, kg/d	34.6	33.5	34.7	33.1	36.8	35.5	37.0	36.1	1.06	<0.01	0.88	0.02
ECM yield, kg/d	39.5	38.9	39.7	37.4	41.6	40.6	41.6	41.3	1.22	<0.01	0.82	0.07
Protein, g/kg milk	40.1	40.7	38.9	39.6	39.1	39.3	38.6	38.6	0.58	<0.01	<0.01	0.11
Fat, g/kg milk	47.9	49.3	48.4	47.7	47.5	48.6	47.3	48.6	1.23	0.63	0.65	0.29

¹Two-way and three-way interactions Energy × Protein, Energy × 3-NOP, Protein × 3-NOP, and Energy × Protein × 3-NOP were non-significant ($P > 0.19$).

METHODS

Twenty-four lactating Nordic Red dairy cows were blocked and enrolled in a cyclic change-over design replicated in periods of 28 days each. Cows were fed 60% forage and 40% concentrate on a DM basis, with grass silage as the sole forage.

Experimental treatments comprised one of two energy sources (barley and high-fat oats), one of two protein sources (rapeseed meal and cold-pressed rapeseed cake), and supplementation with or without 3-NOP at target dose of 60 mg/kg DMI.

Methane emissions were measured by the GreenFeed system (C-Lock Inc.). Milk samples were collected during 4 consecutive milkings on the 3 last days of each period. Data were analyzed in SAS by the MIXED procedure as a 2 × 2 × 2 factorial design.



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