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Decrease in methane emissions in dairy cows with increase in dietary linseed content

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Introduction Because ruminants make a significant contribution to greenhouse gas emissions, attempts are being made by dietary manipulation, to mitigate methane emissions without altering animal performance. Dietary fat supply may be a promising solution (Martin *et al*., 2008a). A first experiment has shown that increasing extruded linseed supply in a hay-based diet resulted in a decrease in methane production (Martin *et al*., 2007). A second experiment has been carried out using a maize silage-based diet and the same linseed supply. The present abstract summarises the results of both experiments.

Materials and methods Two successive experiments have been carried out in dairy cows according to Latin square designs.
In each experiment, four lactating Holstein dairy cows (initial body weight of 627 kg and 668 kg for experiments 1 and 2, respectively) were randomly assigned to four dietary treatments in 4 x 4 Latin square designs. Diets were control diets (experiment 1: 50% natural grassland hay and 50% concentrates; experiment 2: 60% maize silage and 40% concentrates, both on a dry matter (DM) basis) and diets supplemented with 5% (EL5), 10% (EL10), or 15% (EL15) of extruded linseeds, corresponding to an expected oil supplementation of 2, 4, and 6% of dietary DM, respectively. Cows had *ad libitum* access to the diets (10% refusals). The desired forage:concentrate ratio was maintained by daily adjustment of offered amounts of forage and concentrate, depending on the composition of the refusals of the previous day. Each experimental period lasted four weeks, with measurements occurring during the last week of each period. Milk yield was determined on 5 days, organic matter (OM) digestibility was measured by total faeces collection on 6 days and individual CH_4 productions on 4 days using the sulphur hexafluoride (SF_6) tracer technique as described by Martin *et al.* (2008b).
Data were analysed separately for each experiment as 4 x 4 Latin squares using the MIXED procedure of SAS. The statistical model included cow, period, treatment and residual error. Fixed effects included period and treatment. Cow was the random effect. Overall differences between treatment means were declared significant at $P < 0.05$.

Results For each experiment, no significant difference among diets was shown for DM intake (mean and SE: 20.0 and 0.70 kg/d for experiment 1; 18.0 and 1.08 kg/d for experiment 2) and for milk yield (mean and SE: 26.6 and 1.68 kg/d for experiment 1; 24.1 and 2.63 kg/d for experiment 2). Linseed supply significantly decreased methane emission in both experiments (Figure 1). The decrease was significant for EL10 and EL15 with hay diet, for EL15 with maize silage diet. The extent of the decrease was 15, 19 and 40% in experiment 1, and 6, 13 and 42% in experiment 2 for a supply of 5, 10 and 15% of extruded linseeds, respectively. These variations cannot be explained by changes in OM digestibility, which did not vary among diets (mean and SE: 71.5 and 0.84% for experiment 1; 67.4 and 1.91% for experiment 2).

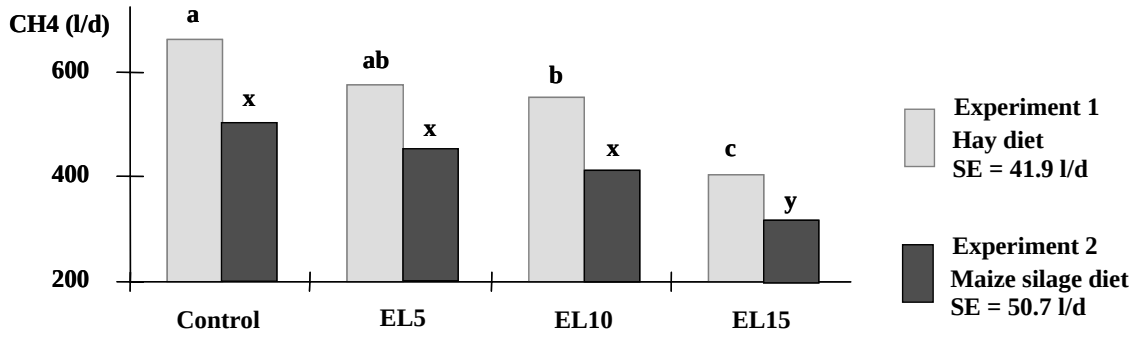

Figure 1 Effect of dietary linseed content on methane emission in dairy cows receiving diets based on hay (experiment 1) or maize silage (experiment 2). Treatments with different superscripts differ ($P<0.05$): a, b, c: experiment 1; x, y: experiment 2.

Conclusion These experiments show that a dietary supply of extruded linseeds decreases methane production both with hay and maize silage diets, without altering milk yield. The extent of the decrease depends on the dietary linseed content. This feeding regime is one of the most efficient yet studied to mitigate methane emissions, but it needs to be confirmed with a larger number of animals and by long-term experiments.

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References

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