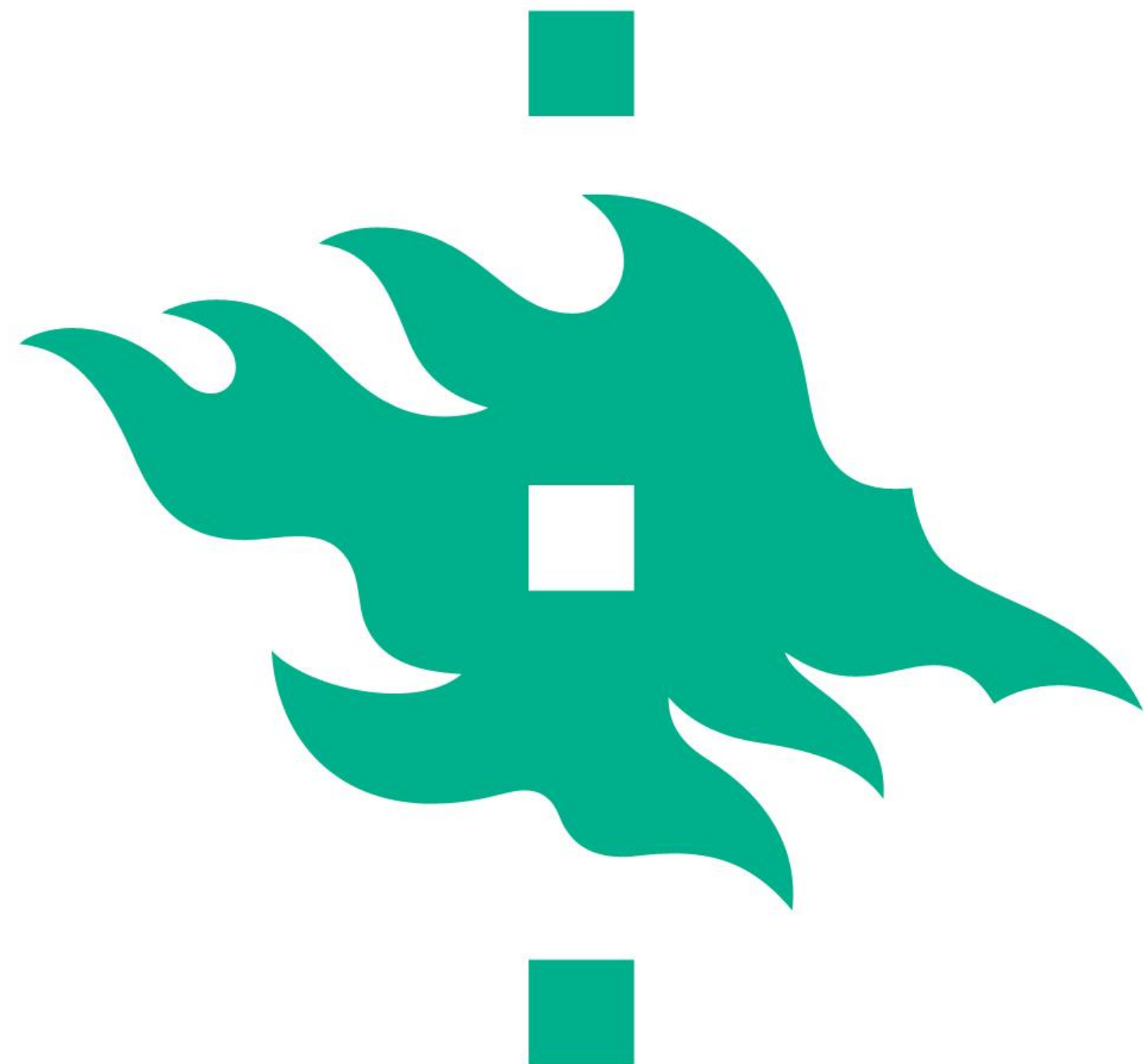




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IN VITRO RUMEN FERMENTATION OF GRASS, CLOVER AND CORN SILAGE-BASED DIETS WITH DIFFERENT PROTEIN SOURCES

INTRODUCTION

- Understanding how different forage sources interact with various protein feeds helps in formulating diets that optimize nutrient utilization by the ruminant.
- In boreal conditions of Finland, grass silage typically consists mixture of timothy (*Phleum pratense*) and meadow fescue (*Festuca pratensis*).
- High N fertilizer costs have increased interest towards red clover (*Trifolium pratense*), which is the most important forage legume in Northern Europe.
- The cultivation of forage corn has gained increasing interest in southern parts of Finland due to climate change.

MATERIALS AND METHODS

- We studied the impacts of rapeseed, camelina or hemp cake on in vitro rumen fermentation characteristics of grass, red clover or corn silage-based diets.

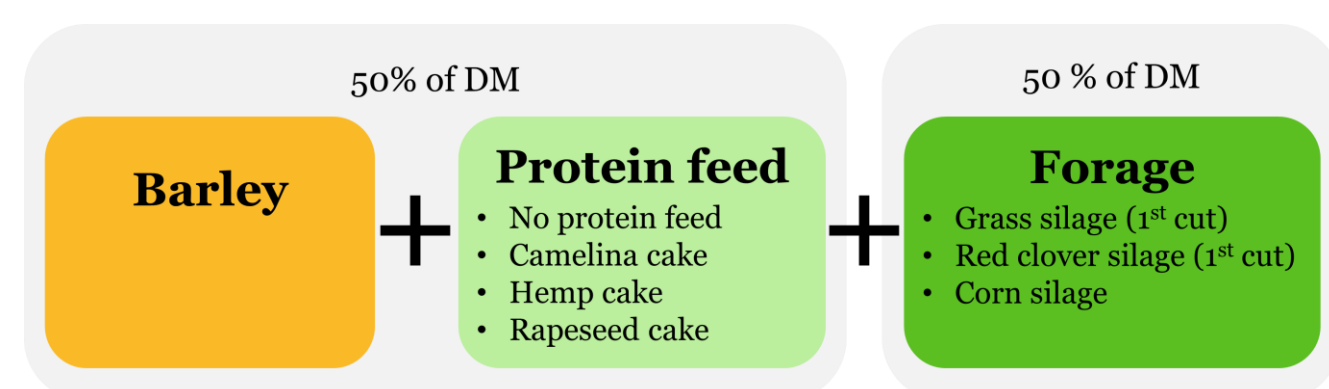


Figure 1. The 12 treatments consisted of combinations of four protein feed options and three forage options.

- The ratio of filtered (250 µm) rumen liquid to McDougall buffer was 1:2 (v:v).
- CP concentration of diets:
 - Unsupplemented diets: 95-140 g/kg DM
 - Protein supplemented diets: 170 g/kg DM

- The digestibility of OM (DOMD) in forages:
 - Grass silage 710 g/kg DM
 - Red clover silage 626 g/kg DM
 - Corn silage 679 g/kg DM
- Experiment was repeated four times with Gas Endeavour in vitro system (Bioprocess control, Lund, Sweden).
- Volatile fatty acids (VFA) were determined at 1, 4, 8, 12, 24, and 30h from the beginning of the experiment.

RESULTS AND DISCUSSION

Effect of forage source:

- Red clover silage-based diets resulted in highest molar proportion of acetate, lowest proportion of butyrate, and higher total VFA concentration than corn silage-based diets.
- Molar proportion of propionate was higher for corn silage than for grass silage, likely due to starch in corn silage.

Effect of protein supplementation:

- No impact on VFA production.

Effect of protein source:

- Camelina resulted in higher molar proportion of propionate and lower proportion of butyrate than rapeseed cake.
- Compared to rapeseed and camelina, hemp cake resulted in highest proportion of acetate.
- Hemp cake resulted in lower total VFA production and molar proportion of propionate than camelina.

Only a few interactions were observed between forage and protein sources:

- On grass silage-based diets camelina tended to result in higher total VFA production

than rapeseed cake; the opposite was true for red clover silage-based diets.

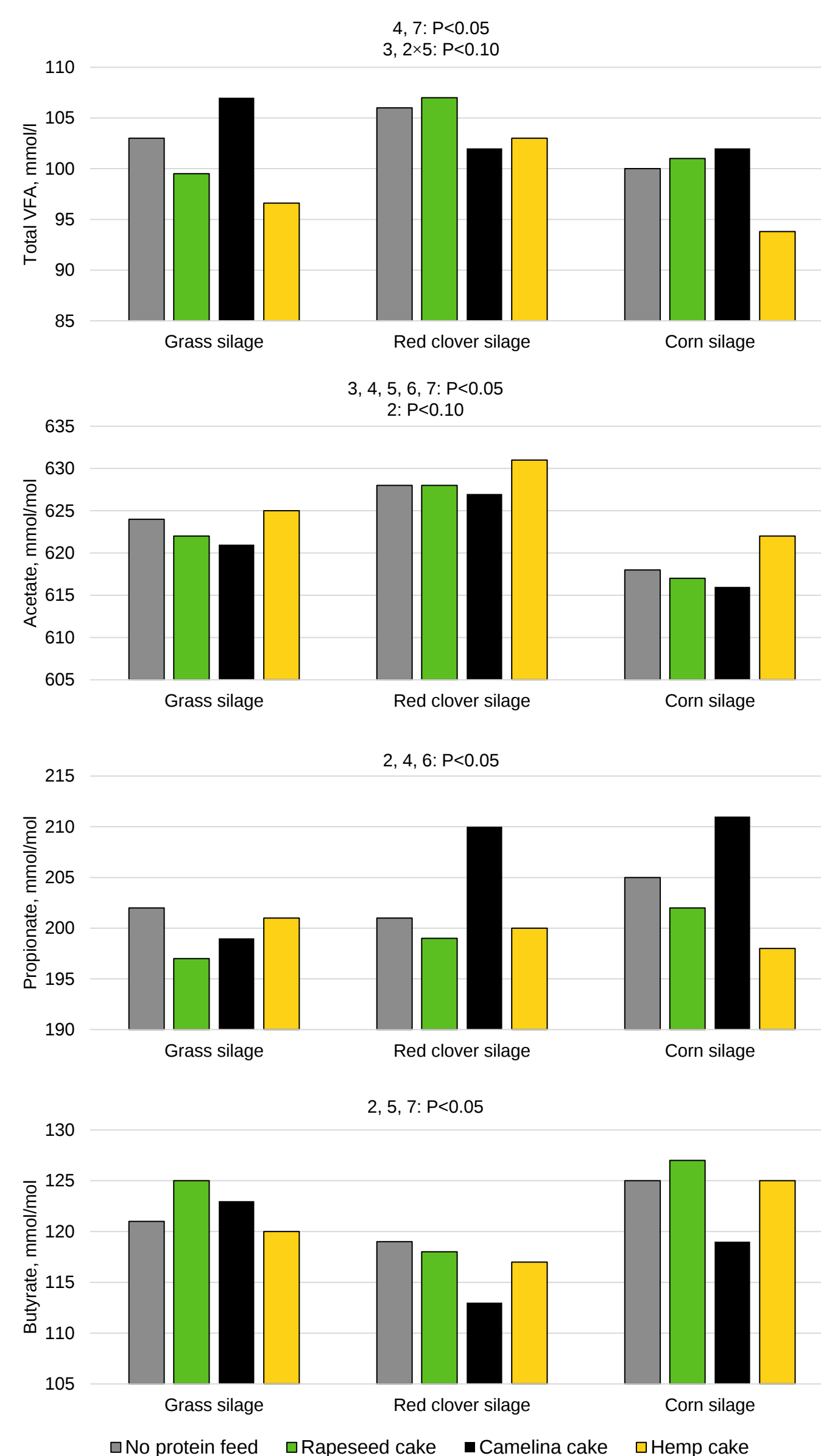


Figure 2. The effect of forage source and protein supplementation on ruminal VFA production in vitro. Numbers in the figure refer to orthogonal contrasts with statistically significant difference. Contrasts tested: 1 = Effect of protein supplementation, 2 = camelina vs. rapeseed, 3 = hemp vs. rapeseed, 4 = camelina vs. hemp, 5 = red clover silage vs. grass silage, 6 = corn silage vs. grass silage, 7 = corn silage vs. red clover silage. Interactions: 2×5, 2×6, 3×5 and 3×6.

CONCLUSIONS

- Both forage and protein source influenced VFA production in vitro.
- Only a few interactions were observed between forage and protein sources.
- Results indicate that the effects of forage and protein source on ruminal VFA production might be independent of each other.
- The effects of studied forage sources are potentially replicable in vitro irrespective of the type of protein supplementation used.

