

Evaluation of European and tropical plants containing phenolic compounds on the biohydrogenation of fatty acids and methanogenesis in the rumen

Jayanegara Anuraga, Soliva Carla R., Marquardt Svenja, Kreuzer Michael and Leiber Florian
ETH Zurich, Department of Agricultural and Food Sciences, anuraga.jayanegara@inw.agrl.ethz.ch

Consumers are demanding animal products that are safe and have health-promoting effects. These properties have been positively assigned to polyunsaturated fatty acids (PUFAs), including conjugated linoleic acids (CLA), but have been negatively assigned to saturated fatty acids. On the other hand, the awareness of global warming due to the accumulation of green house gases (GHG), including methane, has been increasing in recent years. Ruminant animals play a significant role in the last mentioned aspect since they are responsible for about 15 to 20% of the total anthropogenic emission of CH₄. The amount and the composition of feed consumed are the main factors affecting both fatty acid composition and methane formation in the rumen. Therefore, developing nutritional strategies in optimising both aspects while maintaining optimum rumen function and fermentation are highly desirable. The main purpose of the research is to screen a large number of plant species, especially those which containing substantial amount of phenolic compounds, on biohydrogenation of fatty acids and methanogenesis in the rumen. The plants tested were of Swiss alpine and Indonesian origin. With this focus, the present study contributes both to ecological aspects by promoting a higher diversity of forage plant species in animal nutrition and to human health related aspects. Individual activities comprise: (1) Determination of the chemical composition analysis of the test plants. (2) Evaluation of individual test on biohydrogenation of fatty acids and methanogenesis in the rumen environment. This will be assessed by using short-term *in vitro* experiments (Hohenheim gas test, HGT). (3) The most promising plants will be tested *in vitro* in mixtures in a second series of experiments (considering the potential added value of a higher degree of diversity in ruminant nutrition) over longer period experiment. For that purpose, the RUSITEC (Rumen Simulation Technique) will be employed; (4) *In vivo* feeding experiments will be carried out using small ruminants. The *in vivo* experiment for the European plants will be conducted in Switzerland and the *in vivo* experiment for the tropical plants will be conducted in Indonesia. It is expected that this research will help to identify European and tropical plant species rich in phenolic compounds being promising with respect to a desired way of ruminal biohydrogenation of fatty acids, a low ruminal methane formation and a high nutritional value. The role of phenolic compounds in the plants on the above-mentioned aspects shall also be identified. Moreover, this research could give practical information on the viability of using these plants in real feeding systems for ruminant animals.

Keywords: Fatty acid biohydrogenation, polyunsaturated fatty acids, methanogenesis, rumen, phenolic compounds, plant species, Europe, tropics