



Research Article

Encapsulation Method to Protect Unsaturated Fatty Acids from Rumen Biohydrogenation *In Vitro*

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Abstract

Enrichment of ruminants' products with polyunsaturated fatty acids is one of the possibilities to introduce these fatty acids into the human diet. However, the rumen biohydrogenation of unsaturated fatty acids limits their quantity and thus bioavailability in the rumen as well as in animal products. The alginate/carrageenan calcium beads of linseed oil were evaluated *in vitro* to verify the ability of these products to protect polyunsaturated fatty acids from biohydrogenation by ruminal microbes. Encapsulation efficiency was evaluated by measuring the quantity of oil protected by alginate/carrageenan calcium beads as well as changes on linseed oil fatty acids content before and after encapsulation. Experiment was evaluated *in vitro* using batch culture system. The treatments were: control (Control) without supplements, experimental I (Linseed oil) (control + 4% of linseed oil), experimental II (Beads 1) control + 4% of linseed beads containing 15% oil, experimental III (Beads 2) control + 4% of linseed beads containing 20% oil. Linseed oil and both linseed oil beads were supplemented to substrates at 4% of dietary dry matter. The substrate was composed of a mixture of meadow hay and barley meal in the ratio of 60:40 and incubated for 48h. All samples were analyzed for fatty acids content. The results were 87% and 86% for alginate/carragenan beads loaded with 15vol% linseed oil and alginate/carragenan beads loaded with 20vol% oil, respectively. The encapsulation process didn't have a significant effect on PUFA fraction ($P < 0.01$). Results indicated that there is no significant difference ($P < 0.01$) between linseed oil fatty acids content before and after encapsulation process. After incubation in batch culture system, linseed beads decreased ($P < 0.01$) total rumen saturated and monounsaturated fatty acids content. Omega 3 and omega 6 fatty acids contents increased statistically ($P < 0.01$) by beads 1 and beads 2 and numerically by linseed oil treatment. In conclusion, new encapsulation method has the potential to protect linseed oil from rumen biohydrogenation *in vitro*, however, further *in vivo* experiments are required.

Key words: Polyunsaturated fatty acids, Rumen, Biohydrogenation, Encapsulation

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