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Effects of different palmitic acid contents in rumen stable fat powders on milk fatty acid profile in Holstein cows

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Introduction

Reaching the required energy level in a ration for high yielding dairy is often difficult, although high forage quality and additional compound feed, as the amount of concentrates is physiologically limited. Rumen stable fats are renowned for showing a high energy density and with that, contribute to an energetic increase of the ration, without affecting rumen functionality. However, literature shows that they have an influence on the fatty acid profile of milk fat. Common rumen stable fats available on the market do show substantial differences in fatty acid profile in the product.

Goal of this study was to make a contribution with regards to the clarification of the influences of different palmitic acid contents present in rumen stable fats on the milk fatty acid profile in Holstein cows.

Material & Methods

After control ration, mixed rations were periodically fed for at least 14 days, including the different rumen stable fats in the same amount added to the diet. All rumen stable fats have been derived by spray-cooling procedure.

Farm 1: fresh grass with additional mixed ration (corn silage, grass silage, pressed pulp, concentrates). Rumen stable fat: 280 g/cow/day

Farm 2: Grass silage, corn silage, CCM and concentrated feed. Rumen stable fat: 430 g/cow/day

At the end of each period, one milk sample has been taken respectively; one in form of cheese (farm 1) and one in form of tank milk (farm 2).

Table 1 Fatty acid profile of the applicated rumen stable fat souces (proportion in %)

Parts of fatty acids (%)	Vegetable fatty acid, fractionated (Palm)	Vegetable fatty acid, hydrogenated[1] (Palm)	Vegetable fat, hydrogenated[2] (Palm)	Vegetable fat, hydrogenated[3] (Rapeseed)
free fatty acids (FFA)	> 95	> 85	< 2	< 2
≤ C14:0	1	1	1	1
C16:0 (palmitic acid)	82	44	44	4
C18:0 (stearic acid)	3	54	54	92
C18:1 (oleic acid)	11	-	-	-
C18:2 (linoleic acid)	3	-	-	-
≥ C20:0	-	1	1	3

[1] **BEWI-SPRAY®** 99 FA | [2] **BEWI-SPRAY®** 99 M | [3] **BEWI-SPRAY®** RS 70

Results

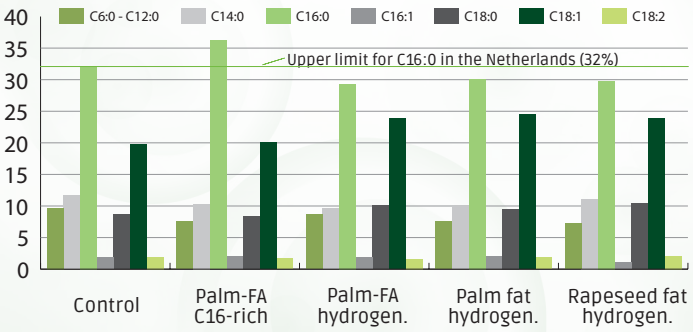

Figure 1 Proportions of selected fatty acids in milk fat derived from cheese on farm 1.

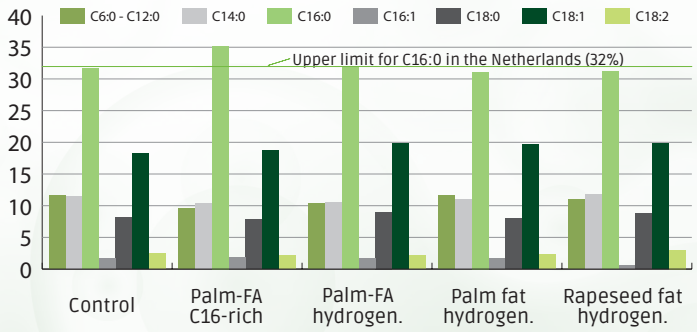

Figure 2 Proportions of selected fatty acids in milk fat derived from tank milk on farm 2.

- Rumen stable fats rich in palmitic acid were subjectively influencing rheological properties during cheese production as well as during processing the tank milk samples.
- Supplementing the fractionated fatty acids derived from palm oil lead to a significant increase of C16:0 content in the milk fatty acid profile, exceeding the national target value of the Netherlands which is at 32% of C16:0 in milk.
- Supplementing rumen stable fats with high contents of C18:0 (> 50%) did not lead to an increase but to a decrease of C16:0 in milk fat, together with a slight increase in C18:0 content as well as a significant increase of C18:1 content.
- These results are in line with literature results (Loften et al., 2014).

Summary

Supplementing rumen stable fat rich in palmitic acid significantly increased the content of C16:0 in milk fat. A supplementation of rumen stable fat rich in stearic acid (> 50%) did not negatively influence milk fat characteristics, while the positively associated oleic acid content in milk fat has been increased. Hence, the selection of type of rumen stable fat in future also should consider the influences on milk fatty acid profile as well as processing properties of the milk.

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Literature

Loften J.R., Linn J.G., Drackley J.K., Jenkins T.C., Sonderholm C.G., Kertz A.F. 2014. Invited Review: Palmitic and stearic acid metabolism in lactating dairy cows. J. Dairy Sci. 97: 4661-4674.