



Milk fat quality from cows fed elephant grass-based diets containing sunflower oils associated with two methods of concentrate feeding

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Diet supplementation with plant oils has been shown to improve the nutritional quality of milk fat in dairy cows. Under practical conditions, lipid supplements are usually mixed with other concentrate feeds and given to animals either during/after milking or as part of total mixed rations (TMR). The latter has been shown to promote a more stable rumen environment as small amounts of concentrate are consumed along with the forage throughout the day, which could in turn affect rumen biohydrogenation. The present study aimed to evaluate the effects of the method of concentrate feeding (twice a day vs. TMR) on the nutritional quality of milk fat from cows fed elephant grass-based diets containing two types of sunflower oil (SO). Thirty-two Holstein x Gyr primiparous lactating cows (75 ± 31 DIM and 15.4 ± 4.8 kg day⁻¹ of milk) were assigned to a 2 x 2 factorial treatment arrangement (two methods of concentrate feeding and two types of SO) in a randomized block experimental design. The two types of SO differed mainly in their oleic and linoleic acid contents and were classified as high oleic - HO (72.6 and 10.4% of oleic and linoleic acid, respectively) and medium oleic - MO (42.8 and 33.6% of oleic and linoleic acid, respectively). The SO was mixed with other concentrate feeds (ground corn, soybean meal, citrus pulp, minerals and vitamins) at 4.5% of diet DM. The concentrate mix containing HO or MO oils was fed either twice a day after morning and afternoon milkings or as part of a TMR (60F:40C, on a DM basis). Chopped elephant-grass (70-90 days of growth) was used as forage source and the trial lasted four weeks. Milk samples were collected individually on the day 21st of treatment period, and milk fatty acid (FA) composition was determined by gas chromatography. The indices of atherogenicity ($AI = (C12:0 + (4 \cdot C14:0) + C16:0) / (C18:1 \text{ cis-9} + \Sigma \text{FA } \omega-6 \text{ cis} + \Sigma \text{FA } \omega-3 \text{ cis})$) and thrombogenicity ($TI = (C14:0 + C16:0 + C18:0) / ((0.5 \cdot C18:1 \text{ cis-9}) + (0.5 \cdot \Sigma \text{FA } \omega-6 \text{ cis}) + (3 \cdot \Sigma \text{FA } \omega-3 \text{ cis}) + (\Sigma \text{FA } \omega-3 \text{ cis} / \Sigma \text{FA } \omega-6 \text{ cis}))$) as well as the ratios between hypocholesterolemic and hypercholesterolemic ($h/H = (C18:1 \text{ cis-9} + \Sigma \text{FA } \omega-3 \text{ cis}) / (C12:0 + C14:0 + C16:0)$) and between $\omega-6$ and $\omega-3$ FA ($\omega-6:\omega-3 = \Sigma \text{FA } \omega-6 \text{ cis} / \Sigma \text{FA } \omega-3 \text{ cis}$) were used as indicators of the milk fat nutritional quality. Statistical analysis was performed using the PROC MIXED of SAS v. 9.0. Type of SO, method of concentrate feeding and their interaction were considered as fixed effects and cow*method as random effect. Effects were considered significant at $P < 0.05$. AI, TI and $\omega-6:\omega-3$ ratio were reduced, whereas h/H ratio was increased ($P < 0.05$) in milk fat from cows fed the HO oil (1.63 vs. 1.74, 2.70 vs. 2.92, 8.14 vs. 10.28 and 1.05 vs. 0.91 for HO and MO, respectively). These results are consistent with the lower contents of medium chain saturated and $\omega-6$ FA, as well as the higher oleic acid content in milk fat from cows fed the HO oil. Overall, our study indicates that the nutritional quality of milk fat can be improved by feeding dairy cows with diets supplemented with high oleic sunflower oil, regardless of the method of concentrate feeding.

Keywords: human health, milk fatty acid composition, plant oil, tropical forage

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