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Milk fat quality from cows fed sugarcane silage-based diets containing increasing levels of whole cottonseed

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Sugarcane (*Saccharum officinarum* L.) is typically used as an alternative roughage source in ruminant diets during the dry season in the tropics. This forage can be fed either fresh or ensiled, with the latter presenting some economic and agronomical advantages. However, sugarcane-based diets must be supplemented with high-energy/high-protein concentrates in order to meet the nutritional requirements of lactating dairy cows. Whole cottonseed is considered a good source of protein and energy for dairy cows, but its high fat content may affect the milk fatty acid (FA) composition. This study aimed to evaluate the effects of increasing levels of whole cottonseed (0, 5, 10 and 15%, on a DM basis) on milk fat nutritional quality of crossbred cows fed sugarcane silage-based diets. Twelve Holstein x Gyr multiparous cows in mid lactation (14.3 ± 1.5 kg day⁻¹ of milk) received the above-mentioned dietary treatments in a switchback design with 17 day-experimental periods (ten days for diet adaptation and seven days for sample collection). Diets were isoproteic and isofibrous and fed twice day as total mixed rations (TMR) composed (DM basis) of 60% sugarcane silage (containing 1% urea, as-fed basis) and 40% of a concentrate mixture (ground corn, cottonseed meal, and mineral-vitamin mixture). As whole cottonseed replaced part of cottonseed meal and corn in the concentrate mix, the experimental diets containing 0, 5, 10 and 15% of whole cottonseed had 1.85, 2.51, 2.75 and 3.94% of fat, respectively. Milk samples were collected individually on the last day of each treatment period and were analyzed for FA composition by gas chromatography. The indices of atherogenicity (AI = $(C12:0 + (4 * C14:0) + C16:0) / (C18:1 \text{ cis-9} + \Sigma \text{FA } \omega-6 \text{ cis} + \Sigma \text{FA } \omega-3 \text{ cis})$) and thrombogenicity (TI = $(C14:0 + C16:0 + C18:0) / ((0.5 * C18:1 \text{ cis-9}) + (0.5 * \Sigma \text{FA } \omega-6 \text{ cis}) + (3 * \Sigma \text{FA } \omega-3 \text{ cis}) + (\Sigma \text{FA } \omega-3 \text{ cis} / \Sigma \text{FA } \omega-6 \text{ cis}))$) as well as the ratio between hypocholesterolemic and hypercholesterolemic FA (h/H = $(C18:1 \text{ cis-9} + \Sigma \text{FA } \omega-3 \text{ cis}) / (C12:0 + C14:0 + C16:0)$) were used as indicators of the milk fat nutritional quality. Statistical analysis was performed using the PROC GLM of SAS version 9.0, and effects were considered significant at $P < 0.05$. There was a linear decrease ($P < 0.001$) in both AI (5.02, 4.01, 3.33 and 2.69, respectively) and TI (6.09, 5.24, 4.70 and 4.18, respectively) and a linear increase ($P < 0.0001$) in h/H ratio (0.335, 0.406, 0.480 and 0.591, respectively) in milk fat as the dietary level of whole cottonseed increased from 0 to 15%. These results are consistent with the lower contents of medium chain saturated FA, as well as the higher oleic acid content in milk fat from cows fed increasing levels of whole cottonseed. Overall, our results indicate that milk fat quality of dairy cows can be improved by including whole cottonseed in sugarcane silage-based diets.

Keywords: human health, milk fatty acid composition, oilseed, tropical forage

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