

Goat milk free fatty acids characterization during pasteurization and ohmic heating by solid-phase microextraction-gas chromatography

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Milking procedures and mechanical treatments during processing may affect physical and chemical components of milk leading to undesirable changes on the quality of dairy products. The appearance of rancid flavors in milk is frequently associated with the release of free fatty acids (FFA) resulting from triglyceride degradation of milk fat. Recent research suggests that the high shear stresses imposed on milk during stirring, pumping and heat treatment may cause damage to the membrane that protects the milk fat globule from the action of lipases. Disruption of this membrane facilitates the hydrolysis of triglycerides, which could lead to an excessive accumulation of FFA in milk. Solid-phase microextraction (SPME) is an economical and solvent free extraction technique that allows the concentration on a silica support coated with a stationary phase of polar, non-polar, volatile and semi-volatile organic analytes from both solid and aqueous food matrices. Previous studies reported that in association with gas chromatography techniques, SPME had been shown to be a useful tool in quantification of individual FFA in dairy products providing enough sensitivity to detect levels of rancidity in milk. The aim of this study is to evaluate the effects of pumping systems (screw and centrifugal pump) and heating units (plate-and-frame heat exchanger and ohmic heater) on the FFA profile (C4 - C10) of milk fat, through the utilization of a combination of SPME and gas chromatography. Results have shown that the quantity of FFA extracted from goat milk by SPME tends to increase with the use of plate-and-frame heat exchanger as compared to raw milk and to ohmic treated milk. Moreover, it was observed that the goat milk pasteurized by ohmic heating, using high temperature short time method, has presented lower content of FFA during refrigerated storage, when compared with goat milk pasteurized by plate and frame heat exchanger.