Influence of extruded linseed on milk and cheese fatty acid composition in dairy cows

Maria Federica Trombetta[1], Simona Mattii[1], Giorgia Canestrai[2], Sara Priori[1], Luciano Terni[3], Adalberto Falaschini[1]

[1]Dipartimento di Scienze Alimentari, Agro-Ingegneristiche, Fisiche, Economico-Agrarie e del Territorio, Università Politecnica delle Marche, Ancona, Italy

[2]Dipartimento di Morfofisiologia Veterinaria e Produzioni Animali, Università di Bologna, Italy

[3]Petrini Institute, Mignini & Petrini SpA, Petrignano di Assisi (PG), Italy

Corresponding author: Maria Federica Trombetta. Dipartimento SAIFET, Università Politecnica delle Marche. Via Brecce Bianche, 60131 Ancona, Italy – Tel. +39 071 220 4927 - Fax: +39 071 220 4988 – Email: m.f.trombetta@univpm.it

ABSTRACT

Milk fat contains 60% saturated fatty acids (SFA) that contribute to human plasma LDL levels; unsaturated fatty acids promote HDL formation and have an important role in metabolism. Lipid supplementation can be provided through green forage or via the addition of oil and/or oil seeds in the ration. Fresh grass and pasture are rich in ω_3 linolenic acid, which is capable of affecting ω_3 acid levels in dairy cow milk. Oil seeds are also rich in long-chain fatty acids (C18:0, C18:1, C18:2, C18:3). Several studies have described changes in the acid composition of milk fat in cows fed seeds; in particular, linseed has been demonstrated to be an important source of ω_3. In a trial conducted in a dairy farm, 80 lactating cows producing on average 30l milk/day were fed a control ration (DC) for 3 months followed by a ration supplemented with extruded linseed: first 400 g/d/head (DL_4) for 3 months and then 800g/d/head (DL_8) for another 3 months. All 80 cows were assigned to the same experimental treatment, because the farm's organisational structure did not allow for multiple groups. On the occasion of the monthly APA checks, milk was randomly collected and lyophilised for gas chromatographic analysis of fat. Six unifeed samples, taken from the mangers at the same times, were subjected to chemical analysis. Throughout the trial, the ration provided DM 72%, CP 16.2%DM, EE 3.53%DM, NDF 36%DM, and ash 9%DM. Cheese made from DC milk (DCC) and DL_8 milk (DL_8C) was sold after 20 day ripening. Data were subjected to analysis of variance with linseed supplementation as the effect. Analysis of the milk yielded significant differences (P<0.001) in relation to the higher linseed supplement (800g); in particular, ω_3 C18:3 rose from 0.56% and 0.61% in DC and DL_4, respectively, to 0.90%. Total SFA were significantly lower (P<0.001) in DL_8 milk (DC 62.7%, DL_4 67.0%, DL_8 57.8%). Significant differences (P<0.001) were also calculated for MUFA (DC 31%, DL_4 25.9%, DL_8 35.3%) and PUFA (DC 3.7%, DL_4 3.9%, DL_8 4.5%). Six cheeses per milk type were subjected to fat chemical and acidic composition analysis. There were no significant differences in the former (DCC: DM 63.8%, protein 40.7%DM, fat 49.3%DM *vs.* DLC: DM 61.7%, protein 42.2%DM, fat 48.6%DM), whereas fatty acid composition evidenced significant differences (P<0.01) in ω_3 C18:3 (DCC 0.51% *vs.* DLC 0.89%); SFA (DCC 68.4% *vs.* DLC 63.5%); MUFA (DCC 25.6% *vs.* DLC 30.6%) and PUFA (DCC 2.9% *vs.* DLC 4.1%). In conclusion, supplementation of the lactating cow ration with extruded linseed allows to modify the acidic composition of milk by increasing its content in unsaturated fatty acids, mainly ω_3 C18:3.