Total Fatty Acids in Murrah Buffaloes Milk on Commercial Farms in Brazil

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ABSTRACT: The objective of this trial was to document the total fatty acids in Murrah buffaloes milk on commercial farms in Brazil. Data from forty lactating Murrah-crossbred buffaloes were collected on five commercial farms located at Sarapui and Pilar do Sul, Sao Paulo-Brazil. A field survey was done from April to November 2002. In four farms, buffaloes were fed with wet brewers grains (primary concentrate). Only one farm (Farm 4) offered pasture and corn silage. Monthly milk samples were collected and stored at -20ºC until analyzed for fatty acid composition. The fatty acids with the highest percentage in total milk fat were $C_{16:0}$; $C_{18:1c9}$; $C_{18:0}$ and $C_{14:0}$. The average content observed in $C_{16:0}$ varied from 25.4 to 32.5%. Farm 4 (pasture plus corn silage) showed a higher $C_{16:0}$ value (32.5%). $C_{18:1c9\ varied}$ from 20.6 to 25.1%, $C_{14:0}$ varied from 5.9 to 8.9 % and CLA content ($C_{18:2c9t11}$) varied from 1.0 to 1.8%. Farm 3 presented higher average of $C_{18:1c9}$ (25.1%) and $C_{18:2c9t11}$ (1.8%), and lower average of $C_{14:0}$ (6.0%). Likewise, unsaturated fatty acids, $C_{18:1c9}$ and $C_{18:2c9t11}$ were higher on Farm 3. Probably, these results can be due to high CLA intakes derived from wet brewers grain and pasture. Long chain fatty acids varied from 34.2% (Farm 4) to 48.8% (Farm 3). In general, diets based on pasture and corn silage increased the levels of medium chain fatty acids in Murrah buffaloes milk.

Key words: Buffalo milk, CLA, Fatty acid profile, Tropical farming.

INTRODUCTION - The ruminant milk fat is predominantly formed by triglycerides (97-98%), small amounts of steroids, free fatty acids and phospholipids. The triglycerides are synthesized by mammary epithelial cells. The preformed fatty acids used in this synthesis are taken up by the mammary gland either from plasma non-esterified fatty acids (NEFA) or low density lipoprotein (VLDL). This source provides long chain fatty acids and 40% of palmitic acid. The mammary gland utilizes β-OH-butyrate in addition to acetate to supply the carbon for the short and medium chain in milk fat. Main fatty acids presents

in ruminant milk show 4 ant 20 carbons. As also observed in cattle, the main saturated fatty acids of buffaloes are palmitic ($C_{16:0}$), generally, more than 30 % of total fatty acids, myristic ($C_{14:0}$), and stearic ($C_{18:0}$). The main unsaturated fatty acids are the oleic ($C_{18:1}$), principally, the cis 9 (20 to 25%). In buffaloes milk, the saturated fatty acid vary from 60 to 65% of the total fatty acids, while the unsaturated fatty acid vary from 35 to 40% (Lock and Garnsworthy, 2003). Recent studies indicate that conjugated linoleic acids (CLA) naturally present in milk and dairy products may have anti-carcinogenic, anti-diabetic and anti-atherosclerotic effects on human health (Bauman D.E., 1999). The CLA are a group of linoleic acid isomers containing double bonds ($C_{18:2c9t11}$). The concentration of CLA in milk fat can be enhanced by changes in the diet. Thus, the intent of animal nutritionists is increase the CLA concentration in milk fat, especially $C_{18:2c9,}$ by diet manipulation. The objective of this trial was to document the total fatty acids in Murrah buffaloes milk on commercial farms in Brazil.

MATERIAL AND METHODS - This trial was carried out on 5 commercial farms located at Sarapui (23º38'28" S and 47º49'38" W) and Pilar do Sul (23º48'44" S and 47º42'29" W) cities, São Paulo-Brazil. In each farm, milk samples of eight buffaloes were collected from April to November 2002. Milk samples were stored at -20º until analyzed for fatty acids composition. The nutritional management adopted in each farm was: Farm 1- buffaloes were maintained in feedlot and fed with corn silage as the main forage source and the wet brewers grain as the primary concentrate; Farm 2 - buffaloes were maintained in feedlot and fed with corn silage either chopped fresh grass (*Pennisetum purpureum*) or sugarcane (*Saccharum officinarum*) and the wet brewers grain as the primary concentrate; Farm 3- buffaloes were maintained on pasture (*Brachiaria decumbens*) supplemented with sugarcane and wet brewers grain as the primary concentrate, Farm 4- buffaloes were maintained on pasture (*Brachiaria decumbens*) supplemented with corn silage and wet brewers grain only in April, October and November; Farm 5- buffaloes were maintained on pasture (*Brachiaria ruziziensis*) supplemented with *B. ruziziensis* silage and concentrate (whole cottonseed, citric pulp and urea) plus wet brewers grain. Only Farm 5 provided a total mixed ration to meet the buffaloes requirements. Milk fat from samples was extracted according to Hara and Radim (1978) and fatty acids methylations were prepared as described by Christie (1982) with modifications (Chouinard *et al*. 1999). Fatty acids methyl esters were quantified using a gas chromatograph (Trace GC3). CRM-164 reference standard (Commission of the European Communities, Community Bureau of Reference, Brussels, Belgium) was used to determine recoveries and correction factors for each fatty acid. Data analysis was done by descriptive way due to different systems of animal production.

RESULTS AND CONCLUSIONS - The highest percentage of fatty acids in milk fatty were observed in $C_{16:0}$; $C_{18:1c9}$; $C_{18:0}$ and $C_{14:0}$ (Table 1).
According to Lock and Garnsworthy (2003) these fatty acids were the same found in bovine milk. The $C_{14:0}$ average content varied from 5.96 to 8.85% of total milk fat. Farm 3 showed the lower value for $C_{14:0}$ (5.96%). The values observed in this experiment were different from results reported by Lock and Garnsworthy (2003) who found 10.7%. On the other

hand, Fedele *et al*. (2001) in studies with buffaloes observed higher average values of $C_{14:0}$ ranging from 11.7 to 12.8% when compared with our experiment. $C_{16:0}$ varied from 25.36 to 32.5%. In contrast, the average value of $C_{16:0}$ found in dairy cows was 18.7% (Lock and Garnsworthy, 2003). Hypercholesterolemic average values ($C_{12:0}$, $C_{14:0}$ e $C_{16:0}$) obtained in this study, varied from 32.48 to 42.9%. The average value found in $C_{18:0}$ varied from 7.9 to 13.4%. Our results were similar to Fedele *et al*. (2001) which observed na average value of 12.6%. Higher values of $C_{18:1c9}$ (25.1%) and $C_{18:2c9t11}$ (1.77%) were found on Farm 3. All farms showed higher CLA contents (1.242%) as compared to the results obtained in Argentinean buffaloes (0.48). Average values found for monounsaturated fatty acids and polyunsaturated fatty acids were, respectively, 31.68% and 3.28%. In conclusion, these data demonstrated that changes in diet, especially the utilization of diets with greater CLA content, can alter the milk fat composition. Diets containing higher polyunsaturated can elevate polyunsaturated concentrations in buffalo milk fat.

Table 1. Mean percentage of principal fatty acids in buffaloes milk (% of total fatty acids)[1]

Fatty acids	Farm 1	Farm 2	Farm 3	Farm 4	Farm 5
			%		
$C^{12:0}$	1.87	1.75	1.15	1.63	1.46
$C^{14:0}$	8.42	8.42	5.96	8.85	7.53
$C^{16:0}$	28.7	29.2	25.3	32.4	28.4
$C^{18:0}$	11.13	11.32	13.44	7.86	11.73
$C^{18:1c9}$	20.6	20.7	25.1	21.2	21.7
$C^{18:2c9t11}$ (CLA)	1.14	1.02	1.77	1.10	1.18
SFA[2]	61.3	61.7	55.6	62.6	59.9
MUFA[3]	27.3	29.0	36.5	31.7	33.9
PUFA[4]	3.1	3.1	3.9	3.1	3.2

2 - SFA: saturated fatty acid; 3 - MUFA: monounsaturated fatty acid; 4 - PUFA: polyunsaturated fatty acid.

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