Poster

Feeding management and milk production in organic and conventional buffalo farms

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ABSTRACT: The feeding management, milk yield and milk composition were investigated in two adjacent buffalo farms, one organic certified (on average, 220 lactating buffalo cows) and one conventional (on average, 314 lactating buffalo cows) located in the Sele Plain (southern Italy). Milk samples from the two farm were collected twice a month during the period from June to November 2006. Milk production was also recorded. The investigated milk components were the content of protein, fat, lactose, urea and the number of somatic cells. The following features about the feeding management of lactating buffalo cows were recorded during monthly farm visits: feed used, herbage utilization, ration composition. Fat and protein correct milk yield was higher in conventional farm than in organic one, but milk components were similar between the farms. The greatest differences were found in the somatic cell count, lower in organic milk than in conventional one, and the urea content, which was higher in organic milk than in conventional farm, but still within the normal range reported for buffalo milk.

Key words: Milk, Organic dairy farm, feeding management, *Bubalus bubalis*.

INTRODUCTION - There are only a 3 organic buffalo (*Bubalus bubalis*) farms in Italy, located in the traditional areas of buffalo breeding (Latina province, the Sele Plain and the Volturno Plain). About the several reasons of this low number, two are of great importance. First, the conventional mozzarella cheese market that still offers a good price premium to the buffalo breeders and dairy producers. Second, as the most of the buffalo farms are small and scattered and the herds are reared under intensive conditions, there are great concerns among commercial farmers in relation to the standards required in organic regulation for diseases treatment, animal welfare and feed supply. In conventional farming soybean and sunflower meals became the main protein sources in the nutrition of dairy buffalo cows where, usually, they are incorporated in the rations as a high-protein complement to silage maize. Nevertheless solvent extracted meals are not allowed in organic farming (2092/91/EEC, Annex 1, Paragraph 4.2). Differences in farm management and cow nutrition in the organic system may potentially affect milk yield and composition. The aim of this study was to compare the milk yield and milk composition from one organic certified and one conventional buffalo farms.

MATERIAL AND METHODS - The study was carried out over six months (June – November 2006) in two adjacent buffalo farms, one organic certified (on average, 220 lactating

buffalo cows, 3.7 parity number, 171 days in milk) and one conventional (on average, 314 lactating buffalo cows, 2.8 parity number, 168 day in milk), representative of the Sele Plain, in southern Italy. For each herd, bulk milk samples from a consecutive morning and evening milking were collected every two weeks, along with the collection of feed samples and the recording of milk production. Farm production and management data were collected each month by farmer. Milk samples were analysed for fat, protein, lactose, non-fat solid (Milkoscan 605, Foss Electric, Sweden), urea (CL 10, Eurochem) content and somatic cell count (SCC; Fossomatic 250, Foss Electric, Sweden). The AOAC (1990) official methods were used to determine chemical composition of feedstuffs. Milk production was standardised to 8.3% of fat and 4.73% of protein (fat-protein corrected milk - FPCM) according to CMBC (2002).

RESULTS AND CONCLUSIONS – Milk traits of the two herds are reported in Table 1. The average milk yield in organic herd was lower than in conventional herd (6.9 *vs*. 8.6 kg/head/d). The same was for FPCM. Fat, lactose and protein percentages were very similar between the two herds. The urea content was higher in organic milk, but still within the normal range of buffalo milk (Di Francia *et al.*, 2003a). The mean bulk tank somatic cell count (SCC) was higher on conventional farm than on organic farm, but none of milk samples exceeded the critic threshold of 400,000 somatic cells/ml, which is associated with increased rennet coagulation time and a slower rate of curd firming during mozzarella cheese making (Terramoccia *et al.*, 2001).

Table 1. Milk traits and fatty acid composition in the organic and the conventional farms.

		Farm	
		Organic	Conventional
Milk yield	kg/head/d	6.9±0.7	8.6±1.0
FPCM[1] yield	"	7.0±0.8	8.4±1.0
Fat	%	8.47±0.35	8.26±0.61
Protein	"	4.56±0.15	4.46±0.20
Lactose	"	4.75±0.08	4.75±0.18
Non fat solid	"	10.32±0.25	10.20±0.23
Somatic cell count	"	79,455±53,101	90.152±50,097
Cryoscopy index		-0.526±0.01	-0.537±0.01
pH		6.74±0.06	6.72±0.09
Urea	ml/dl	38.78±9.4	33.96±7.2

[1]8.3% fat and 4.73% protein corrected milk.

Both the herds adopted the total mixed ration (TMR) system. Chemical compositions of the feedstuffs used are listed in Table 2. The TMR components on the organic farm were similar to those typically adopted in dairy buffalo conventional farms in the Sele Plain (Di Francia *et al.*, 2003b). Maize silage (substituted in late spring by grass silage) was the main ingredient of rations, in which high- energy and high-protein complements were incorporated.

Table 2. Chemical compositions and nutritional characteristics of the feedstuffs used in the organic (O) and the conventional (C) farms throughout the 6-month observation period.

	Farm	DM	UFL	CP	Fat	Ash	NDF	ADF	ADL	Starch
Alfalfa hay	O	93.1	0.54	12.6	2.1	9.3	58.6	47.0	10.4	-
Alfalfa hay	C	92.7	0.60	16.1	1.9	9.9	51.0	39.6	9.3	-
Alfalfa silage	O	59.6	0.56	8.7	1.3	11.5	69.8	47.9	5.9	-
Maize silage	O	36.3	0.78	5.4	2.8	6.2	51.3	32.3	3.9	26.4
Maize silage	C	33.3	0.72	6.6	1.9	5.9	56.4	37.1	4.8	22.1
Barley and Triticale silage	O	44.0	0.73	5.7	1.8	5.4	48.5	29.7	4.2	14.0
Ryegrass and Clover silage	C	39.0	0.64	10.8	2.5	10.4	52.8	40.1	5.8	-
Wheat straw	C	90.7	0.40	3.8	1.5	10.0	81.0	57.2	8.9	-
Wheat straw	O	90.0	0.40	4.1	1.5	10.5	80.0	55.2	8.5	-
Organic Concentrate	O	89.2	1.01	23.9	6.3	8.0	25.5	17.3	4.8	21.9
Flaked barley	C	86.0	1.3	11.6	2.3	2.7	17.4	6.4	1.2	58.1
Flaked soybean	C	88.0	1.39	41.1	21.0	6.0	14.1	9.5	0.9	8.1
Soybean meal	C	88.7	1.14	47.8	1.7	7.2	16.1	10.4	5.8	-
Maize meal	C	88.7	1.25	11.7	4.0	2.0	19.3	4.2	1.5	66.0
Wheat middlings	C	87.0	0.96	15.3	4.1	3.6	22.0	6.9	2.1	36.0

The quality of silages was quite good. Cereals, soybean and wheat middlings were used as high energy feedstuffs and protein sources in the conventional farm; a commercial concentrate was instead used in the organic farm, in contrast with one of the principles of organic farming that is to produce all feeds in site.

Chemical composition of the rations utilised in the two farms is reported in Table 3. The rations used in the organic herd, compared to those used in the conventional one, were characterized by lower energy density, crude protein concentration and starch content. By contrast, the NDF percentage and the forage/concentrate ratio were higher, as a consequence of the fact that one of the basic principles of the organic farming prescribes the formulation of forage based diets. The low energy and protein densities and the high forage/concentrate ratio forage might in turn adversely affected the milk yield. Nevertheless, the ratio UFL/kg FPCM was better in organic farm probably due to the reduced amounts of concentrate fed to buffalo cows in organic herd.

Although the protein content of organic diets was lower than that observed in conventional farm, the milk urea content was higher, probably because the protein solubility and the non structural carbohydrate degradability of organic diets were unbalanced. In conclusion, our data show that nutritional factors critically affect the milk yield in organic herd.

Table 3. Chemical composition of rations used in the organic and the conventional farms.

	Farm	
	Organic	Conventional
DM intake	18.6±0.93	20.7±1.0
UFL	14.5±0.56	17.8±0.9
UFL%DM	0.78±0.01	0.87±0.01
UFL/kg FPCM	1.30±0.14	1.50±0.12
CP g	2227±89	2984±209
CP %DM	12.0±0.28	14.4±1.0
NDF%DM	46.2±1.3	39.4±1.7
Starch	3160±251	4581±617
Starch% DM	17.4±2.1	22.1±2.6
Forage/concentrate ratio	71/29	57/43

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