in milk and sheep cheese

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RIASSUNTO – Effetto di due pascoli a differente composizione botanica sul contenuto in CLA nel latte e nel formaggio ovino – *E' stata svolta una prova per valutare l'effetto di differenti pascoli sulla composizione acidica del latte e del formaggio, con particolare riferimento al CLA, in ovini di razza Sarda. I pascoli differivano per la presenza o meno del crisantemo coronario. Non sono stati registrati effetti significativi dei trattamenti sulla produzione lattea, il tenore in grasso e proteine. La composizione acidica sia del latte che del formaggio è risultata influenzata in modo significativo dal tipo di pascolo sia per quanto riguarda i livelli di CLA, che per livelli di PUFA, facendo registrare livelli più alti nei gruppi che pascolavano il miscuglio contenente il* Chrysanthemum coronarium *L.*

KEY WORDS: sheep, cheese, CLA, milk fat, pasture.

INTRODUCTION – It is known that milk composition included conjugated linoleic acid (CLA) is affected by animal feeding system (Cabiddu *et al.*, 2001). In Sardinia dairy sheep feeding is mainly based on pastures. Most of them are characterised by self-regenerating species, like annual ryegrass (*Lolium rigidum* Gaudin) and burr medic (*Medicago polymorpha* L.). Non conventional species belonging to the Compositae family such as (*Chrysanthemum coronarium* L.) seem interesting for sheep feeding when other herbages decrease in quality (late spring- early summer). It was observed that *C. coronarium* establishes rapidly, can be grazed early in the growing season and persist where other pasture species may disappear; for these reasons it can be considered a valuable source of food. Moreover a preliminary study with dairy sheep fed fresh forage of *C. coronarium* showed relatively high levels of CLA in milk (Molle G. *pers. com.*) The aim of the present work was to study the influence of different pastures on milk composition, with particular reference to CLA and its precursors.

MATERIAL AND METHODS – The experiment was undertaken in 2001 at Bonassai research station (NW Sardinia 41° N latitude, mean annual rainfall 547 mm) during late spring (May). Forty lactating Sarda ewes at about 150 days in milking, 47.8±0.9 (mean±SE) kg of liveweight, 2.76±0.03 of body condition score (BCS), 1364±52 (ml/head day) of milk yield, were allotted to two homogeneous groups. The ewes were allowed to graze all day long, with exception for the two machine milking (at 7 A.M and at 4 P.M.), pastures sown with different mixture: *Lolium rigidum* + *Medicago polymorpha* (LM) and *Lolium rigidum* + *Medicago polymorpha* + *Chrysanthemum coronarium* (LMC). No supplement was offered. Chemical composition of hand-plucked samples of sown species was measured, DM, CP, EE (AOAC, 1990); NDF, ADF and ADL (Goering and Van Soest, 1970) Fatty acids composition of sown species was also determined (Christie, 1989). The botanical composition of sheep diet was estimated by the *n-alkane* method (Dove and Moore, 1995). Live weight and BCS were measured at the beginning and at the end of the experiment. On 3 occasions group milk was processed into uncooked cheese using a pilot plant. Milk yield, milk and cheese composition (fat, protein and fatty acids) were measured. All data were analysed by one-way ANOVA with diet as fixed effect. Treatment means were separated by least significant difference.

RESULTS AND CONCLUSIONS – The chemical composition of forage species (Table 1) showed a trend towards lower DM and NDF content of *C. coronarium* (C) compared to *L. rigidum* (L) and *M. polymorpha* (M). Moreover *C. coronarium* showed a higher content of ether extract and precursor of CLA ($C_{18:2}$ *9cis, 12cis*) . In the two diet the proportion of L was similar. C tended to substitute M in the LMC diet (Table 1). The two groups did not show significant differences in milk yield (Table 2). LMC milk and cheese (Table 3) showed higher content ($P<0.01$) of $C_{18:1}$ *11trans*, $C_{18:2}$ *9cis* and CLA *9cis 11trans*, as a consequence of a higher content of CLA-precursors in *C. coronarium*. $C_{18:3}$ *9cis, 12cis, 15cis* content was higher in LM milk and cheese. Nevertheless the LMC diet increased also PUFA level in milk and cheese.

Table 1. Chemical composition of sown species and botanical composition of diets.

		L	M	C
DM	%	43.2	39.32	21.60
CP	% DM	8.06	14.88	12.53
EE	"	1.35	2.47	4.30
NDF	"	59.55	52.18	29.56
$C_{18:0}$	mg/Kg DM	0.24	0.67	0.65
$C_{18:1}$ *11t*	"	0.02	0.04	0.01
$C_{18:2}$ *9c 12c*	"	1.83	2.38	4.82
$C_{18:3}$ *9c 12c 15c*	"	2.59	6.73	3.02
Botanical comp. LM diet	%	26.60	73.40	-
Botanical comp. LMC diet	%	24.10	41.60	34.30

In conclusion the two different diets did not influence milk yield, protein and fat content in milk. Higher amount of CLA and its precursors in milk and cheese were found in the group LMC, probably due to the higher contents of $C_{18:2}$ *9cis, 12cis* in *C. coronarium*.

Table 2. Milk yield and milk composition of ewes grazing either LM or LMC pastures.

		LM	LMC	F test
Milk yield	ml/head/day	992	996	NS
Fat	%	6.88	6.59	NS
Protein	"	5.44	5.25	NS
$C_{18:0}$	mg/g fat	107.96	98.62	0.07
$C_{18:1}$ *11t*	"	17.09	27.14	**
$C_{18:2}$ *9c 12c*	"	21.50	26.42	**
$C_{18:3}$ *9c 12c 15c*	"	24.68	17.22	**
CLA *9c 11t*	"	9.96	15.79	**
MFA[1]	"	314.06	317.43	NS
LFA[2]	"	387.53	370.95	NS
PUFA	"	56.14	59.43	**

** $P<0.05$; ** $P<0.01$; [1]medium chain fatty acids (C_{12}-C_{16}); [2]long chain fatty acids (C_{17}-C_{18})*

Table 3. Cheese composition of ewes grazing either LM or LMC pastures.

		LM	LMC	F test
Fat	%	32.51	31.94	NS
Protein	"	20.08	20.06	NS
$C_{18:0}$	mg/g fat	107.21	97.91	*
$C_{18:1}$ *11t*	"	16.49	28.15	**
$C_{18:2}$ *9c, 12c*	"	21.76	26.59	**
$C_{18:3}$ *9c 12c 15c*	"	25.10	17.24	**
CLA *9c 11t*	"	10.15	16.23	**
MFA	"	310.50	313.27	NS
LFA	"	388.40	370.75	*
PUFA	"	57.01	60.06	*

* *P<0.05; ** P<0.01*

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