Effect of season on characteristics of pecorino cheese and ricotta of Pistoiese Appennine: first results

L. Pianaccioli, A. Acciaioli, R. Malvezzi, L. Giustini

Dipartimento di Scienze Zootecniche. Università di Firenze, Italy

Corresponding author: Anna Acciaioli. Dipartimento di Scienze Zootecniche. Università di Firenze. Via delle Cascine 5, 50144 Firenze, Italy - Tel. +39 055 3288266 - Fax: +39 055 321216 - Email: anna.acciaioli@unifi.it

ABSTRACT: The "Pecorino pistoiese" is made from milk of Massese Sheep. The flocks are reared by grazing on natural pastures of Pistoiese Appennine. The farms product cheeses by milk without pasteurization. The handmade cheeses are characterized by a remarkable variability due to farm and to season. The aim of this work is to study the effect of season on characteristics of the pecorino e ricotta pistoiese with particular attention for the determination of the yield. One trial was run in each season (4 trials) and in 3 farms. Every phases of the cheesemaking were controlled and milk, cheese and ricotta were weighed and analysed. The season showed some significant effects on the chemical composition of milk: lactose and SNF showed lower values in summer. The pecorino cheese showed 18.5% of fat and 24.7% of protein on average. In spring and in summer the yield in pecorino cheese (15.8%) was significantly worse than in winter (19.3%). The ricotta cheese was fatter in summer (27.6%) than in winter (17.5%). The yield of ricotta at 24 hours was 13.5% on average.

Key words: Pecorino, Ricotta, Cheese yield, Massese sheep milk.

INTRODUCTION – The "Pecorino pistoiese" is made from milk of Massese Sheep. The flocks are reared by grazing on natural pastures of Pistoiese Appennine. Massese breed has good aptitude to milk production (Franci et al.,1999; Pugliese *et al*.,1999; Acciaioli *et al*., 2000). The cheesemake is made with milk of each one milking. This technique allows the cheesemaking process without pasteurization of milk assuring the natural fermentation made by autochthonous lactic microflora (Innocenti *et al*, 2004). The cheeses have characteristics that can not be produced by industrial process, for that reason Slowfood conferred to this pecorino cheese the role of "presidio". However, the handmade cheeses are characterized by a remarkable variability due to farm and to season. The aim of this work is to study the effect of season on characteristics of the "pecorino pistoiese" and "ricotta pistoiese" with particular attention for the determination of the yield.

MATERIAL AND METHODS – Trial was conducted in 3 farms controlling milk and cheese production in each season. On overall 12 control periods were considered. The farms had medium size of flock (141± 44 heads) and they employed the same technique of rearing and cheesemaking (Disciplinary of "Consorzio Montagne e Valli di Pistoia"). In each period, all the cheesemaking phases were controlled; milk was sampled (ASPA, 1995); ricotta was weighed at 12 and 24 hours; cheeses were regularly weighed at 0, 2, 30 and 90 days of seasoning; yield of milk in cheese and ricotta was calculated. Twelve samples of bulk milk were analysed for: protein, fat, lactose, SNF (milkoscan); somatic cell count (SCC) by Fossomatic 400; clotting properties (R, K20, A30, A45) by Formagraph. The chemical composition of cheese at 2 days and of ricotta at 24 hours was determined (AOAC, 1990). Data were analysed with the following linear model (SAS, 2003): $Y_{ijk} = \mu + A_i + B_j + E_{ijk}$ (μ = mean; A=season (i=1, 2, 3, 4); B=farm (j=1, 2, 3); E= error). The evolution of cheese yield was described by regression (Y= yield, X=days of seasoning).

RESULTS AND CONCLUSIONS – The season showed some significant effects on the chemical composition of milk (table 1): lactose and SNF showed lower values in summer. This fact could depend on different feeding system: grazing in late spring and summer and hay + concentrate in the other seasons. Clotting properties of milk

were variable even if not different among seasons. The values were similar to data found by Cecchi *et al*. (1997) but worst than data found by Pugliese *et al*. (1997) in the milk of Massese ewe. Generally the results described a few reactive milk that required very long time in the farm cheesemaking. Effectively, the average coagulation time recorded during the cheesmaking were 41, 33, 58, 38 minutes in spring, summer, autumn and winter, respectively.

Table 1. Composition and clotting properties of milk.

		Season*				Rsd
		Spring	Summer	Autumn	Winter	
Fat	%	5.95	6.10	5.97	6.15	1.049
Protein	%	5.73	4.94	5.66	6.10	0.625
Lactose	%	4.67^{A}	4.40^{B}	4.72^{A}	4.68^{A}	0.130
SNF	%	11.10^{AB}	10.09^{B}	11.03^{AB}	11.43 A	0.572
SCC log.		5.71	5.71	5.95	5.82	0.213
R		26′7″	22′52″	33′10″	32′57″	8′ 13″
K 20		3′37″	4′15″	8′45″	4′08″	2′ 55″
A 30	mm	26.89	25.71	8.46	14.28	24.07
A 45	mm	53.4	51.7	27.12	19.83	16.82

** means with different superscript are significantly for P< 0.05.*

Chemical characteristics and yield of pecorino cheese were showed in table 2. No significant differences were found among seasons for the chemical traits while yield was significantly higher in winter than in spring and in summer. In fact, although all not significant, in cold season the milk was richer and the cheese was wetter (the low temperature reduces purging of whey). The yield was 18% on average, resulting lower that reported by Ania (2006) and Castagnetti *et al*. (2004) on cheese obtained with pasteurized milk.

Table 2. Chemical composition (% wet basis) and yield of pecorino cheese.

		Season*				
		Spring	Summer	Autumn	Winter	Rsd
Moisture	%	47.52	47.79	49.83	50.08	5.71
Fat	%	17.53	20.42	17.45	18.75	4.25
Protein	%	26.31	24.45	24.71	23.34	2.81
Ash	%	4.14	3.45	3.94	3.96	0.42
Yield (2d)	%	16.93^{B}	15.76^{B}	17.77^{AB}	19.30^{A}	1.13

** means with different superscript are significantly for P< 0.05.*

Figure 1 describes the evolution of yield during ripening until 90 days. The winter showed always better values than the other seasons.

The chemical composition of ricotta (table 3) changed significantly during the year: in Autumn and in Winter it had higher moisture and, generally, lower fat and protein content than in the other two seasons.

The yields was determined both at 12 and at 24 hours because the first one is the typical local product while the second one is everywhere used. The yields were not different among seasons.

The 12h yield was noticeably high (about 16%) while the 24h yield was similar to data obtained by Portolano *et al*. (1996).

Figure 1. Evolution of yield in pecorino cheese during seasoning.

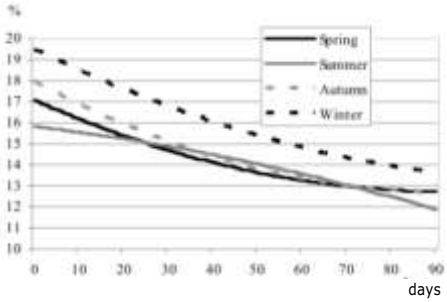

Table 3. Chemical composition of ricotta (% wet basis) at 24 hours and yields.

		Season*				
		Spring	Summer	Autumn	Winter	Rsd
Moisture	%	59.94^{B}	57.81^{B}	66.27^{A}	66.70^{A}	3.14
Fat	%	24.99^{A}	27.60^{A}	20.06^{AB}	17.46^{B}	4.05
Protein	%	11.06^{A}	10.32A^{B}	8.43^{B}	10.01^{AB}	0.95
Ash	%	0.95	0.96	0.87	1.03	0.09
Yield (12h)	%	16.49	15.75	14.24	15.99	2.79
Yield (24h)	%	13.89	13.98	12.28	13.99	2.60

** means with different superscript are significantly for p < 0.05.*

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