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in

Rubino R. (ed.), Morand-Fehr P. (ed.).
Production systems and product quality in sheep and goats

Zaragoza : CIHEAM

Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 46

2001

pages 135-139

Article available on line / Article disponible en ligne à l'adresse :

<http://om.ciheam.org/article.php?IDPDF=1600125>

To cite this article / Pour citer cet article

Wazna E., Gut A., Wójtowski J. **The effect of rearing methods on qualitative and quantitative parameters of ewe milk yields.** In : Rubino R. (ed.), Morand-Fehr P. (ed.). *Production systems and product quality in sheep and goats* . Zaragoza : CIHEAM, 2001. p. 135-139 (Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 46)



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The effect of rearing methods on qualitative and quantitative parameters of ewe milk yields

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SUMMARY – Two methods of milking were adopted in case of ewes coming from two dairy lines. In group I ewes were milked from the beginning of the 2nd to the end of the 6th month of lactation, whereas in the first month lambs sucked for 12 hours, and in the following 12 hours the ewes were milked once a day. At the end of the 3rd month of lactation lambs were weaned and ewes were milked twice a day. In group II ewes were milked after weaning lambs, from the beginning of the 3rd month to the end of the 6th month of lactation. On the basis of control milkings in the 3rd, 4th, 5th and 6th months of lactation, physical and chemical properties as well as the hygienic quality of milk were compared for both groups of ewes. No effect of the adopted lamb rearing method and the genotype of ewes was found on the milking performance and qualitative traits of milk during the 4-month period of lactation after weaning. Ewes milked in the season from July to November showed performance 33% higher than that for ewes milked in the season from February to June.

Key words: Sheep, milk, rearing of lambs, somatic cells, general bacteria count.

RESUME – "L'effet des méthodes d'élevage sur les paramètres qualitatifs et quantitatifs des rendements laitiers des brebis". Deux méthodes de traite des brebis provenant de deux lignées à lait étaient appliquées. Dans le 1er groupe les brebis étaient traitées dès le 2ème jusqu'au 6ème mois de lactation. Au cours du premier mois les agneaux les accompagnaient pendant 12 heures et après elles étaient traitées une fois pour les 12 heures qui suivaient. Au commencement du 3ème mois les agneaux étaient séparés des brebis et celles-ci étaient traitées deux fois par jour. Dans le 2ème groupe les brebis séparées des agneaux étaient traitées dès le 3ème jusqu'au 6ème mois de lactation. Les paramètres physico-chimiques et la qualité hygiénique du lait provenant de 2 groupes de brebis ont été comparés aux traites de contrôle faites dans le 3ème, 4ème, 5ème et 6ème mois de lactation. Il a été constaté qu'il n'y avait pas d'influence de la méthode d'élevage des agneaux et du génotype des brebis sur la productivité laitière et sur les paramètres qualitatifs du lait de brebis pendant les 4 mois de lactation suivant la séparation des agneaux et des femelles. La productivité des brebis traitées dans la période juillet-novembre dépassait de 33% celle des brebis traitées dans la période février-juin.

Mots-clés : Brebis, lait, élevage des agneaux, cellules somatiques, nombre total de micro-organismes.

Introduction

In order to maintain profitability of milking in case of ewes in the lowlands it is essential to keep ewes with at least average milking potential and to have intensive dairy use. Frequently it is also attempted to reduce the seasonal character of milk production by introducing out-of-season lambings.

An intensive system of dairy use may consist in, e.g., weaning lambs at an earlier time or introducing at the same time milking and allowing lambs suck, especially in the first 2-3 months of lactation (Boyazoglu, 1991). Such a system makes it possible to increase milk production, among other things as a result of prolonged commercial lactation (Lischka, 1976). Also Margetin and Gyarmathy (1997) and Ni_nikowski *et al.* (1997) indicate a dependency between the lamb rearing method on one hand and the length of lactation and the amount of obtained milk on the other hand.

The aim of the paper was to investigate the effect on milking performance of ewes and the hygienic quality of their milk of such factors that have the biggest impact in the intensive system of milking sheep in the lowlands. These factors are lamb rearing methods, the season of the year and the genotype of ewes.

Materials and methods

Studies were carried out in the years 1998 and 1999 at the Experimental Station in Z_otniki (the Agricultural University of Pozna_) for ewes coming from two milk lines: 10/16 East Friesian Milk Sheep, 6/16 Polish Merino; and 13/16 East Friesian Milk Sheep and 3/16 Polish Merino. Ewes were milked in two calendar seasons in 1998: February through June and July through November, and the February-June period in 1999. In each season ewes were assigned at random to two groups: experimental (I) and control (II), respectively. In the first group lambs, since the end of their first month of life, were every evening separated from their mothers for the period of 12 hours. The ewes were milked in the morning. At the end of the second month, the lambs were weaned and separated from their mothers on the permanent basis, and the ewes were milked twice a day. In the control group lambs were kept with their mothers until they were two months old. Only after weaning the ewes were milked twice a day, as in the experimental group.

On the basis of control milkings in the middle of the 3rd, 4th, 5th and 6th month of lactation, when milk yields were recorded in the mornings and in the evenings and milk samples from both milkings were tested in the laboratory, certain parameters were determined for each ewe. The parameters were: overall and daily milk yields, percentage of basic milk constituents, active acidity (pH), somatic cell count and general bacterial count (petrifilm). Moreover, the persistence of milk production was also determined, i.e., the percentage of ewes milked until the 150th day of lactation.

Experiment results were analysed using the GLM procedure of the SAS package (1989).

Results and discussion

Parameters in Table 1 characterize milking capacity of ewes, for which a complete set of data was available from all 4 milk yield recordings.

Table 1. The effect of investigated factors on milk yields of ewes (LSM \pm SE)

Factor	n	Milking period (No. of days)	Overall yield (dm ³)	Daily yield (dm ³)
Rearing method		ns	ns	ns
I	52	113.8 \pm 2.7	86.04 \pm 6.50	0.76 \pm 0.05
II	37	116.2 \pm 2.8	84.87 \pm 6.95	0.73 \pm 0.05
Genotype		ns	ns	ns
10/16	29	112.8 \pm 3.3	81.18 \pm 8.06	0.73 \pm 0.06
13/16	60	117.2 \pm 2.4	89.74 \pm 5.76	0.76 \pm 0.05
No. of reared lambs		ns	ns	ns
1	38	113.6 \pm 1.8	90.68 \pm 4.38	0.80 \pm 0.03
2	49	113.2 \pm 1.8	91.70 \pm 4.46	0.81 \pm 0.04
3	2	118.1 \pm 6.7	73.99 \pm 16.34	0.63 \pm 0.13
Season		ns	*	*
1	55	112.4 \pm 2.6	73.42 \pm 6.42	0.65 \pm 0.05
2	34	117.5 \pm 3.1	97.50 \pm 7.55	0.84 \pm 0.05
Year		*	**	**
1998	55	106.8 \pm 2.6	63.69 \pm 6.32	0.60 \pm 0.05
1999	34	123.1 \pm 3.2	107.22 \pm 7.78	0.89 \pm 0.06
Consecutive lactation	89	ns	ns	ns

*P<0.05; **P<0.01; ns = non significant.

Ewes from both dairy lines differed slightly in milk yields (P>0.05), and their yields were not high – the average being approximately 86 dm³ of milk during the 114 day long period after weaning.

It should, however, be emphasized that in the breeding of both dairy lines, rams of the East

Friesian Milk Sheep were taken from Polish breeding farms, where no selection is carried out on the basis of milking parameters. The levels of milk production, however, were similar to those obtained for crossbreds of the Friesian sheep and Merinos in Hungary (Kukovics *et al.*, 1993) and Poland (Osikowski and Borys, 1996). The ewes showed good persistence of milk production, as 87% of those selected for milking were milked throughout all the period, i.e., 150 days.

No effect of the method of rearing lambs was found on the ewes' yields ($P > 0.05$). It needs to be added that ewes from the experimental group (I) were milked for 27 days once a day prior to complete weaning of lambs at the age of approx. two months. In that period they gave 15.2 dm³ of milk.

Margetin and Gyarmathy (1997) indicated, however, that the initiation of milking one month earlier makes it possible to increase milk production by 30 kg from a ewe, but this result was obtained at milking the ewes twice a day.

The method of rearing lambs used in this experiment, i.e., separating lambs from their mothers for half a day and then milking ewes, did not adversely affect the milk yields and milk production in the following 4 months of lactation. It is consistent with the results of earlier papers (Ni_nikowski *et al.*, 1997; Bocquier *et al.*, 1999).

The ewes genotype, as well as their prolificacy (the number of reared lambs) and consecutive lactation did not have any effect on their yields. However, ewes milked in the later season (July-November) had higher yields ($P < 0.05$) than those milked earlier in the year (February-June). The higher yields in the later season could have been caused by higher quality feed in the summer feeding, which lasted longer in case of ewes from that group.

Among the experimental factors, the calendar year had the most significant effect on the milk production ($P < 0.01$), which confirms the well-known effect of environmental factors on milk production. The interaction genotype x the year indicates that the effect of the rearing method was not uniform in both experimental years. Table 2 presents the values of parameters characterizing milk quality in case of the investigated sheep and the effect of the most important experimental factors on qualitative parameters. As in case of milk yields, no effect of the adopted rearing method was found on the values of qualitative parameters.

Protein content percentage in milk depended only on the genotype and calendar season ($P < 0.05$). Higher protein content in the milk of ewes with a smaller share of the Friesian sheep genotype may be connected with their lower, though not statistically confirmed (Table 1), daily milk production. At the same time, the higher protein content in the milk of ewes milked later in the year could be the effect of the longer period of green lucerne feeding in that season (4 months instead of 2, as in the earlier season).

Fat content percentage in milk depended only on the year of the experiment ($P < 0.05$), which confirms a significant effect of environmental factors, connected basically with the quality of feed, on that parameter.

No effect of main experimental factors was observed on the values of hygienic parameters of milk quality. The authors' own research did not confirm the advantageous effect of method I on the clinical status of udders, as was indicated by studies conducted by Bocquier *et al.* (1999). It may be connected with the too short period of time – in comparison to the whole lactation period – when this method was used.

Conclusions

Separating lambs from their mothers for half a day (12 hours) in the second month of lactation makes milking ewes once a day possible. After weaning at the beginning of the third month of lactation, these ewes produced a similar amount of milk, characterized by similar quality, as that of the ewes, which started to be milked in the traditional way, i.e. after weaning of lambs at the age of two months.

The adopted method of milking once a day and nursing the lambs by their mothers restricted to only half a day had a beneficial effect on the persistence of milk production of ewes – 87% of these ewes were milked to 150th day of lactation, whereas only 65% of ewes with the traditional rearing method were milked to 150th day of lactation.

Table 2. Qualitative parameters of ewes milk (LSM ± SE)

Factor	n	Fat (%)	Protein (%)	Lactose (%)	Dry matter (%)	pH	Log SCC [†]	n	Log GBC ^{††}
Rearing method (M)		ns	ns	ns	ns	ns	ns		ns
I	52	6.40 ± 0.19	6.02 ± 0.14	4.37 ± 0.06	17.49 ± 0.26	6.56 ± 0.03	5.43 ± 0.20	25	4.24 ± 0.15
II	37	6.40 ± 0.21	5.95 ± 0.15	4.40 ± 0.07	17.47 ± 0.28	6.56 ± 0.05	5.53 ± 0.21	21	4.31 ± 0.16
Genotype (G)		ns	*	ns	ns	ns	ns		ns
10/16 East Friesian	29	6.71 ± 0.24	6.11 ± 0.18	4.35 ± 0.08	17.89 ± 0.32	6.54 ± 0.04	5.46 ± 0.24	16	4.22 ± 0.19
13/16 East Friesian	60	6.08 ± 0.17	5.85 ± 0.12	4.42 ± 0.06	17.08 ± 0.23	6.57 ± 0.03	5.49 ± 0.17	30	4.33 ± 0.13
No. of reared lambs (R)		ns	ns	ns	ns	ns	ns		ns
1	38	6.50 ± 0.13	6.05 ± 0.09	4.47 ± 0.04	17.74 ± 0.17	6.53 ± 0.02	5.68 ± 0.13	19	4.16 ± 0.12
2	49	6.49 ± 0.13	6.09 ± 0.10	4.40 ± 0.04	17.69 ± 0.18	6.52 ± 0.02	5.54 ± 0.13	25	4.30 ± 0.12
3	2	6.20 ± 0.49	5.81 ± 0.36	4.30 ± 0.16	17.01 ± 0.65	6.62 ± 0.07	5.20 ± 0.49	2	4.36 ± 0.34
Season (S)		ns	*	ns	ns	ns	ns		ns
1	55	6.88 ± 0.19	5.72 ± 0.14	4.39 ± 0.06	17.29 ± 0.25	6.59 ± 0.03	5.43 ± 0.19	26	4.30 ± 0.16
2	34	6.33 ± 0.22	6.24 ± 0.16	4.38 ± 0.08	17.68 ± 0.30	6.52 ± 0.03	5.52 ± 0.13	20	4.25 ± 0.16
Year (Y)		**	ns	ns	ns	*	ns		ns
1998	55	6.88 ± 0.19	5.92 ± 0.14	4.31 ± 0.06	17.80 ± 0.25	6.52 ± 0.03	5.67 ± 0.19	20	4.25 ± 0.16
1999	34	5.92 ± 0.23	6.04 ± 0.17	4.47 ± 0.08	17.16 ± 0.30	6.60 ± 0.03	5.28 ± 0.23	26	4.30 ± 0.16
Consecutive lactation (L)		ns	ns	ns	ns	ns	ns		ns
1	19	6.24 ± 0.27	5.92 ± 0.19	4.45 ± 0.09	17.36 ± 0.35	6.57 ± 0.04	5.24 ± 0.26	5	4.25 ± 0.25
2	27	6.36 ± 0.22	5.99 ± 0.16	4.37 ± 0.07	17.40 ± 0.29	6.53 ± 0.03	5.53 ± 0.22	15	4.13 ± 0.17
>3	43	6.59 ± 0.19	6.04 ± 0.14	4.34 ± 0.06	17.68 ± 0.25	6.57 ± 0.03	5.65 ± 0.19	26	4.44 ± 0.14
Interactions		ns	ns	(GxY)*	ns	ns	(GxL)*; (GxR)*		ns

[†]Log SCC = logarithm of somatic cell count.

^{††}Log GBC = logarithm of general bacteria count.

* = P<0.05; ** = P<0.01; ns = non significant.

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