Asian Journal of Chemistry Vol. 19, No. 3 (2007), 2135-2140

Studies of Biochemical Parameters of Milk of Sheep Milked by Machine During Early Lactation Period

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In this research, it was investigated the effect of weeks on milk biochemical parameters such as fat and protein of machine milked non-dairy sheep and to show the curves of these biochemical parameters during early lactation weeks. In the study, 14 Karayaka sheep with single lamb were used. The experiment began at 4 d of lamb age and lasted after 7 weeks. Sheep were fed a diet containing 135.1 g crude protein and 9.7 MJ metabolisable energy (ME)/kg. The weekly means of protein were similar (except first week) to those shown for the overall early lactation. The fat of milk was secreted at its highest rate at the start of lactation and then declined until 3rd week when it started to gradually increase again until the end of the study. The fat and protein reached their lowest points at week 3, which coincided with maximum milk yield. The lactation curves of non dairy sheep milked by machine of this study were similar with reported results for dairy and non-dairy ewes.

Key Words: Milk, Fat, Protein, Weeks, Machine milking, Sheep.

INTRODUCTION

Fat and protein have received most attention in biochemical parameters of milk[1]. Lactation curves can be used to study the accuracy of estimation methods for lactation yield and biochemical parameters in milk such as fat and protein[2,3]. Jordan[4-6] reported that the problems encountered in attempting to get non dairy ewes to increase milk yield and alter milk composition. But there were not enough statements about reason of this problem for non dairy sheep in his studies. The relationships for many

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observed biochemical parameters in milk were not clear in non dairy sheep as much as dairy animals[7,8]. Little is known about factors affecting milk components and their interrelationships in ewes. Therefore we must know effective factors such as lactation weeks, milking methods, nutrients on milk components of non dairy sheep in early lactation. Previous studies have documented the effects of environmental factors such as season, parity, age, pregnancy, and days dry on lactation yield curves[9,10]. However, comprehensive information on factors influencing fat and protein in milk is limited. Generally, biochemical parameters of milk vary inversely with milk yield[11]. Fat and protein metabolism of lactating animals and their secretion into milk are affected by the machine milking[12]. It was reported that milk composition was affected by milking methods in breeds because they have different autocrine control of milk secretion[13]. However no studies have reported on the changes of fat and protein in milk of machine milked non-dairy sheep during early lactation weeks. The aim of this study is to investigate the effect of weeks on milk biochemistry of machine milked non-dairy sheep and to show the milk component curves during early lactation weeks.

EXPERIMENTAL

In this study, 14 Karayaka sheep with single lamb were used. The experiment started at 4 d of lamb age and lasted after 7 weeks. Milk yield was measured twice daily. Time of milking was between 0830 and 0930 and between 1600 and 1700. The ewes were milked by a portable machine which has two milking unit (α-Laval). Pulsation rate was 120 min^{-1} with a milking to massage phase ratio of 60:40 and a vacuum level of 45 kPa[14]. Sheep were fed a diet containing 135.1 g crude protein (CP) and 9.7 MJ Metabolisable energy (ME)/kg. The composition of diet was based on the nutritional requirements for the first two months of lactation in sheep with single lamb[15]. All lambs were separately housed from their mothers during experiment.

To determine milk composition, samples were obtained from each sheep for the 3 d (1st, 4th and 7th d) of every week during study. The means of samples of three days is used of every week to determine the data of milk components. Milk samples were composites of milk collected at consecutive morning and afternoon. The samples were collected into plastic vials preserved with microtabs, stored 4ºC until analysing for determination of fat and protein. The milk total protein was determined by Kjeldahl method (N × 6.38). The milk fat was determined by Roese-Gottlieb Method[16].

Analysis of variance (ANOVA) was performed on all data collected. Comparisons were done by using Duncan's test with help of the SPSS[17].

RESULTS AND DISCUSSION

Weekly yield, fat and protein in milk were presented in Table-1. There was an increase of milk production from 456 g/d for first week to a peak of 553 g/d at three weeks and thereafter a gradual decline to 420 g/d at 7 weeks of study.

TABLE-1
MEANS AND STANDARD ERRORS OF MILK YIELD AND COMPONENTS DURING EARLY LACTATION

Milk	Week						
	1	2	3	4	5	6	7
Yield (g/d)	456 ± 33 b	453 ± 30 b	553 ± 11 a	489 ± 16 ab	479 ± 21 b	448 ± 31 b	420 ± 17 b
Fat (%)	6.3 ± 0.2 c	5.1 ± 0.3 b	4.1 ± 0.2 a	4.8 ± 0.2 ab	4.7 ± 0.3 ab	4.8 ± 0.3 ab	4.8 ± 0.3 ab
Protein (%)	5.6 ± 0.2 b	5.6 ± 0.2 ab	4.8 ± 0.4 a	5.3 ± 0.2 ab	5.5 ± 0.3 ab	5.5 ± 0.2 ab	5.5 ± 0.3 ab

The daily yields of 420-550 g/d of milk by Karayaka sheep during 7 weeks were high when compared to 302-405 g by Karayaka sheep for a lactation period[18] of 75 d. In their studies, Karayaka sheep fed in pasture, whereas the Karayaka sheep fed with concentrate diets in our study. It was explained that the concentrate diets were responsible for the high levels of milk in our study. Early lactation ewes are generally unable to consume enough feed to meet energy demands of high milk production in pasture[19]. The lactation curve for milk yield of sheep at 3rd week was the highest (Fig. 1). To our best of knowledge, there has been no report on the early lactation curve of Karayaka sheep. The daily peak milk production of Karayaka sheep is on week 3 which is in agreement with the peak milk production of non-dairy Cameroon Dwarf Blackbelly sheep reported by Nijwe and Manjeli[20].

In this study, the means of fat in milk from machine milking were low when compared with results of Banda *et al.*[21] studied with milked by hand and suckled non-dairy sheep during 8 weeks. We can explain to reason of low milk fat that the milking machine captures cisternal milk but not alveolar milk, where most of the fat is found[22]. In addition, concentrate diet with high energy also causes low milk fat[23]. The weekly means of protein were similar (except first week) to those shown for the overall early lactation in Table-1. The weekly means of milk protein were higher than reported for milked by hand and suckled non-dairy sheep during early lactation[21]. In study of Banda *et al.*[21], the sheep were fed with restricted concentrate diets in addition to pasture, whereas the sheep in our study were fed a concentrate diet containing high energy by *ad libitum*.

Increasing dietary energy concentration results in an increase in milk protein percentage[24,25]. Such contrasting results between our study and literature may be due to the fact that these studies were carried out with different breeds of sheep which might have efficient or inefficient autocrine control of milk secretion. Bencini[13] reported that milk composition was affected by milking methods in breeds because they have different autocrine control of milk secretion.

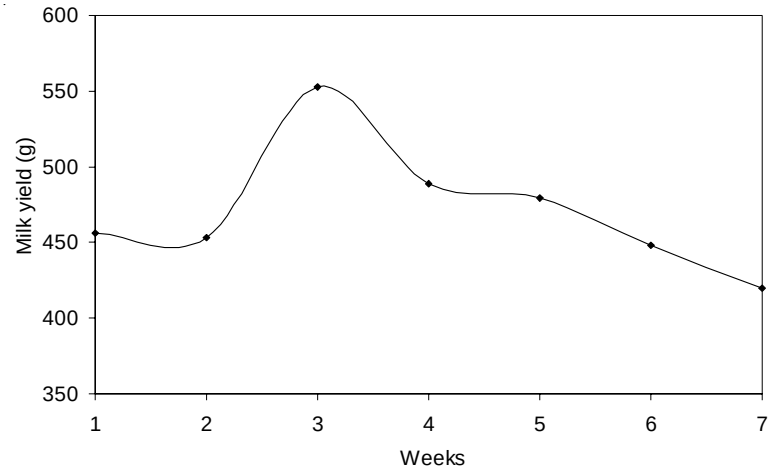

Fig. 1. Lactation curve for milk yields during early lactation

Lactation curves of fat and protein in milk were given in Figs. 2 and 3. The milk fat was secreted at its highest rate at the start of lactation and then declined until 3rd week when it started to gradually increase again until the end of the study. Figs. 2 and 3 show that the resistance to decline of milk biochemical parameters was higher during last weeks (between 4-7 weeks) than during first weeks (between 1-3 weeks) of lactation.

As shown in Figs. 1-3, fat and protein percentages of milk showed a pattern opposite that for milk yield; the lowest point of protein and fat curves, when detectable, occurred at the same period of peak milk yield. Latif *et al.*[26] also recorded the minimum values for fat and protein percentage and maximums for yield between the 2nd and 5th week postpartum in other sheep breeds, in agreement with our results. The large volumes of milk obtained in peak period had low contents of milk fat and protein. According to report of Keys *et al.*[27], there are relationships between milk biochemical parameters and milk yield. These lactation curves were similar to those for dairy[2,28] and non-dairy ewes[21] and those described for yield, fat percentage and protein percentage for other sheep breeds[28,29]. The curves of biochemical parameters in milk of machine milked non-dairy sheep coincide with curves of milked by hand and suckled non-dairy sheep during early lactation period (8 weeks) in literature[21].

The most striking conclusion in our study was that the means of biochemical parameters in milk from machine milking were differ than reported results for milked by hand and suckled non-dairy sheep in early lactation period, whereas the curves of milk biochemical parameters were coincide with the curves of non-dairy sheep in literature.

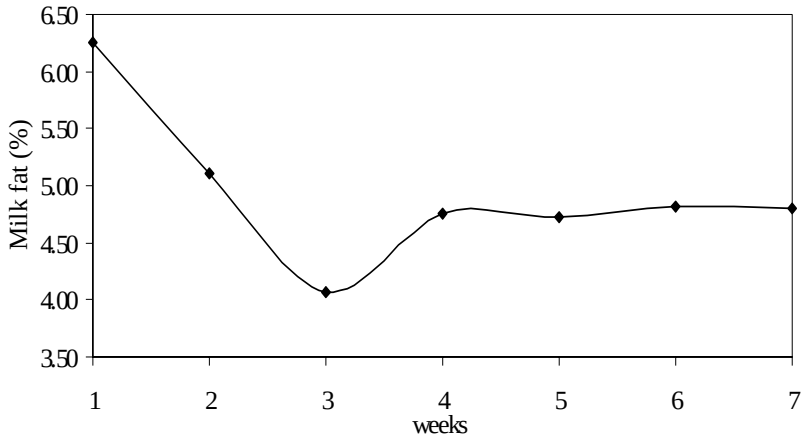

Fig. 2. Lactation curve for milk fat during early lactation

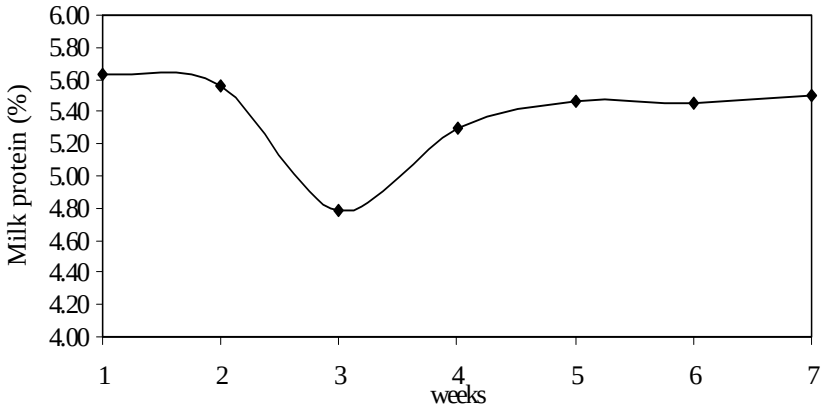

Fig. 3. Lactation curve for milk protein during early lactation

ACKNOWLEDGEMENTS

This study was financially supported by DIMES Ltd., Tokat, Turkey. The authors thank to Mr. Ali Riza Diren, Mr. Koray Suner and their staff for financially and technical supports of this research and thanks to Mr. Rustem Uzamis whose sheep were used during this research in Songut village, Tokat, Turkey.

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(*Received*: 6 May 2006; *Accepted*: 26 October 2006) AJC-5228