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THE EFFECTS OF ORDER OF LACTATION ON MILK COMPONENTS IN WATER BUFFALO RAISED IN SHEEP BREEDING RESEARCH INSTITUTE

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Abstract: This study was make in order to determine according to the order of lactation, the composition of milk, Murrah x Anatolian Water Buffaloes (M x A) crossbreds raised in Institute conditions. The animal material consisted of total of 47 heads M x A crossbreeds cows. The data of the study included between February 2016 - January 2018. Actual milk yield was used to determine average lactation length and lactation milk yield. Milk samples were taken to specify the milk components. The fat, nonfat dry matter, protein, and lactose contents of water buffalo milk samples were determined by using a Funke Gerber® milk analyzer. Lactation length and lactation milk yield were found to be 259 days and 1343.14 liters respectively. The least square means were found fat, nonfat dry matter, protein, and lactose, 7.20%, 10.66%, 4.00%, and 5.88% respectively. The milk yield in the first and second lactations of G2 (M x A) crossbreeds and Murah genotype were higher than others in the present study. A negative correlation between milk yield and milk fat is expected. Although not statistically significant, a negative correlation was determined as expected.

Keywords: Water buffalo, Anatolian, Murrah, Milk component

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1. Introduction

Domestic buffalo, called “Water Buffalo” belonging to the species Bubalus bubalis; is divided into two different types, namely River and Swamp Buffalo (Şekerden, 2000; Atasever and Erdem, 2008; Özkan et al., 2017). While swamp buffaloes generally benefit from draft power and meat yield, river buffaloes gained value in terms of both meat and milk yield characteristics (Soysal, 2006).

River buffaloes (Bubalus bubalis) are distributed in almost every region of the world, from America to Asia, due to their ability to adapt to various climatic and topographical conditions. It was brought to Europe from Asia in the Middle Ages with the Crusades, and it has been cultivated in terms of milk yield characteristics from West India to Egypt and even to Europe, as well as providing the formation of Italian and Bulgarian buffaloes that are cultivated today (Soysal, 2006).

The buffalo population in the world is 200967747 heads, and approximately 97.415% of this is in the Asian continent. Although India, Pakistan, and China are the top 3 countries with the highest number of buffaloes globally, India has approximately 56% of the world's buffalo population (Anonymous, 2019). As in the number of buffaloes, it is stated that the main dairy breeds of India and Pakistan, which produce the most in terms of milk production, are Murrah, Nilli-Ravi, Surti, Mehzana, Nagpuri, and Jaferabadi (Subasinghe et al., 1998). India has the best buffalo breeds in the world and the economic value of buffalo milk is relatively high. Between 2017 and 2018, it is seen that there was an increase of 0.77% in the number of animals and 6.44% in milk production (Anonymous, 2019).

Turkey, the Anatolian Buffalo is bred as a buffalo species. Due to the lack of importance given to water buffalo breeding in the past years, a significant decrease in the number of animals was observed until 2010. In the period between 2006 and 2010, the number of buffaloes decreased to 84726 heads. Since 2011, thanks to the Ministry of Agriculture and Forestry projects, the number of animals and milk production has increased more than twice (Anonymous, 2020). Buffalo milk production increased from 40372 tons to 70341 tons between 2011 and 2019.

Milk plays an important role in human nutrition. Buffalo milk is of great importance in human nutrition due to its rich content compared to other milk. Components of buffalo milk are affected by factors such as breeding, feeding, season, lactation order and lactation period. It also varies according to the lactation week (Şekerden et al., 1999; Zava and Sansinena, 2017).

Compared to cow's milk, buffalo milk; has a high solid matter, fat and protein content, and its main components

are fat, protein and lactose. Depending on the saturated fatty acids in milk fat, there are differences between fat's consistency, freezing, and melting points (Özkan et al., 2017). Gürsoy (2020) stated that the dry matter, fat, protein, lactose and ash contents of buffalo milk are 17.2%, 7.4%, 3.5%, 5.4%, 0.8% respectively; that the mentioned components of bovine milk are 12.6%, 3.7%, 3.4%, 4.7%, 0.7% respectively. Şekerden (2016) states that studies have concluded that the higher fat content in buffalo milk compared to other milk has not adversely affected digestibility. The water content is lower (Cockrill, 1974).

This study was carried out to determine the variation of some components of M x A crossbreeding buffalo milk grown under the conditions of the Sheep Breeding Research Institute within the scope of the "Breeding of Anatolian Buffalo Project" according to the order of lactation.

2. Materials and Methods

2.1. Animal Materials

The material of the study consisted of the data obtained from 47 M x A crossbreeding cows raised in the Sheep Breeding Research Institute and gave birth from February 2016 to January 2018. No changes were made in the breeding and feeding practices of the animals. Actual milk yield records were used to determine lactation period and the lactation milk yield.

To determine the milk components, the sampling process was carried out in 30-day periods. 50 cc milk samples were taken from each animal's morning and evening milking, mixed, and brought to the laboratory in the cold chain. Analyzes were performed on the day the samples were taken. This study; used Funke Gerber® milk analyzer to determine milk fat, non-fat dry matter, protein and lactose content.

2.2. Statistical Analysis

The obtained data were evaluated using to the least squares method, using the SPSS 25.0 package program (SPSS 2015).

3. Results

Lactation duration and lactation milk yield, which are considered within the scope of the research, are given in Table 1, the averages of lactation order and milk components are shown in Table 2, and the correlations between milk yield and milk components are shown in Table 3. Lactation duration and lactation milk yield averages, respectively were determined as 259 days and 1343.14 liters.

Table 1. Least squares mean of lactation duration and lactation milk yield

Lactation order	n	Lactation duration (Day) Mean	Lactation milk yield (Liter) Mean ± SE
1	9	277	1255.33 ± 133.880
2	18	248	1489.13 ± 74.852
3	8	267	1315.18 ± 110.272
4	12	251	1208.66 ± 68.639
Overall mean	47	259	1343.14 ± 48.014

Table 2. Least squares mean of lactation order and milk component

Lactation order	Fat (%)		Nonfat dry matter (%)		Protein (%)		Lactose (%)	
	n	Mean±SE	n	Mean ±SE	n	Mean ±SE	n	Mean ±SE
1	9	7.01 ± 0.288	9	10.61 ± 0.111	9	3.96 ± 0.43	9	5.81 ± 0.58
2	17	7.11 ± 0.234	18	10.70 ± 0.106	18	4.02 ± 0.45	18	5.90 ± 0.61
3	8	7.18 ± 0.349	8	10.43 ± 0.190	8	3.94 ± 0.79	8	5.82 ± 0.117
4	12	7.49 ± 0.149	12	10.79 ± 0.117	12	4.05 ± 0.47	12	5.96 ± 0.65
Overall mean	46	7.20 ± 0.124	47	10.66 ± 0.064	47	4.00 ± 0.26	47	5.88 ± 0.036

Table 3. Correlations between milk yield and milk components

	Milk yield	Lactose	Protein	Nonfat dry matter	Fat	Lactation order
Lactation order	0.163	0.168	0.120	0.080	0.202	1
Fat	-0.05	0.540*	0.565*	0.482*	1	
Nonfat dry matter	0.113	0.898*	0.926*	1		
Protein	0.067	0.988*	1			
Lactose	0.057	1				
Milk yield	1					

*P<0.05

In the first lactation order, although the lactation period was the longest, was obtained the highest milk yield from the buffaloes in the second lactation. The effect of lactation order on lactation duration and lactation milk yield is statistically nonsignificant. Buffaloes during the 1st and 2nd lactations; as it is a Murrah and G2 (M x A) cross, milk yield was higher than in other lactation order cows.

In this study; Milkfat, non-fat dry matter, protein, and lactose content were highest in animals in the 4th lactation order. Observed that only the fat content increased regularly depending on the progression of the lactation order. The results of the analysis carried out to determine the milk composition are given in Table 2. However, it was concluded that lactation order did not significantly affect on milk composition ($P < 0.05$).

As seen in Table 3, milk yield and milk fat; Although not statistically significant, a negative correlation was found as expected. The negative correlation is expected to increase with the increase in milk yield and material number following the breeding program.

4. Discussion

According to Özkan et al. (2017), the average dry matter content of buffalo milk is around 17%, of which approximately 7% consists of fat. Towards the end of lactation, along with the decrease in milk yield, an increase dry matter occurs and the fat ratio rises to 10-15%. Mahmood and Usman (2010) reported the content of fat, protein and lactose in buffalo milk as 7.97%, 4.36% and 5.41%, respectively.

In the study we carried out; it was seen that the effect of lactation order on milk components was statistically nonsignificant. When our results are compared with the results of different researchers; the fat and protein content is lower than the values obtained by Mahmood and Usman (2010), while the lactose content is high. Similarly, the fat and protein contents were lower than Şekerden et al. (1999), Ariota et al. (2007) and Şekerden and Avşar (2008).

Lactation sequence does not effect on any component; Şekerden et al. (1999) is similar to the report. According to Afzal et al. (2007), "Lactation milk yield increased with increasing lactation length", but these results obtained in the study, Afzal et al. (2007) are not similar to their findings.

The changing of lactation duration according to lactation order is not similar to the findings obtained by Ilieva and Peeva (2007) in the study they conducted in Bulgarian Murrah buffaloes. As a result, lactation orders has no effect on lactation length, yield, and milk components. The results are likely to change as animal material increases depending on the "Breeding of Anatolian Buffalo Project".

Author Contributions

All authors contributed equally to the study and reviewed and approved the manuscript.

Ethical Approval

A retrospective ethics permit is not required for the articles, which were produced from used master/doctorate or research studies before 2020.

Conflict of Interest

The authors declared that there is no conflict of interest.

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