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EFFECTS OF AGE, CALVING SEASON AND SPECIFIC GRAVITY OF FIRST MILKING COLOSTRUM ON MILK COMPONENTS AND SOMATIC CELL COUNT IN EARLY LACTATION ANATOLIAN BUFFALO (*Bubalus bubalis*) COWS

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Abstract: This study aimed to evaluate the milk components and somatic cell count (SCC) of Anatolian buffalo cows at different stages of lactation (days 15th, 30th, 45th and 60th of lactation) by determining the effects of the age of the cow, calving season and specific gravity of colostrum (SGC) on these milk quality traits. The experiment was conducted using 62 healthy lactating primiparous and multiparous Anatolian buffalo cows at two private farms in Samsun, Türkiye. The SGC values at the second hour (first milking) after birth were measured using a colostrometer, and the milk components were analyzed using a milk analyser. In addition, the SCC in milk was measured with a portable cell counter. The data are divided into three groups: age (≤80 mo and >80 mo), calving season (spring and summer) and SGC (<1.070 g/l and ≥1.070 g/l). The age and calving season of the cows affected some milk components in different lactation periods. The dry matter (DM), solids-non-fat (SNF) and protein percentage of the cows in the group with high SGC (≥1.070 g/l) were higher than those of cows in the group with low SGC (<1.070 g/l) on day 15 of lactation. Similarly, the DM and fat percentage of the milk of the cows in the group with high SGC (≥1.070 g/ml) were higher than those of the milk from the cows in the group with low SGC (<1.070 g/l) on day 45 of lactation. In contrast, on day 60 of lactation, the log SCC value of the milk of cows with high SGC was lower than that of the milk from those with low SGC in other lactation periods. Among the environmental factors in this study, only the SGC can be partially controlled by herd management practices. Management of the dry period, a sensitive period for buffalo cows, has an important effect on increasing colostrum and milk quality at the beginning of lactation.

Keywords: Buffalo cow, Calving age, Calving season, Colostrum specific gravity, Milk components, Somatic cell count

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1. Introduction

Recently, intensive buffalo farming systems in Türkiye and some European countries (Italy, Romania and Bulgaria) are growing rapidly to satisfy the increasing interest of consumers in buffalo dairy products. This intensification process also increases the required quality of the milk (Napolitano et al., 2019). The quality of milk is important not only to improve the product but also to produce healthy calves with high viability and growth performance.

As in dairy cattle farms, female buffalo calves replace buffalo cows that are culled from the herd for various reasons. In other words, the herd is renewed by choosing healthy heifers over the cows that leave the herd (Erez and Göncü, 2012; Singh et al., 2019). In addition, it is essential to obtain high-quality milk from each buffalo cow every year, which depends on the farm conditions. Although calf management is one of the most important parts of herd management (Okuyucu and Erdem, 2017), the calves are often neglected on buffalo farms (Gupta et al., 2019). Therefore, neonatal calf mortality resulting in economic losses, health problems and poor growth performance are common problems in dairy buffalo farms. Calf mortality is usually high in calves aged 0–90 days, confirming the claim by Khan et al. (2007) that most buffalo calf deaths (87.50%) occur between 0 and 90 days. The calves receive most of their primary nutrients from milk and the rest from roughage and concentrate (Singh and Saini, 2020). Therefore, buffalo calves should consume sufficient amounts of necessary nutrients with milk in the newborn period of their lives for high milk yields in the future. Moreover, these features are important for improving product quality because high-quality milk is characterized by high milk components, low somatic cell (SCC) and microorganism counts (Şahin and Yıldırım, 2012). The SCC is a reliable criterion for detecting udder health, milk quality, hygiene and food safety (Şahin et al., 2017; Erdem and Okuyucu, 2019). Depending on the nature and level of a cow's udder infection, the SCC increases significantly as the first defence response (Aytekin and Boztepe, 2014).

The lactation period in ruminant animals begins with colostrum secreted before birth, stored in the udder and released from the udder after birth. The colostrum secreted from the udder is rapidly transformed into normal milk in subsequent milkings. It is important for the calf to obtain sufficient passive immunity that the calf receives this unique fluid in sufficient quality and quantity as soon as possible after birth. A large body of authors generally associate colostrum quality with high levels of immunoglobulin (Hoyraz et al., 2015; Erdem et al., 2022a). Several methods can be used to predict colostrum quality in dairy farms. To determine colostrum quality, colostrometers (densimeters) and refractometers are generally used because they are simple, practical and easily applicable. The colostrum densimeter (KRUUSE UK Ltd, Langeskov, Denmark) evaluates the quality of colostrum according to its specific gravity (Erdem et al., 2022b). Determining the quality of colostrum and focusing on the direct and/or indirect effects of milk quality in the later stages of lactation are important in terms of both feeding the calf with high quality colostrum and milk and understanding the quality of the milk offered to the market.

Several factors affect milk components and SCC in buffalo cows, such as parity, lactation period, age, live weight, feeding, calving season, pregnancy, body condition score, lameness, heat stress, milking temperament, and udder health (Boro et al., 2018). Many authors have focused on non-genetic factors affecting milk component values (Misra et al., 2008; Yadav et al., 2013; Patbandha et al., 2015) and SCC (Şahin et al., 2017; Erdem and Okuyucu, 2019). However, reports on the effects of age and calving season on milk components and SCC in early lactation Anatolian buffalo cows are still limited. To the best of our knowledge, no detailed information is available on the effects of SGC value, which is an important indicator in determining colostrum quality on the components and SCC values of milk produced in early lactation Anatolian buffalo cows. Therefore, revealing these effects will provide important information. In this context, this study aimed (i) to evaluate the components and SCC of milk produced at different lactation stages by early lactation Anatolian buffalo cows and (ii) to determine the effects of SGC, age and calving season on the components and SCC of milk from early lactation Anatolian buffalo cows.

2. Materials and Methods

This study was carried out on two dairy buffalo farms from December to November. These farms are situated in the Black Sea region of Türkiye. A total of 62 healthy primiparous and multiparous Anatolian buffalo cows in two intensive condition farms were randomly selected from Samsun province. Moreover, records were taken from the breeders to confirm the ages and calving seasons of the cows.

During the experiment, the buffalo cows were housed in free-stall (an open barning system with a concrete floor) barns and fed a total mixed ration balanced according to their physiological needs. The cows were fed wheat straw, corn silage and concentrate under similar breeding conditions.

To determine the specific gravity of colostrum (SGC) of cows at the first milking, 2 hours after calving, colostrum samples (approximately 0.25 L) were collected from the cows before the calves were allowed to feed. The colostrum samples reached the laboratory approximately 45 min later, transported in containers at 4 °C. These samples were analysed after they were heated to 20–22 °C in a hot water bath. The colostrum quality was determined by a KRUUSE© colostrometer based on the relationship between immunoglobulin (Ig) concentration and specific gravity (Kaygısız and Kose, 2007; Erdem and Okuyucu, 2020).

To evaluate the milk components (DM, fat, protein, lactose, density and freezing point) and SCC of the cows, a milk sample was collected from each buffalo cow during the morning milking on days 15, 30, 45 and 60 of lactation. After machine milking, the milk samples were transferred into 50-ml plastic tubes from the bucket. Then, the milk samples were transported to the laboratory by cold chain (+4 °C). The milk samples were analysed for milk components using a milk analyser (Lactostar, Funke-Gerber, Berlin, Germany). Also, the SCC in milk was measured using a portable cell counter (DeLaval, Tumba, Sweden).

Our study obtained a single value by taking the arithmetic mean of the SGC values (first milking colostrum). The first group consisted of values lower than this average (Group-1: <1.070 g/l), and the values higher than this average were taken as the second group (Group-2: ≥1.070 g/l). Similarly, the data were grouped according to the age of the cow (Group-1: ≤80 mo, Group-2: >80 mo) and calving season (Group-1: Spring, Group-2: Summer). Also, a logarithmic transformation (base 10) was performed on the SCC data to form a normal distribution. The statistical analyses were performed using the general linear model (the linear mixed model)/univariate procedure of SPSS.

To evaluate the effects of age, calving season and SGC values on milk components and log SCC on days 15, 30, 45 and 60 of lactation, the Equation 1 was used:

$$Y_{ijkl} = \mu + a_i + b_j + c_k + \varepsilon_{ijkl} \quad (1)$$

where, Y_{ijkl} = the observation value (DM, fat, SNF, protein, lactose, density, and log SCC), μ= the overall mean, a_i = the effect of age (i= 1, 2), b_j= the effect of calving season (j=1, 2), c_k= the effect of SGC (k=1, 2) and e_{ijkl} = a random error.

All statistical analyses were performed using SPSS 21.0.

3. Results

In our study, the means of the milk components, SCC, and log SCC according to different lactation periods are shown in Table 1. The percentage of DM on days 15, 30, 45 and 60 of lactation periods ranged from

17.05%±0.163% to 17.78±0.147%. The fat percentage during these lactation periods ranged from 7.63±0.134% to 7.83±0.117%. Additionally, the average SNF percentages of the milk were 9.42±0.081%, 9.66±0.082%, 9.96±0.104% and 9.93±0.108%, at the days 15, 30, 45 and 60 of lactation, respectively. The protein percentage on days 15, 30, 45 and 60 of lactation were 4.86±0.023%, 4.88±0.023%, 4.90±0.021% and 4.97±0.032% respectively. The mean lactose percentage on days 15, 30, 45 and 60 of lactation ranged from 4.91±0.023% to 4.99±0.023%. In addition, the milk density values ranged from 1.0269±0.00012 g/l to 1.0273±0.00012 g/l.

In this research, the log SCC, which is considered a trustworthy indicator of the hygienic quality of milk and udder health, ranged from 4.617±0.0296 (47290.3±3177.24 cell/ml) to 4.701±0.0281 (57096.8±3937.8 cell/ml) on days 15, 30, 45 and 60 of lactation (Table 1).

The data presented in Table 2 show that the effect of the age of the cow on all the milk components was statistically insignificant on day 15 of lactation. As shown in Table 2, the effects of the calving season on fat percentage were significant (P=0.002) on day 15 of lactation. The highest fat percentage was found in the summer months (17.2%), compared to the spring months (16.9%). However, the DM, SNF, protein and lactose percentages produced on day 15 of lactation were not affected by calving season. The DM (P=0.044), SNF (P=0.046) and protein (P=0.033) percentages produced on day 15 of lactation were affected by changes in the SGC of buffalo cows at first milking (2 hours after calving), but the fat and lactose were not.

In this experiment, the mean milk component values of buffalo cows on day 30 of lactation according to age, calving season and colostrum SGC groups are shown in Table 3. Except for the protein percentage, the effect of the age group on all the milk components was statistically insignificant on the thirtieth day of lactation; the effect of age on the protein percentage was significantly different on day 30 of lactation (P=0.039). The protein percentage in the older group of buffalo cows (>80 mo) was higher than in the younger buffalo cows (≤80 mo). However, the effect of the calving season and SGC groups on the milk component values of buffalo cows was statistically insignificant for this lactation period.

In the present study, the changes in DM, fat, SNF, protein and lactose values of buffalo cows on day 45 of lactation according to age, calving season and colostrum SGC groups are presented in Table 4. A statistically significant increase in the DM (P=0.048), SNF (P=0.043) and protein (P=0.024) values of the cows with increasing age was seen on day 45 of lactation. The DM, SNF and protein percentage in the milk of cows aged ≤80 mo was lower than those >80 mo in age. However, the effect of the age on the fat and lactose content of buffalo cows was statistically insignificant for this lactation period. Additionally, the effect of the calving season on the milk component values of buffalo cows was statistically insignificant for these lactation periods.

Table 1. Means of milk components, SCC (cell/ml) and logSCC according different lactation periods

Components	15th day	30th day	45th day	60th day
	mean ±SE	mean ±SE	mean ±SE	mean ±SE
DM (%)	17.05±0.163	17.41±0.140	17.78±0.147	17.61±0.139
Fat (%)	7.63±0.134	7.75±0.110	7.83±0.117	7.68±0.100
SNF (%)	9.42±0.081	9.66±0.082	9.96±0.104	9.93±0.108
Protein (%)	4.86±0.023	4.88±0.023	4.90±0.021	4.97±0.032
Lactose (%)	4.93±0.028	4.98±0.026	4.99±0.023	4.91±0.023
Density	1.0273±0.00012	1.0272±0.00001	1.0267±0.00011	1.0269±0.00012
SCC (cell/ml)	49758,1±3727,47	57096,8±3937,8	47290,3±3177,24	50080,65±3302,10
logSCC	4.62±0.032	4.701±0.0281	4.617±0.0296	4.645±0.0285

DM= dry matter, SNF= solids-non-fat, SCC= somatic cell count, SE= standard error.

Table 2. Means milk component values (%) of buffalo cows on day 15 of lactation according to cow's age, calving season and colostrum SGC groups

Components	Cow's age (mo)				Calving season				SGC groups (g/l)			
	≤80 mo	>80 mo	± SEM	P	SP	SU	± SEM	P	G-1	G-2	± SEM	P
DM	17.0	17.1	0.16	0.737	16.9	17.2	0.16	0.873	16.5	17.3	0.16	0.044
Fat	7.7	7.6	0.13	0.857	7.4	7.8	0.13	0.002	7.6	7.8	0.13	0.172
SNF	9.3	9.5	0.08	0.702	9.5	9.2	0.08	0.411	9.2	9.6	0.08	0.046
Protein	4.9	4.9	0.02	0.575	4.9	4.9	0.02	0.844	4.6	4.9	0.23	0.033
Lactose	4.9	5.0	0.03	0.746	4.9	4.9	0.03	0.931	4.9	4.9	0.28	0.966

DM= dry matter, SNF= solids-non-fat, SP= spring, SU= summer, G-1= <1.070 g/l, G-2= ≥1.070 g/l.

Table 3. Means milk component values (%) of buffalo cows on day 30 of lactation according to cow's age, calving season and colostrum SGC groups

Components	Cow's age (mo)				Calving season				SGC groups (g/l)			
	≤80 mo	>80 mo	± SEM	P	SP	SU	± SEM	P	G-1	G-2	± SEM	P
DM	17.4	17.4	0.14	0.933	17.4	17.4	0.14	0.812	17.2	17.5	0.14	0.355
Fat	7.8	7.7	0.11	0.925	7.6	7.9	0.11	0.862	7.7	7.8	0.11	0.750
SNF	9.6	9.7	0.08	0.984	9.7	9.6	0.08	0.535	9.5	9.7	0.08	0.259
Protein	4.8	4.9	0.02	0.039	4.9	4.9	0.02	0.857	4.9	4.9	0.22	0.755
Lactose	5.0	5.0	0.03	0.965	5.0	4.9	0.03	0.245	5.0	5.0	0.26	0.717

DM= dry matter, SNF= solids-non-fat, SP= spring, SU= summer, G-1= <1.070 g/l, G-2= ≥1.070 g/l.

Table 4. Means milk component values (%) of buffalo cows on day 45 of lactation according to cow's age, calving season and colostrum SGC groups

Components	Cow's age (mo)				Calving season				SGC groups (g/l)			
	≤80 mo	>80 mo	± SEM	P	SP	SU	± SEM	P	G-1	G-2	± SEM	P
DM	17.6	18.0	0.15	0.048	17.9	17.7	0.15	0.148	17.4	18.0	0.15	0.027
Fat	7.9	7.8	0.12	0.577	7.8	7.9	0.12	0.531	7.4	8.0	0.12	0.036
SNF	4.8	5.0	0.02	0.043	10.1	9.9	0.10	0.192	10.0	10.0	0.10	0.431
Protein	4.8	5.0	0.02	0.024	4.9	4.9	0.02	0.761	4.9	4.9	0.02	0.307
Lactose	5.0	5.0	0.02	0.583	5.0	5.0	0.02	0.214	5.0	5.0	0.02	0.853

DM= dry matter, SNF= solids-non-fat, SP= spring, SU= summer, G-1= <1.070 g/l, G-2= ≥1.070 g/l.

Table 5. Means milk component values of buffalo cows on day 60 of lactation according to cow's age, calving season and colostrum SGC groups

Components	Cow's age (mo)				Calving season				SGC groups (g/l)			
(%)	≤80 mo	>80 mo	± SEM	P	SP	SU	± SEM	P	G-1	G-2	± SEM	P
DM	17.9	17.4	0.14	0.160	17.7	17.6	0.14	0.244	17.8	17.6	0.14	0.871
Fat	7.8	7.6	0.92	0.520	7.6	7.8	0.92	0.639	7.5	7.9	0.92	0.277
SNF	10.1	9.8	0.11	0.179	10.1	9.8	0.11	0.243	10.2	9.8	0.11	0.265
Protein	5.0	5.0	0.03	0.309	5.0	4.9	0.32	0.350	4.9	5.0	0.32	0.286
Lactose	4.9	4.9	0.02	0.592	4.9	4.9	0.02	0.209	4.9	4.9	0.23	0.447

DM= dry matter, SNF= solids-non-fat, SP= spring, SU= summer, G-1= <1.070 g/l, G-2= ≥1.070 g/l.

On day 45 after calving, the DM and fat percentage of cows in the group with high SGC (≥1.070 g/l) were higher than those of the cows in the group with low SGC (<1.070 g/l) (Table 4). A statistically significant increase in the milk DM (P= 0.027) and fat (P= 0.036) percentage of the cows with increasing SGC of the colostrum produced at first milking (2 hours after calving) was determined on day 45 of lactation. However, the effects of SNF, protein and lactose in the SGC groups were statistically insignificant.

As seen in Table 5, the effect of age, calving season and SGC groups on all the milk components was statistically insignificant on day 60 of lactation.

The changes in milk density values on days 15, 30, 45 and 60 of lactation according to age, calving season and SGC groups are shown in Figure 1. Except for the calving season, the effect of age and SGC groups on all the milk components was statistically insignificant for all lactation periods. However, the density of the milk from buffalo cows calving in the summer months was lower than those calving in the spring months (P<0.05) on days 15 and 30 of lactation (Figure 1b).

In our study, the changes in log SCC on days 15, 30, 45 and 60 of lactation are presented according to age, calving season and SGC groups in Figure 2. The effect of age and calving season on log SCC were statistically insignificant for all lactation periods (Figure 2a,b).

Except for day 60 of lactation, the value during the other periods was higher in cows in the high SGC group (≥1.070 g/l) than in the low SGC group (<1.070 g/l) (Figure 2c). A statistically significant increase was determined in the log SCC value of the buffalo cows with low colostrum SGC during these lactation periods.

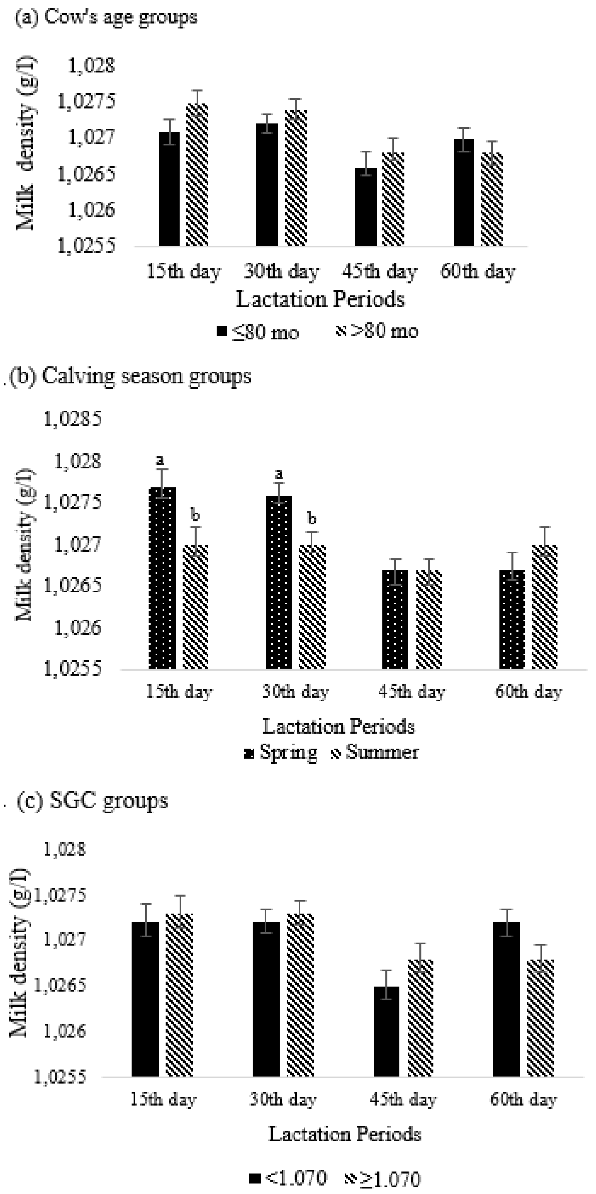

Figure 1. Changes milk density values of buffalo cows according to cow's age, calving season and colostrum SGC groups at different lactation periods

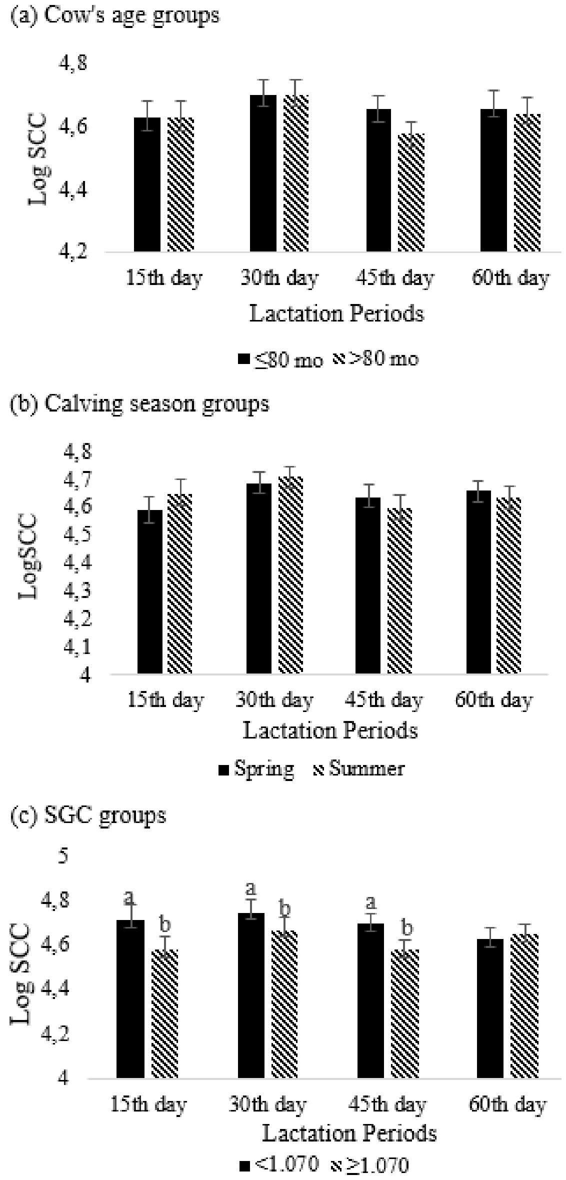

Figure 2. Changes Log SCC values of buffalo cows according to cow's age, calving season and colostrum SGC groups at different lactation periods.

4. Discussion

The DM percentage in this study was lower than that reported in a previous study conducted on Murrah buffalo cows (Sundaram and Harharan, 2013). However, these results were consistent with some studies (Şekerden and Avşar, 2008; Sarfarz et al., 2008) conducted on water buffalo cows but higher than those reported in other studies (Gürler et al., 2013; Şahin et al., 2014). The fat percentage was higher than that reported in some studies (Sarfarz et al., 2008; Tripaldi et al., 2010; Gürler et al., 2013; Şahin et al.,2014) conducted on water buffalo cows. However, the fat percentage in our study was lower than that reported in other studies (Aurelia et al., 2009; Sundaram and Harharan, 2013). Additionally, the SNF percentage of buffalo milk has previously been reported as lower by Şahin et al. (2014).

The protein percentages of the present study were consistent with those reported by Şahin et al. (2014). Conversely, Sarfarz et al. (2008), Tripaldi et al. (2010) and Gürler et al. (2013) reported lower values. The lactose percentage was lower in some studies conducted on water buffalo cows (Sarfarz et al., 2008; Şahin et al., 2014) compared to our results, but higher than that reported in other studies (Gürler et al., 2013; Tripaldi et al., 2010). The milk density value of the present study was consistent with those reported by Şekerden and Avşar (2008). Unlike these results obtained in this study, Şahin et al. (2014) have reported a higher value for milk density. Generally, the mean milk component values were within appropriate ranges for the entire study period. However, the differences observed between the values of some milk components obtained in our study and the results of other studies can be explained by multiple effects, such as breed, feeding, geographical location, herd management practices, barning systems, body condition score, udder health, heat stress and milking temperament (Damé et al., 2010; Şahin and Yıldırım, 2012; Erdem and Okuyucu, 2019; Boro et al., 2018).

Considering that the SCC in milk produced from a healthy cow is generally <200,000 cells/ml (Aytekin and Boztepe, 2014), the data obtained in this study showed that the SCC value of the milk produced during the early lactation period of Anatolian buffaloes is low. Also, the SCC value was higher than that in a previous study conducted on Anatolian buffalo cows (Şahin et al., 2014). However, the SCC value in this study was lower than that presented in other studies (Şahin et al., 2016; Şahin et al., 2017). It also had a lower SCC value compared to the results of studies in cattle (Atasever and Erdem, 2009; Coban et al., 2009; Stádník and Atasever, 2015). The differences in SCC value of buffalo and cattle are mostly attributed to differences in mammary anatomy and physiology. Several authors stated that buffaloes prevent microorganisms from infecting the udder due to their tight teat sphincter and long narrow teat canal compared to cattle, and because of these differences, buffalo cows have a strong defense mechanism against mastitis (De et al. 2010; Şahin et al., 2017).

In present study, the calving season did not affect protein and lactose content in all lactation periods. However, the highest fat percentage was found in the summer months, compared to the spring months on day 15 of lactation. Contrary to our findings, Patbandha et al. (2015) have reported that the effect of calving season on protein and lactose percentage in Jafarabadi buffalo cows was statistically significant. In an earlier study, Yadav et al. (2013) have reported that the effect of calving season on fat percentage was significantly different. These authors noted that the fat percentage of Murrah buffalo cows calving in the summer months was higher than in the winter months. However, the number of cows calving in the summer months was lower than the number calving in the winter months. The authors associated the lower milk fat ratio of cows calving in summer compared to cows calving in winter with a negative correlation between milk yield and milk fat. These discordances between our findings and results noted previously may be attributed to climatic differences in the geographic regions.

In our study, the effect of the age of the cow on all the milk components was statistically insignificant on day 15 of lactation. Furthermore, the protein (on days 30 and 45 of lactation) DM and SNF (on day 45 of lactation) percentage in the older group of buffalo cows was higher than in the younger buffalo cows. The observed higher DM, SNF, protein content in the cows with age of > 80 mo may be attributable to changes in various physiological mechanisms that support reproductive performance when buffalo cows reach mature equivalents (do Nascimento Rangel et al., 2014; Erdem et al., 2022a). Similarly, Sodi et al. (2008) have observed that the effect of parity on the fat and protein percentages in Murrah buffaloes was not statistically significant. In contrast to Sodi et al. (2008), Sundaram and Harharan (2013) have reported that the effect of parity on DM, fat and protein percentages in Murrah buffalo cows was statistically significant. Observed variations among the obtained findings can be explained by the multi-effects of the variability in locations, dry period management, lactation period, genotype, live weight and barning.

In the our study, as the SGC of buffalo cows at first milking increased, the DM, SNF and protein percentages on day 15 of lactation increased. These findings showed the relationship between SGC and some milk components, a result of the effect of dry period management on colostrum quality (Erdem and Okuyucu, 2020). Hence, sequential effects occurred on milk components in the later stages of lactation. Collier et al. (2012) have demonstrated that changes in the udder histology of cows during the dry period initiated significant changes in the composition of udder secretions. These authors have also reported that the metabolic status of the cow after calving may differ according to changes in feeding conditions and grouping during the dry period. Therefore, the management and feeding of buffaloes in the dry period may directly affect the quality of the products produced in both colostrum and milk yield periods. Considering that the production of good-quality colostrum after calving is associated with a healthy udder and successful dry period management, it is expected that cows producing high-quality colostrum will have high milk components during the lactation period.

The findings obtained in our study showed that the calving season had no effect on the SCC value for all lactation periods. Similar to these findings, studies conducted on Holstein cows (Erdem et al., 2007; Kul et al., 2019) have also reported no differences between the log SCC values for cows calving in the summer months and the log SCC values for cows calving in the spring months. Because the SCC value depends mainly upon season, climatic conditions inside the barn and management in dairy farms, the observed high SCC value in hot-humid climates are attributed to high humidity and ambient temperature (Singh and Ludri 2001). Furthermore, the authors reported that the SCC value increased because the teats were exposed to more microorganisms in hot-humid conditions. Several authors have indicated that the log SCC values for buffalo cows calving in the summer months were higher than for those calving in the spring months (Şahin et al., 2017). Our findings did not support these ideas, as our study failed to evidence calving season has an effect on SCC.

In this study, the differences in cow's age did not affect SCC values for all lactation periods. The findings were consistent with the results of the study conducted on cattle by Singh and Ludri (2001). However, a previous study (Şahin et al., 2017) on Anatolian buffalo cows has reported that a statistically significant decrease in the log SCC value of the cows with increasing parity was determined. Although several authors reported that the first parity had a higher SCC value than the later parities due to the different responses of the mechanisms supporting defense mechanisms against udder infection in different parities (Muggli, 1995; Şahin et al., 2017), the SCC value was not affected by the cow's age in our study.

As expected, the buffalo age and calving season affected some milk components in different lactation periods. However, the high SGC in the first milking colostrum positively affected some milk components and SCC, which are important milk quality factors in the later stages of lactation. Because the density or specific gravity of colostrum is mainly dependent on basic components (DM, fat, protein, lactose, mineral, vitamins etc.), biologically active elements and bacteriostatic substances such as immunoglobulins, lactoperoxidase, lactenins, lactoferrins, lysozymes and leukocytes (Puppel et al., 2019), differences in milk components and SCC values of early lactating cows can be attributed to differences in colostrum specific gravity. These active biological substances have an important role in both maternal immunity and calf immunity. In order to explain these results, it is important to understand the importance of dry period management. Many authors have reported that the dry period of management (dry period length and feeding), an important part of herd management practices, is closely related to optimal milk production and adequate body reserve of cows before calving. The cumulative information in the literature suggests that low milk yield due to poor dry period management is due to multiple physiological factors (Collier et al., 2012). The most important physiological factors for milk yield in the next lactation are udder involution and cell proliferation in the dry period. Because colostrogenesis begins 15 to 20 days before calving (Collier et al., 2012), poor dry period management may adversely affect the level of immunoglobulins associated with colostrum quality (Erdem and Okuyucu, 2020). Thus, the management of buffalo cows is likely to affect the quality ingredients of the colostrum and milk produced with the onset of lactation. In addition, Pecka-Kiełb et al. (2018) have reported the relationship between feeding cows in the dry period and the quality of colostrum and milk produced from birth. The same authors have observed that colostrum and milk synthesis may be adversely affected by the onset of lactation in cases where the necessary nutrients cannot be provided in the dry period. These statements have been verified by Collier et al. (2012) and Erdem and Okuyucu (2020). When these statements are evaluated as a whole, dry period management has a significant effect on the cellular regeneration of the udder quarters of buffalo cows (Collier et al., 2012), as well as the rumen, due to the concentrated feed consumed during lactation. Therefore, dry period management (optimal dry period duration and care-feeding), a sensitive period for buffalo cows, is an important environmental factor in increasing colostrum and milk quality at the beginning of lactation. The findings herein demonstrate that the dry period is an important part of herd management in buffalo rearing.

5. Conclusion

The findings obtained in our study indicated that age, calving season and specific gravity of the first milking colostrum of different lactation periods affected some milk components. In particular, the specific gravity, considered an important indicator of colostrum quality, has positive effects on some milk components and SCC values in early lactation. As the specific gravity of the first milking colostrum of buffalo cows increased, some milk components increased in the early lactation period, while the SCC value decreased. Taken together, numerous non-genetic environmental factors (including parity, dry period length, feeding, body condition score, age, and calving season) may indirectly or directly affect colostrum and milk quality in buffalo cows. Some of these factors can be controlled by sensitive herd management. Dry period management is the most important of these environmental factors. Therefore, a better understanding of the importance of dry period management, which is closely related to the colostrum and milk quality of buffalo cows, will be beneficial to improve many future yield aspects.

Author Contributions

The percentage of the author(s) contributions is presented below. All authors reviewed and approved the final version of the manuscript.

	H.E.	İ.C.O.	H.D.
C	80	10	20
D	40	30	30
S	100		
DCP	20	10	70
DAI	100		
L	20	60	20
W	50	50	
CR	50	40	10
SR	70	30	
PM	60	20	20

C=Concept, D= design, S= supervision, DCP= data collection and/or processing, DAI= data analysis and/or interpretation, L= literature search, W= writing, CR= critical review, SR= submission and revision, PM= project management.

Conflict of Interest

The authors declared that there is no conflict of interest.

Ethical Consideration

Permissions were obtained from the Ondokuz Mayis University Animal Experiments Local Ethics Committee. All procedures performed involving animals were in accordance with the ethical standards approved by the

Ondokuz Mayis University Animal Experiments Local Ethics Committee (protocol code: 2014/20 and date: June 03, 2014).

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References

Atasever S, Erdem H. 2009. Estimation of milk yield and financial losses related to somatic cell count in Holstein cows raised in Turkey. J Anim Vet Adv, 8(8): 1491-1494.

Aurelia P, Cristian C, Camelia R, Vioara M, Gheorghe M. 2009. The study of the main parameters quality of buffalo milk. J Center Eur Agri, 10(3): 201-206.

Aytekin I, Boztepe S. 2014. Somatic cell count, importance and effect factors in dairy cattle. Turkish J Agri Food Sci Tech, 2(3): 112-121. DOI: 10.24925/turjaf.v2i3.112-121.66.

Boro P, Debnath J, Kumar Das, T, Naha BC, Debbarma N, Deabbarma P, Debbarma C, Devi LSB, Devi TG. 2018. Milk composition and factors affecting it in dairy Buffaloes: A review. J Entomol Zool Stud, 6(3): 340-343.

Coban O, Sabuncuoglu N, Tuzemen N. 2009. A study on relationships between somatic cell count (SCC) and some udder traits in dairy cows. J Anim Vet Adv, 8(1): 134-138.

Collier RJ, Annen-Dawson EL, Pezeshki A. 2012. Effects of continuous lactation and short dry periods on mammary function and animal health. Animal, 6(3): 403-414. DOI: 10.1017/S1751731111002461.

Damé MCF, Lima CTS, de Marcondes CR, Ribeiro MER, Garnero ADV. 2010. Preliminary study on buffalo (Bubalus bubalis) milk production in Southern Brazil. Proceedings 9th World Buffalo Congress, April 10-12, 2010, Buenos Aires, Brasil, pp: 582-584.

De K, Mukherjee J, Prasad P, Dang AK. 2010. Effect of different physiological stages and managemental practices on milk somatic cell counts of Murrah buffaloes, Proceedings 9th World Buffalo Congress, April 10-12, 2010, Buenos Aires, Brasil, 549-551.

do Nascimento Rangel, AH, de Oliveira JPF, de Medeiros HR, de Araújo VM, Novaes LP, de Lima Júnior DM. 2014. Influence of Murrah buffalo behavior in milking parlors on production characteristics. Arch Vet Sci, 19(3): 53-61.

Erdem H, Atasever S, Kul E. 2007. Some environmental factors affecting somatic cell count of Holstein cows. J Appl Anim Res, 32(2): 173-176. DOI: 10.1080/09712119.2007.9706871.

Erdem H, Okuyucu IC, Abaci SH. 2022a. Milking temperament of Anatolian buffaloes during early lactation. Appl Anim Behav Sci, 253: 105679.

Erdem H, Okuyucu IC, Demirci H. 2022b. Components and specific gravity of colostrum from Anatolian buffalo cows and effects on growth of buffalo calves. South African J Anim Sci, 52(3): 316-325.

Erdem H, Okuyucu IC. 2019. Influence of hygiene status of cows on somatic cell count and milk components during summer season. Large Anim Rev, 25: 7-10.

Erdem H, Okuyucu IC. 2020. Non-genetic factors affecting some colostrum quality traits in Holstein cattle. Pakistan J Zool, 52(2): 557-564.

Erez İ, Göncü S. 2012. The effects of early weaning practice at performances of black and white calves. Çukurova Üniv Fen Müh Bil Derg, 28(3): 68-78.

Gupta A, Kamboj, ML, Chandra S, Sahu D, Chaudhary M, Sahu MC, Sahu M, Yadav V, Armo S. 2019. A comparative study of immune, growth and health status of primiparous and multiparous Murrah buffaloes calves. J Entomol Zool Stud, 7(1): 1321-1323.

Gürler Z, Kuyucuoğlu Y, Pamuk Ş. 2013. Chemical and Microbiological Quality of Anatolian Buffalo Milk. African J Microbiol Res, 7(16): 1512-1517. DOI: 10.5897/AJMR12.1014.

Hoyraz M, Sezer R, Demirtaş M, Koç A. 2015. A Research on colostrum quality and constituents of Holstein-Friesian cows. J Tralleis Elektron. 4: 1-7.

Kaygısız A, Kose M. 2007. The quality of colostrum and its effects on calves growth characteristics in Holstein cattle. J Agric Sci Ankara Univ, 13: 321-325.

Khan ZU, Khan S, Ahmad N, Raziq A. 2007. Investigation of mortality incidence and managemental practices in buffalo calves at commercial dairy farms in Peshawar City. J Agri Biol Sci, 2(3): 16-22.

Kul E, Şahin A, Atasever S, Uğurlutepe E, Soydaner M. 2019. The effects of somatic cell count on milk yield and milk composition in Holstein cows. Veterinarski Arhiv, 89(2): 143-154. DOI: 10.24099/vet.arhiv.0168.

Misra SS, Sharma A, Bhattacharya TK, Kumar P, Saha RS. 2008. Association of breed and polymorphism of α-s1and α-s2casein genes with milk quality and daily milk and constituent yield traits of buffaloes (Bubalus bubalis). Buffalo Bulletin, 27: 294-301.

Muggli J. 1995. Influence of somatic cell counts on stage of lactations. Anim Breed Abst, 1996.

Napolitano F, Serrapica F, Braghieri A, Masucci F, Sabia E, De Rosa G. 2019. Human animal interactions in dairy buffalo farms. Animals, 9(5): 246. DOI: 10.3390/ani9050246.

Okuyucu İC, Erdem H. 2017. Effects of some milk compounds on growth performance in Holstein calves. Academia J Eng Appl Sci, 1(3): 69-80.

Patbandha TK, Ravikala K, Maharana BR, Marandi S, Ahlawat AR, Gajbhiye PU. 2015. Effect of season and stage of lactation on milk components of Jaffrabadi buffaloes. Bioscan, 10(2): 635-638.

Pecka-Kiełb E, Zachwieja A, Wojtas E, Zawadzki W. 2018. Influence of nutrition on the quality of colostrum and milk of ruminants. Mljekarstvo: Časopis za Unaprjeđenje Proizvodnje i Prerade Mlijeka, 68(3): 169-181. DOI: 10.15567/mljekarstvo.2018.0302.

Puppel K, Gołębiewski M, Grodkowski G, Slósarz J, Kunowska-Slósarz M, Solarczyk P, Łukasiewicz M, Balcerak M, Przysucha T. 2019. Composition and factors affecting quality of bovine colostrum: a review. Animals, 9(12): 1070.

Şahin A, Ulutaş Z, Yildirim A, Kul E, Aksoy Y, Ugurlutepe E, Sözen S, Kaplan Y. 2016. The effect of some environmental factors on milk composıtıon of Anatolian buffaloes. Scient Papers Series Dairy Anim Sci, 59: 57-64.

Şahin A, Yildirim A, Ulutas Z, Ugurlutepe E. 2017. The effects of stage of lactation, parity and calving season on somatic cell counts in Anatolian Water Buffaloes. Indian J Anim Res, 51(1): 35-39. DOI: 10.18805/ijar.1146r.

Şahin A, Yıldırım A, Ulutaş Z. 2014. Relationships between somatic cell count and some raw milk paramaters of Anatolian buffaloes. Tekirdağ Zir Fak Derg, 11(1): 114-121.

Şahin A, Yıldırım A. 2012. Somatic Cell Count and Raw Milk Composition in Water Buffaloes. J Fac Agri GOU, 29(2): 43-48.

Sarfarz A, Gaucher I, Rousseau F, Beaucher E, Piot M, Grongnet

JF, Gaucheron F, 2008. Effect of acidification on physico-chemical characteristics of buffalo milk: A comparison with cow's milk. Food Chem, 106(1): 11-17. DOI: 10.1016/j.foodchem.2007.04.021.

Şekerden Ö, Avşar YK. 2008. Anadolu mandalarında süt kompozisyonu, rennet pıhtılaşma süresi, üre muhtevası ve bunları etkileyen çevre faktörleri. Hayvansal Üretim, 49(2): 7-14.

Singh M, Ludri RS. 2001. Influence of stages of lactation, parity and season on somatic cell counts in cows. Asian-Australasian J Anim Sci, 14(12): 1775-1780.

Singh PK, Kamboj ML, Chandra S, Kumar A, Kumar N. 2019. Influence of weaning on growth, health and behaviour of buffalo (Bubalus bubalis) calves. Indian J Anim Res, 53(5): 680-684. DOI: 10.18805/ijar.B-3546.

Singh R, Saini AK. 2020. Effect of Early Weaning on Nili Ravi Buffalo and Calf Performance. Vet Res, 8(03): 247-253.

Sodi SS, Mehra ML, Jain AK, Trehan PK. 2008. Effect of non-genetic factors on the composition of milk of Murrah buffaloes. Indian Vet J, 85: 950-952.

Stádník L, Atasever S. 2015. Influence of some environmental factors on body condition score and somatic cell count in Czech Holstein cows. Indian J Anim Res, 49(6): 774-777.

Sundaram M, Harharan G. 2013. Preliminary study on Evaluation of Effect of Lactation number on Milk yield and Milk composition in Murrah (Bubalus bubalis) Buffaloes. Res J Anim Vet Fishery Sci, 1(7): 21-23.

Tripaldi C, Palocci G, Miarelli M, Catta M, Orlandini S, Amatiste S, Bernardini RD, Catillo G. 2010. Effects of Mastitis on Buffalo Milk Quality. Asian-Austuralian J Anim Sci, 23(10): 1319-1324. DOI: 10.5713/ajas.2010.90618.

Yadav SP, Sikka P, Kumar D, Sarkar S, Pandey AK. Yadav PS, Sethi RK. 2013. Variation in milk constituents during different parity and seasons in Murrah buffaloes. Indian J Anim Sci, 83(7): 747-751.