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Short Communication

Effect of parity and calf gender on milk yield and composition of buffalo, *Bubalus bubalis* inhabiting southern Iraqi wetlands

Muayad Abdulwahid Jaber Al-Fayad*, Hussein Majeed Shareef

Department of Animal Production, Faculty of Agriculture and Marshlands, University of Thi-Qar, Nasiriyah, Iraq.

Abstract: This study was conducted to investigate the effect of birth sequence and gender of newborns on milk production and its components in Iraqi buffaloes. A total of 210 raw milk samples were used from 70 female buffaloes at different ages, breastfeeding young of different sexes. The result showed a significant effect of the birth sequence on daily milk production, where the group of mothers with the fourth birth sequence and more was significantly had higher production. The mothers with the second birth sequence significantly outperformed the mothers with the first birth sequence. The highest daily milk production was in the fourth birth sequence group and more and the lowest in the first birth sequence group (11.14±0.165 vs. 3.74±0.198kg). The effect of the birth sequence was significant (P<0.05) on the percentage of total solids, fat percentage, and milk density. The results showed a significant effect of the newborn gender on daily milk production, total solids, and the density of milk, where the mothers of male births had the higher daily milk production (8.74±0.328 vs. 6.40±0.328kg), while the mothers of female births had a significantly higher percentage of total solids and milk density.

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Introduction

The buffalo is one of the ancient and indigenous animals in Iraq. It was domesticated in the middle of the third millennium BC in 2500 BC, approximately in the Sumerian city of Ur in Mesopotamia (Borghes, 2008). The Iraqi buffalo spreads throughout Iraq from south to north and is found in large numbers in the southern governorates viz. Basra, Maysan, and Dhi-Qar due to the presence of water bodies from marshes and rivers and its population in the Dhi-Qar Governorate is 50,200 thousand heads (Dhi Qar Agriculture Directorate, 2010).

The Iraqi buffalo is used to produce milk and meat. It supplies the local markets with high nutritional value dairy products, such as cream, cheese, butter, yogurt, and fat. This animal is characterized by its long productive life and high milk production, with a high percentage of fat compared to other local livestock (Al-Jamas, 2010).

Milk production and its components are affected by genetic and non-genetic factors such as newborns' birth sequence and gender. Al-Salami (2005) indicated an increase in milk production with an increase in births, while Nyamushamba et al. (2014) reported a significant effect of the birth sequence on milk components. Minick et al. (2001) indicated a significant effect of the gender of the newborn on daily milk production, while Taher et al. (2011) indicated no significant effect of the gender of the newborn on the chemical and physical properties of milk. Hence, this study aimed to assess the effect of the birth sequence and the gender of the newborn on milk production and its properties in Iraqi buffaloes.

Materials and Methods

This experiment was conducted in Iraq, Dhi-Qar Governorate, Shatra District, Bani Zaid district from 01.11.2018 to 01.11.2019 to assess the effect of the birth sequence and gender of the newborn on milk

*Correspondence: Muayad Abdulwahid Jaber Al-Fayad
E-mail: muaeid@utq.edu.iq

production and its components in Iraqi buffaloes. The study included 210 raw milk samples taken from 70 buffaloes of different ages who breastfed young.

Estimate amount of milk: The amount of milk was estimated by a balance to calculate the daily milk production after the udder was completely emptied, and the females were milked once in the morning by manual milking.

Milk sample analysis: 210 samples of raw milk of 100ml for each sample were collected from 70 female buffaloes during the morning milking process. The samples were placed in a thermally insulated box containing crushed ice to prevent damage to the samples until they reached the laboratory to analyze their components, and the milk components were estimated as the percentage of total solids fat, non-fat solids, protein, lactose, ash, milk density by EKO MILK device. Statistical analysis: The data were statistically analyzed using the statistical program SPSS (ver. 2006). The significance of the averages was tested using LSD at 0.05.

Results and Discussion

Table 1 shows the effect of the birth sequence on the daily milk production and milk components in Iraqi buffaloes, where there was a significant (P<0.05) of the birth sequence on the daily milk production. The mothers with the third birth sequence outperformed those with the second and first birth sequences. Also, the mothers with the second birth sequence significantly outperformed those of the first birth sequence, and the averages were 3.74±0.128, 5±0.026, 7.4±0.073, and 11.14±0.165kg, respectively. This result agrees (Khosroshahi et al., 2011; Bampidis et al., 2012, Al-Zarkani et al., 2020). The reason may be attributed to the large body size, large size of the digestive system, and increase in the development of udder tissues with repeated births (Nyamushamaba et al., 2014).

A significant effect (P<0.05) of the birth sequence was observed on some milk components, where the females with the first birth sequence had significantly higher total solids compared to those with second, and more birth sequences. In addition, the females with the second birth sequence significantly outperformed the females with the fourth birth and more, and there were no significant differences between the females with the third and the fourth birth sequence and more (Table 1). The averages of total solids from 1st-4th birth sequence were 15.15±0.198, 14.02±0.237, 13.61±0.138, and 13.23±0.122, respectively. Also, the birth sequence had a significant effect (P<0.05) on the percentage of fat and milk density. The mothers with the first birth sequence significantly outperformed others in the percentage of fat, but there were no significant differences between the second and third birth sequences and fourth and above, and the averages of the fat and milk density were 5.96±0.18, 5.21±0.082, 5.09±0.095, and 4.84±0.053, respectively.

The mothers with the first and second birth sequences significantly outperformed (P<0.05) in milk density than others and from 1st to 4th were 31.86±0.27, 32±0.36, 30.60±0.19 and 30.73±0.32, respectively. The results did not show any significant effect of the birth sequence on non-fat solids, protein percentage, lactose percentage, and ash percentage.

The results showed that the fat decreases with the increase in the sequence of births, and this may be due to the inverse proportion between the percentage of fat and the increase in milk production with the age of the animal and the increase in the number of births. The young animals have higher milk components than the elders (Khosroshahi et al., 2011; Pawar et al., 2012; Hassan, 2013; Al-Zarkani et al., 2020; Al-Khauzai et al., 2020). The effect of the gender of the newborn on the daily milk production and milk components was significant (P<0.05), where the mothers of male births significantly outperformed female births, with the averages of 8.74±0 and 32¸6.40kg±0.26, respectively (Table 2). This may be due to the large size of male newborns compared to females. The testosterone hormone increases the metabolism of minerals and proteins, so it needs more nutrients and motivates its mothers to produce more significant quantities of milk (Landete-Castillejos et al., 2005;

Table 1. Average (±SE) of the effect of parity on daily milk production and milk composition.

birth seq.	Daily milk production/k	Total Solid %	Fat %	Solid Non-fat %	Protein %	Lactose %	Ash %	Density %
1	3.74±0.128^{d}	15.15±0.198^{a}	5.96±0.18^{a}	9.2±0.076^{a}	3.38±0.029^{a}	5.14±0.045^{a}	0.65±0.006^{a}	31.86±0.27^{a}
2	5±0.26^{c}	14.02±0.237^{b}	5.21±0.082^{b}	8.8±0.17^{a}	3.26±0.065^{a}	4.9±0.21^{a}	0.64±0.01^{a}	32±0.36^{a}
3	4.7±0.73^{d}	13.61±0.138^{bc}	5.09±0.095^{b}	8.49±0.061^{a}	3.14±0.023^{a}	4.75±0.034^{a}	0.61±0.039^{a}	30.6±0.19^{a}
4 and more	11.14±0.165^{a}	13.23±0.122^{c}	4.84±0.053^{b}	8.37±0.083^{a}	4.69±0.042^{a}	4.69±0.047^{a}	0.64±0.0086^{a}	30.73±0.32^{a}

Different letters in the same column mean significant differences at the level of probability (P<0.05).

Table 2. Average (±SE) of the effect of calf gender on daily milk production and milk composition.

Gender	Daily milk production/k	Total Solid %	Fat %	Solid Nonfat %	Protein %	Lactose %	Ash %	Density %
Male	8.74±0.32^{a}	13.79±0.16^{b}	.17±0.073^{a}	.61±0.005^{a}	.18±0.021^{a}	4.83±0.032^{a}	0.63±0.0046^{a}	30.83±0.18^{b}
Female	6.4±0.26^{b}	14.22±0.1^{a}	5.42±0.077^{a}	8.79±0.077^{a}	3.24±0.028^{a}	4.9±0.043^{a}	0.64±0.0054	31.51±0.2^{a}

Different letters in the same column mean significant differences at the level of probability (P<0.05).

Al-Qudsi and Elia, 2010; Hamad and EL-Moghazy, 2015; Oliveira et al., 2017).

The results showed that there was a significant effect (P<0.05) of gender on some components of milk, where the mothers of female births have significantly higher total solids and density compared with mothers of males (Table 2). There was no significant effect of the gender of the newborn on the percentage of fat, protein, lactose, ash and non-fat solids. This finding is partly in agreement with the findings of Al-Khauzia et al. (2020), AL-Fartosi and AL-Moussawi (2017), and Hinde (2014).

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