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Effect of Non-Genetic Factors on Lactational Efficiency of Indigenous Buffaloes at Different Stage of Parity in Western Hills of Nepal

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ABSTRACT

A study was executed during October-November 2016 to evaluate the effect of breed, parity and breed-parity interaction (breed × parity) on lactational efficiency of indigenous buffaloes. The sites of study were Muna VDC-3, Faliyagaun of Myagdi district and Ramjhathati VDC-9 of Parbat district at Western Nepal. Total of 100 buffaloes, 50 from each study site were considered by purposive sampling and data were collected using the semi structured questionnaire. Data analysis was done by Henderson's Least Square Mixed Model and Maximum Likelihood (LSMMML PC-2) computer program using Harvey-1990 software. Colostrum period (days), Days to reach peak milk yield (DPMY), Lactation length (days) and Dry period (days) were the parameters under consideration to study the lactational efficiency. The overall means for colostrums period, DPMY, lactation length and dry period were 3.11, 13.91, 362.10 and 165.40 days respectively. All non genetic factors; breed, parity and (breed × parity) had non-significant effect with the traits of lactational efficiency. But higher value of lactation days was found at later parity (above7th parity) than early parities (1st -3rd parity) and mid parities (4th -6th parities) where values of later parity were (394.10 ± 48.02), mid parities were (353.90 ± 24.51) and early parities were (361.20 ± 12.53). Similarly, lower value of dry period was found in later parities (105.70 ± 36.05) as compared to mid (135.20 ± 18.40) and early (175.90 ± 9.41) parities. The lactation length value was found higher in later parities for both Parkote (394.20 ± 47.53) and Lime breed (394.00 ± 75.15). Dry period value was found lowest in Lime (60.00 ± 56.42) in later parities. Better management skill with appropriate breeding program is the need to increase the lactational efficiency of indigenous buffaloes.

Key words: Lime, Parkote, lactational efficiency, parity, breed

INTRODUCTION

Buffaloes are the main source of milk and meat in Nepal with the total annual production of about 65.22% (milk) and 54.33% (meat) which is equivalent to 1.21 million metric ton of milk and 175 thousand metric ton of meat from 5.16 million heads of buffaloes (DOA, 2017). In Nepal, buffaloes are mainly raised for milk, meat, draught, milk product, manure and hides (FAO, 2005). Indigenous buffalo (*Bubalus bubalis*) in Nepal are riverine type having 25 pairs of chromosome (2n=50). Lime, Parkote and Gaddi are the identified indigenous breeds of buffalo domesticated in Nepal in which Lime and Parkote are abundantly found in western mid-hills of Nepal whereas Gaddi are found in far-western hills (Neopane *et* al, 2007). It has been estimated that Lime is about 35% of the total indigenous buffalo population found in the hills and mountains of the country and only 25% of the total population are Parkote (Rasali, 1998). Indigenous buffaloes of Nepal are hardy and have the ability to adapt themselves in different agro-ecological regions. Because of their special qualities like production potentiality in low input system, efficient forage digestion ability, tolerance to cold and harsh climate, and relatively smaller body size than other exotic breeds, they are highly suitable to flourish on narrow and steep slope of the hills and mountains of the country. Within the indigenous breeds of buffaloes, some very high yielding individuals have been reported. However, due to the absence of the proper mating application and knowledge of selection, those high potential genetic stocks have not been utilized. (Poudel *et* al, 2011). Only limited studies have been done regarding the improvement of the production potential of such indigenous breeds. Even though, identification and characterization of different breeds of buffaloes have been done. (Shrest and Sherchan, 1997). However, NARC has recently started to work on molecular characterization of indigenous buffalo and National Buffalo Research Center has been working to study the performance of Murrah crossed indigenous breed and its cross breed maintenance.

MATERIALS AND METHODS

Study was executed during October-November of 2016 in Muna VDC-3, Faliyagaun of Myagdi district and Ramjhathati VDC-9 of Parbat district at Western Nepal. Information from DLSO staffs and key informants was utilized for site identification and to obtain the list of indigenous buffalo rearing farmer. Total of 100 buffaloes, 50 from each study site were considered by purposive sampling and household survey was conducted to collect the data using the semi structured questionnaire. Different lactational traits such as “colostrum period” (days), “days to reach peak milk yield”, “lactation length” (days) and “dry period” (days) were recorded. Thus collected data were used to study the effect of non genetic factors (breed and parity) and their interaction (breed*parity) on lactational traits of Lime and Parkote buffalo breeds. Collecting all the information required for the study, the data were coded and entered into Ms-excel & converted into text documents (Text MS-DOS). The data were analyzed by least square procedure using Harvey (1990) software package and mean comparison was performed by Duncan’s Multiple Range Test (DMRT) software. Among different models of Harvey (1990), following fixed effect model was used to estimate the effect of different non genetic factors on “colostrum period”, “days to reach peak milk yield”, “lactation length” and “dry period”.

$$Y_{ijk} = \mu + a_i + b_j + c_{(ij)} + e_{ijk}$$

Where, μ is the overall mean

a_i is the effect of i^{th} breed (i=1and 2)

b_j is the effect of j^{th} parity (j=1,2 and 3)

$c_{(ij)}$ is the effect of interaction between i^{th} breed and j^{th} parity

e_{ijk} is the random (residual) element assumed as randomly & independently distributed

RESULTS AND DISCUSSION

The traits of lactational efficiency such as colostrum length (days), days to reach peak milk yield, lactation length (days) and dry period (days) are ultimately the important economic traits of the dairy animals. So, the above traits were considered for the study. The non genetic factors such as breed, parity and breed-parity interaction were considered to study their effects to the above mentioned traits of lactational efficiency. The results of the study are presented in Table 1 and 2.

Colostrum length

The overall mean colostrum length (days) in this study was found to be 3.11 ± 0.21 days with the range of 1-7 days (Table 1). The result in within the range of finding by FAO (1993) in which it is reported that after 3-5 days of calving the milk will reach its normal composition.

There was no significant effect of breed on colostrum length of buffalo (Table 1). Both Lime and Parkote breeds have almost similar value of colostrum period. Moreover, the non significant difference on colostrum length was observed with respect to parity (Table 1). However, slightly higher value of colostrum length was observed in early parity (1st to 3rd parity) than the later parities (7th and above parities).

Breed and parity interaction (B×P) also has no significant effect on colostrum length (Table 1). However, slightly higher value of colostrum length was observed in early parity (1st to 3rd) in case of both the breeds (Lime and Parkote).

Table 1. Least Square Mean and Standard errors of Colostrums period (days) and Days to reach peak milk yield with respect to breed, parity and breed-parity interaction of indigenous buffalos

Factors	No. of observations	Colostrum period (days)	Days to reach peak milk yield
Pooled mean	100	3.11 ± 0.21	13.91 ± 1.25
Range	100	1-7	4-30
Breed			
Lime	58	3.08 ±0.20	13.95 ±1.20
Parkote	42	3.12 ±0.20	13.45 ±1.20
Significance		NS	NS
Parity			
1st to 3rd	55	3.18 ± 0.12	13.73 ± 0.71
4th to 6th	38	2.95 ± 0.24	13.00 ± 1.39
Above 7th	07	2.70 ± 0.47	15.84 ± 2.73
Significance		NS	NS
Breed X Parity Interactions			
Lime X 1st to 3rd	37	3.18 ± 0.16	14.19 ± 0.92
Lime X 4th to 6th	19	2.91 ± 0.30	13.42 ± 1.74
Lime X Above 7th	02	2.50 ± 0.74	13.00 ± 4.27
Parkote X 1st to 3rd	18	3.17 ± 0.19	13.10 ± 1.12
Parkote X 4th to 6th	19	3.00 ± 0.39	12.43 ± 2.28
Parkote X Above 7th	05	3.00 ± 0.47	19.80 ± 2.70
Significance		NS	NS
CV%		33.84	43.49

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Days to reach peak milk yield

The overall mean 'days to reach peak milk yield' was 13.91 ± 1.25 (around two weeks) with the range of 4-30 days (Table 1). However, Poudel *et al*. (2011) found higher value of 'days to reach peak milk yield' in his study at Gulmi and Argakhanchi districts. While working on production performance of indigenous as well as Murrah cross breed, he observed that the value of 'days to reach peak milk yield' was between 4-6 weeks. Similarly, Shah *et al*. (2011) also found 'days to reach peak milk yield' value of Lime breed to be around 36 days.

There was no significant effect of breed on 'days to reach peak milk yield' of indigenous buffaloes (Table 1). Both Lime and Parkote breeds have almost similar value of 'days to reach peak milk yield'. No difference in the value of 'days to reach peak milk yield' in both Lime and Parkote breed was also observed by Poudel *et al*. (2011). However, he found higher value of 'days to reach peak milk yield' (5-6 weeks) in case of Murrah crossbred.

The non significant difference on 'days to reach peak milk yield' was observed with respect to parity too (Table 1). However, 'days to reach peak milk yield' value was higher in late parity (7^{th} and above parity) than in early (1^{st}-3^{rd}) and mid (4^{th} -6^{th}) parities.

Breed and parity interaction (B×P) also has no significant effect on 'days to reach peak milk yield' (Table 1). However higher value of 'days to reach peak milk yield' was observed in case of Parkote × late parity (7^{th} and above parity) but lower and similar values in other B×P observations.

Lactation length (days)

The overall mean lactation length was 362.10 ± 22.10 days (Table 2) with the range of 210-635 days. This value is higher in comparison to the findings of Shah *et al.* (2011) who found the lactation length of Lime of western hills to be 303 days.

Breed has no significant effect on lactation length (Table 2). Both Lime and Parkote breeds have almost similar value of lactation length but Shrestha *et al*. (2005) found significant ($P<0.01$) effect of breed on lactation length where he observed the lactation length of Lime and Parkote to be 276 days and 285 days respectively. The difference in the value of lactation length within Nepalese indigenous breed is much lesser as compared to exotic breeds. Metry *et al.* (1994) found the lactation length value of Egyptian buffalo to be between 288-301 days. Similarly, Silva *et al.* (1995) found the lactation length value of Murrah between 248-441 days and Tailore *et al*. (1992) found the lactation length value of Surti buffalo between 261-379 days.

The non significant difference on lactation length was observed with respect to parity (Table 2). However, value of lactation length is found higher in case of late parity (7^{th} and above parity) than early (1^{st}-3^{rd}) and mid (4^{th}-6^{th}) parities. Jamuna *et al*. (2015) while carrying out the performance study of Murrah buffalo and Afzal *et al.* (2007) studying the milk yield and lactation traits of Nili Ravi buffalo also revealed the non significant difference of lactation length with respect to parity. However, Bashir *et al.* (2015) found the significant difference ($P<0.05$) of lactation length with respect to parity. In his findings, lactation length was maximum after first calving (283 days) and has decreased with increase in parity reaching minimum (258 days) in ≥10 lactations.

Breed and parity interaction (B×P) also has no significant effect on lactation length (Table 2). However, bit higher value of lactation length was observed in late parity (7th and above) in case of both the breeds (Lime and Parkote). The value of lactation length in this case has gone in the line of parity as the lactation length value in case of breeds is almost constant. In this case, it seems that proper management and breeding practices would be determining factor to increase the lactational efficiency of indigenous buffalo.

Dry period (days)

The overall mean dry period was 165.40 ± 16.59 days with the range of 31-365 days (Table 2). The value of dry period in this study is much lower in comparison to Bashir *et al.* (2015) who revealed the dry period value of Nili Ravi buffalo to be 258 days. So, there is much difference in dry period within the breeds though the value of dry period within Nepalese indigenous breeds (Lime and Parkote) in this study is almost similar with no significant differences (Table 2).

Statistically no significant difference of dry period was observed with respect to parity (Table 2). However, much lower value of dry period was observed at late parity (7th and above). The value of dry period decreases with increase in parity. Bashir *et al.* (2015) also recorded that the dry period is longer (290 days) for 1st parity Nili Ravi buffalo followed by gradual decline of dry period value in later parities. Similar result (gradual decrease in dry period with the increase in parity) was also reported by Kandasamy *et al.* 1993. Differential climatic conditions and managerial operations may also leads to variation in dry period value (Hussian *et al*. 2006). Reproductive management can be a dependent factor to optimize the dry period to 45-60 days (Kanaujia and Balaine, 1975). It is also possible that some animals can conceive very early after calving, have longer lactation length and very few dry days (Bashir *et al*, 2015).

Breed and parity interaction (B×P) also has no significant effect on lactation length (Table 2). As the value of dry period within the breeds (Lime and Parkote) is almost constant, the dry period value at different breed-parity interaction is in the same line as in the dry period value at different parities.

Table 2. Least Square Mean and Standard errors of Lactation length (days) and Dry period (days) with respect to breed and parity and breed–parity interaction of indigenous buffalos

Factors	No. of observation	Lactation length (days)	Dry period (days)
Pooled mean	100	362.10 ± 22.10	165.40 ± 16.59
Range	100	210-635	31-365
Breed			
Lime	58	363.30 ±22.01	161.90 ±16.50
Parkote	42	360.50 ±22.01	164.50 ±16.50
Significance		NS	NS
Parity			
1st to 3rd	55	361.20 ± 12.53	175.90 ± 9.41
4th to 6th	38	353.90 ± 24.51	135.20 ± 18.40
Above 7th	07	394.10 ± 48.02	105.70 ± 36.05
Significance		NS	NS

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Breed X Parity Interactions			
Lime X 1st to 3rd	37	364.80 ± 16.21	179.00 ± 12.17
Lime X 4th to 6th	19	346.40 ± 30.68	134.50 ± 23.03
Lime X Above 7th	02	394.00 ± 75.15	60.00 ± 56.42
Parkote X 1st to 3rd	18	356.20 ± 19.74	171.50 ± 14.82
Parkote X 4th to 6th	19	364.30 ± 40.17	136.30 ± 30.16
Parkote X Above 7th	05	394.20 ± 47.53	169.20 ± 35.68
Significance		NS	NS
CV%		29.35	48.26

CONCLUSION

Indigenous breeds considered in this study and parity does not make significant influence in increasing the lactational efficiency. Nevertheless, few traits of these indigenous breeds like "days to reach peak milk yield, lactation length and dry period are more acceptable compared to similar traits of other exotic breeds. So, appropriate breeding/mating plans with good management practice and proper nutrition would be a key in the improvement of lactational efficiency.

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