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Short Note

Effect of Season and Age at First Calving on Early Performance Traits in Murrah Buffaloes

GURPREET KOUR[1*], RAMAN NARANG[2] AND AMANDEEP SINGH[3]

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ABSTRACT

The present investigation was carried on 659 Murrah buffaloes, sired by 188 bulls, maintained at Directorate of Livestock Farms, Guru AngadDev Veterinary and Animal Sciences University, Ludhiana, for the duration of 27 years (1991-2017). The purpose of this study was to investigate the effect of non-genetic factors like season and age at first calving on early reproductive and productive traits like age at first calving (AFC), first service period (FSP), first calving interval (FCI) and age at puberty (AAP), 305 day milk yield (305MY), first lactation length (FLL), first peak yield (FPY), first days to attain peak yield (DPY) and first dry period (FDP). Season of calving had highly significant influence on FSP, FCI and FDP, significant effect on AFC, AAP, 305MY, FLL and FPY and non-significant effect on DPY. Age at first calving had non-significant effect on all the studied traits.

KEYWORDS

Age at first calving, Murrah, Effect of season, Reproduction traits, Production traits, Non-genetic factors.

Crowned as the 'black gold', the buffaloes in the country form the backbone of the dairy sector. India stands at the top in terms of buffalo population (Milan *et al.*, 2018). There are about 15 breeds of buffalo being registered by National Bureau of Animal Genetic Resources, Karnal, which contribute immensely to the unique germplasm of the country. Of these buffaloes available in the country, Murrah is one of the important breed with superior genetic potential for milk production. And in order to enhance productivity of a dairy animal, it is necessary to develop an understanding of the factors affecting its reproduction traits. Indian buffaloes, owing to its potential, may have short productive period in terms of milk and high unproductive life with longer inter calving period and age at first calving. This may be due to several genetic and non–genetic factors like parity, period of calving and season of calving. The unfavourable environmental conditions may not help in the exploitation of animal fullest potential in terms of milk production.

The present study was carried out on 659 Murrah buffalo herd, sired by 188 bulls, maintained at the Directorate of Livestock Farms, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana. The data pertaining to the reproduction and production traits for the present investigation were collected from the history-cum-pedigree sheets, calving register, peak yield register, drying register, production and reproduction records maintained at the dairy farm from 1991-2017. The economic traits under study were age at first calving (AFC), first service period (FSP), first calving interval (FCI), age at puberty (AAP), 305 day milk yield (305MY), first lactation length (FLL), first peak yield (FPY), first days to attain peak yield (DPY) and first dry period (FDP).

Classification of non-genetic factors: Non-genetic factors viz. season of calving and age at first calving were classified into subclasses to assess the effects of non-genetic factors on different reproduction traits. The entire duration of study was divided into four seasons, viz. winter (December to February), summer (March to May), rainy (June to August) and autumn (September to November). Age at first calving was classified into three groups (AFC1, AFC2 and AFC3) using mean and standard deviation after normalizing the data.

Statistical analysis: The means and standard error were estimated by using standard statistical procedures. The effects of non-genetic factors like season of calving and age at first calving on normalized traits were estimated by using least square analysis for non-orthogonal data (Harvey, 1990).

Least square analysis for non-genetic factors: The estimation of effects of non-genetic factors was done using the least square analysis by the following model:

$$y_{ijk} = S_i + A_j + e_{ijk}$$

where,

y^{ijk}= observation of k^{th} animal of i^{th}season and j^{th}age at first calving

Si = effect of i^{th} season of calving

[1]PhD Scholar, Deptt. of Animal Genetics & Breeding, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab, India
[2]Asso. Prof., Deptt. of Animal Genetics & Breeding, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab, India
[3]Veterinary Asstt. Surgeon, Department of Sheep Husbandry, Government of Jammu & Kashmir. (Former MVSc Scholar, Division of Extension Education, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh, India)
*Corresponding author email : gurpreetkour1469@gmail.com

A_j= effect of jthage at first calving
e_{ijk}= residual term (NID≈0, σ2e)

Age at first calving: The average and standard error for age at first calving was estimated to be 1331.89 ± 8.76 (Table 1). The results obtained in this study were in agreement with the findings of various workers. The results were comparable with the studies of Raheja (1992), Kuralkar and Raheja (1997), Nath (1998), Banik (2001), Gandhi (2002), Sachan *et al.* (2006), Wakchaure (2008) and Patil *et al.* (2012). The season of calving had significant effect on the trait, with highest values reported in winter season and lowest in autumn and rainy season. Similar significant influence of season of calving on age at first calving was reported by Bajetha (2003), Wakchaure *et al.* (2008), Gupta (2009) and Thiruvenkadan *et al.* (2015).

First service period: The averages for the first service period (FSP) were found to be 187.61± 4.61 days (Table 1). The value was well within range as reported by various workers. The present value of FSP was found to be comparable with Kumar (2000), Godara (2003), Nawale (2010), Singh and Barwal (2012) and Jakhar *et al.* (2016). The first service period was found to be highly significant from the season of calving with highest mean reported in winter season and lowest in rainy, ranging from 235 to 157 days, respectively. The results were in conformation with Thiruvenkadan *et al.* (2010), Patil (2011), Dev *et al.* (2015) and Jakhar *et al.* (2016). The relation with age at first calving for FSP was found to be non-significant.

First calving interval**:** Average first calving interval was estimated to be 496.75 ± 4.71 days (Table 1). The average calving interval found in this study was within the range reported by various workers like Raheja (1992), Kumar (2000), Chander (2002) and Wakachaure *et al.* (2008). The season of calving had highly significant effect on first calving interval. Shorter calving interval was reported in rainy season, while the longest in winter season. The results were in accordance with Wakachaure *et al.* (2008), Thiruvenkadan *et al.* (2015), Dev *et al.* (2015) and Jakhar et al. (2016). Non-significant effect of age at first calving was found on FCI.

Age at puberty: The averages of age at puberty were found to be 1022.51± 8.77 days in the present study (Table 1). The

Table 1: Least square means and effect of non-genetic factors on reproductive traits

Traits/ Factors	AFC	FSP	FCI	AAP
Overall mean	1331.89±8.77 (659)	187.61±4.61 (464)	496.75±4.71 (460)	1022.51±8.77 (659)
Season	**S***	**S****	**S****	**S***
Winter	1371.31^{a}±16.21	235^{a}± 8.9	550.51^{a}±9.15	1059.84^{a}±16.15
Summer	1349.72^{ab}±18.56	210.20^{b}±9.68	504.08^{b}±9.76	1039.93^{ab}±18.6
Rainy	1310.42^{b}±15.60	157.84^{c}±7.64	462.88^{c}± 7.8	1002.95^{b}±15.62
Autumn	1305.69^{b}± 16.7	171.79^{bc}±8.74	485.33^{bc}±9.04	996.51^{b}± 16.77
AFC	-	**NS**	**NS**	-
AFC 1	-	184.19 ±7.52	497.02 ± 7.73	-
AFC 2	-	190.90 ± 7.11	497.54 ± 7.24	-
AFC 3	-	171.90 ± 8.74	507.54 ± 8.62	-

*** (p<0.01); * (p<0.05); NS – Non-significant; S- Significant*

averages were found to be relevant with the studies reported by Naz and Ahmad (2006) and Thiruvenkadan *et al.* (2015). The season of calving was reported to have significant effect on age at puberty with highest mean found in winter season and lowest in autumn and rainy season. Naz and Ahmad (2006) found significant influence of season on the trait.

First 305 day milk yield: The estimates for the average of 305 day milk yield were reported to be 1893.68 ± 20.69 (Table 2). The present value of the estimate was comparable to the values reported by Chakraborty *et al* (2010), Thiruvenkadan *et al.* (2014), Malhotra (2014), and Sahoo *et al.* (2014). First 305 day milk yield was also significantly affected by season of calving with highest production reported in summer season and least in autumn. The increased milk production during summer and winter season is witnessed due to supply of good quality fodder during the period. The age at first calving had non-significant effect on the trait.

First lactation length**:** The average first lactation length was reported to be 343.85 ± 3.47 (Table 2). The estimate was in close agreement with those reported by Raheja (1992), Chander (2002), Kumar *et al.* (2002) and Katneni (2007). The effect of season of calving on first lactation length was found to be significant with longest lactation of 358.67 days in summer season and least in autumn. Age at first calving had non-significant effect on the trait.

First peak yield: The average first peak yield was reported to be 10.55 ± 0.07(Table 2). The averages were found relevant with the studies reported by Suresh *et al.* (2004), Chakraborty *et al.* (2010), Malhotra (2014) and Dev *et al.* (2015). The season of calving had significant effect on peak yield. The winter and summer season were found to have significant effect on the trait along with highest production in winter season. Hence, PY was highest for animals calved during winter, as it is considered to be favourable season for production and reproduction because of high quality leguminous fodder. Literature supporting the present study was reported by Bajetha (2003), Godara (2003), Malhotra (2014) and Jakhar *et al.* (2016). The age at first calving also did not have any significant influence on first peak yield as per the study.

First days to attain peak yield: The mean value for days to attain peak yield was estimated 53.04 ± 1.21 days (Table 2). The average values in the present study were found to be in close association with the studies of the researchers like Chaudhary *et al*, (2000) and Kundu *et al*, (2003). Days to attain peak yield did not show any significant influence by season of calving. Malhotra (2014), however, reported significant effect of the season on the trait. The age at first calving was also reported to be non-significant for days to attain peak yield.

First dry period: The average value for first dry period was found to be 154.48 ± 3.67 days (Table 2). The values, in general, were comparable with the findings of Wakachaure *et al.* (2008), Singh and Barwal (2012) and Jakhar *et al.* (2016). The high variability of the dry period offers maximum opportunity for improvement through managemental

Table 2: Least square means and effect of non-genetic factors on production traits

Traits / Factors	FLL	305MY	FPY	DPY	FDP
Overall mean	343.85±3.47 (659)	1893.68±20.69 (659)	10.55±0.07 (659)	53.04±1.21 (659)	154.48±3.67 (460)
Season	**S***	**S***	**S***	**NS**	**S****
Winter	355.99^{a}± 6.64	1922.15 ^{ab}± 36.72	10.90 ^{a}± 0.13	48.63±2.34	181.79 ^{a}±7.30
Summer	358.67 ^{a}± 7.68	1981.25 ^{a}± 42.48	10.76 ^{a}± 0.15	53.54±2.71	154.98 ^{ab}± 7.79
Rainy	336.24 ^{ab}± 6.44	1877.97 ^{ab}± 35.61	10.18 ^{b}± 0.12	54.10± 2.27	136.14 ^{b}±6.22
Autumn	325.03 ^{b}± 6.93	1816.17 ^{b}± 38.30	10.45 ^{ab}± 0.13	55.95±2.44	154.35 ^{b}±7.21
AFC	**NS**	**NS**	**NS**	**NS**	**NS**
AFC1	343.42 ± 6.20	1888.99 ± 34.31	10.479± 0.12	54.13±2.19	147.78 ± 6.17
AFC2	344.48 ± 5.66	1887.63 ± 31.29	10.49 ± 0.11	51.53±2.00	157.45 ± 5.78
AFC3	345.15 ± 6.45	1921.84 ± 35.66	10.76 ± 0.12	53.51±2.27	165.21 ± 6.88

*** (p<0.01); * (p<0.05); NS – Non-significant; S- Significant*

strategies. Among the non-genetic factors, the season of calving had high significant effect on dry period. Similar reports were presented by Sharma *et al.* (2010), Thiruvenkadan *et al.* (2015) and Jakhar *et al.* (2016). Non-significant effect was observed for age at first calving on the trait in the present study.

CONCLUSION

In the present study, the effect of season of calving on the studied traits revealed that the reproductive traits like AFC, AAP, FCI and FSP showed better performance for buffaloes calved during rainy and autumn season and the production traits showed better results for the summer calvers (March to May). This might be as a result of favourable environmental and managemental conditions. It was concluded that season of calving had significant effect on all the reproduction and production traits except for DPY, which had non-significant effect. The effect of age at first calving was, however, non-significant on all the early performance traits.

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