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Non-genetic factors affecting economic traits in Jaffrabadi Buffalo at organized farm

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Abstract

Present study was conducted on some productive and reproductive traits in Jaffrabadi buffaloes. The study involved performance records of 310 lactations from 123 Jaffrabadi buffaloes, spread over a period of 15 years (1978-1992), maintained at Cattle Breeding Farm, Junagadh Agricultural University, Junagadh (Gujarat). Data were analysed by least squares technique to examine the effect of non-genetic factors on various economic traits in Jaffrabadi buffalo. Overall least square means of 300 days or less milk yield (305DMY), Lactation length (LL), Peak yield (PY), Days to attain peak yield, Persistency, Calving interval (CI) and Dry period (DP) were 1920.39 ±52.00 kg, 334.03±9.01 days,13.02± 0.33 kg, 62.69±6.46 days, 0.82±0.02, 527.24 ± 20.78 days and 210.41 ± 15.95 days,respectively. Effect of season of calving was non-significant; while period of calving had significant ($P<0.05$) effect on all the traits under study. Significant ($P<0.05$) effect of parity was observed on all the traits, considered in study except 300DMY. The findings of thisstudy had shown that animals of first period (1978-1992) excelled in performance than those of other periods. Both productive and reproductive performances of pluriparous animals were found better than primiparous buffaloes. The results of this study revealed that most of economic traits in Jaffrabadi buffalo are significantly affected by environmental factors. Therefore, management can play key role in improving both productive and reproductive performances in Jaffrabadi buffaloes.

Keywords: Milk yield, Lactation length, Calving interval, Jaffrabadi buffalo, Persistency, Dry period, Peak yield

Introduction

Jaffrabadi buffalo is one of the important milch breeds found in Saurashtra region of Gujarat state. Average lactation yield of Jaffrabadi buffalo is reported to be 2238.66±74.87 kg (Shukla and Gajbhiye, 1986). 300-day milk production was much higher in these buffaloes as compare to Murrah buffalo.The lactation length was very close to that of Murrah breed while dry period was higher about 1 month. Age at puberty, age at first calving and calving interval were little higher than in Murrah buffaloes (Dhanda and Gajbhiye, 1988). The genetic potential of this dairy breed warrants greater attention for the improvement in its

economic characters in order to achieve maximum milk production.Environment has an important bearing not onlyon the productive performance but also on the reproductiveefficiency of the dairy animals. Prolonged high ambienttemperature coupled with high humidity under Indianconditions makes the animal uncomfortable and significantlyaffects the economic traits of dairy buffalo. In dairy animalsboth production and reproduction traits are low to moderatelyheritable, which indicates that the major part of variation inthese traits is governed by environmental factors that can beminimized by efficient managerial practices. Effect of non-genetic factors like season, parity and period of calving play significant role in the expression of the economic traits. Therefore, efficient management ofanimals during adverse climatic conditions is a key factor tomaintain animal's productive and reproductive efficiency atoptimum level.Hence, considering the importance of economic traits and lack of such research in Jaffrabadi buffaloes, the present study was undertaken to investigate effect of non-genetic factors on economic traits in Jaffrabadi buffaloes.

Materials and methods

The present investigation was conducted on Jaffrabadi Buffalo (n= 123) maintained at Cattle Breeding farm, Junagadh agricultural University, Junagadh, Gujarat. Study areais located at 68° to 72° East Longitudeand 20° to 24° North latitude and is 60 meters above the mean sea level in South Saurashtra region of Gujarat state. There are three major seasons in theyear viz. winter, summer,monsoon. The climate is mainly tropical to sub-tropical with maximum air temperature during summer about 43.7°C, minimum temperature duringwinter near to 9°C andrelative humidity ranged between 53-95%, annual precipitationvaried from 345 mm to 2546 mm averaging 1436.5 mm mostly from mid-June to October during the period of study (1978 to 1992).

The data for present study were collected from production recordsspread over a period of 15 years (1978-1992) of Jaffrabadi herd maintained at Cattle Breeding farm, Junagadh agricultural University, Junagadh(Gujarat) utilized for thisstudy. The performance traits examined were 300 days or less milk yield(300DMY), Lactation length (LL), Peak Yield (PY), Days to attain peak yield, Persistency, Calvinginterval (CI) and Dry period (DP) of Jaffrabadi buffalo. The data on the variousperformance traits were analysed to evaluate the magnitudeof various environmental sources of variation. Lactationrecords of less than 120 days and incomplete lactations for any recorded reason were not taken into the study.

In the present investigation for evaluating the effect of periods,the whole data were classified into 3 periods of 5 consecutiveyears according to the year of calving as under:

Period-I (P1) = 1978 to 1982
Period-II (P2) = 1983 to 1987
Period-III (P3) = 1988 to 1992

The year of calving was divided into 3 seasons as under:

Winter (S1): November to February.
Summer (S2): March to June
Monsoon (S3): July to October

The influence of various non-genetic factors on differentproduction and reproduction traits was studied by least squares analysis of variance, using the technique described by Harvey (1987). The statistical models used for different economic traits are described below.

$Y_{ijkl} = \mu + P_i + S_j + L_k + e_{ijkl}$

Where,

Y_{ijkl} = non-genetic effect of l^{th} observation of i^{th} period, j^{th} season and k^{th} parity

μ = Overall population mean

P_i= Effect of i^{th}period of calving (i=1,..3)

S_j = Effect of j^{th}season of calving (j=1,..3)

L_k = Effect of k^{th} lactation (k=1,2,….6)

e_{ijkl}= Random error

Persistency was calculated as per method given by Johansson and Hensson (1940) as under:

Persistency =

Milk yield(kg) in second 100 days period

Milk yield(kg) in first 100 days period

Results and discussion

300-Days milk yield (300DMY)

The overall least squares mean for 300DMY was 1920.39.31±52.00 kg (Table-1) Shukla and Gajbhiye (1986) have reported higher estimate 300 DMY in comparison to present study; while it is higher than the average of 300DMY reported by Narasimha Rao and Sreemannarayana (1994) in Murrah Buffalo. A significant (P<0.01) (Table-2) effect due to different periods on lactation milk yield was observed which is in conformity with that of Khan *et al.* (1987), Trineni Dutt and Taneja (1994) in Murrah bubbaloes. The least square means of 300-day yield exhibited significantly higher in period-I. The highest average 300 DMY (2244±78.90 kg) was found in animals calved during the period of 1978-1982, while the lowest (1746.04±56.94kg) value was observed for the period of 1988-92.Such type of findings are observed due to lower rainfall and scarcity conditions in Saurashtra area during period-II and period-III. The effect of season of calving on 300-day yield was found to be non-significant. The findings were in agreement with those reported by Khan *et al.* (1987) and Neog *et al.* (1993) in Murrah buffalo. Since the buffaloes on this farm have been provided proper summer management, housing and were raised on cultivated green fodder from irrigated land where greens are available round the year and supplementation was done with concentrate. Consequently, the season would not be expected to have any large influence. A non-significant effect of parity on lactation milk yield was observed. Similar results have been reported by Gurnani *et al*. (1976) while Gogoi *et al*. (1985), Agarwal *et al*. (1987) and Anand Prakash and Tripathi (1990) reported significant effect in Murrah buffalo.Parity-wise least square means revealed that the maximum milk yield was attained in third lactation. The 300DMY of first lactation buffaloes was found lowest (1816.24±55.86 kg) among different parities that might have been associated with the first exposure of primiparous animals to calving and lactation stresses along with suboptimal growth in comparison to plueriparous ones.

Lactation Length (LL)

Overall LL was observed to be 334.03±9.01 days in Jaffrabadi buffaloes (Table-1). It is said that LL of Jaffrabadi buffaloes is very longer than any other breed of Indian buffalo. But the result of present study shows thatit is very close to that of other Indian buffaloes. So it can be concluded that LL of Jaffrabadi buffalo can be brought very close to standard LL by improving management and reproduction. Period of calving was a significant (P<0.01) (Table-2) source of variation for LL which is in conformity with that of Jain and Taneja (1982), Umrikar and Deshpande (1985) and Neog *et al.* (1993) in Murrah buffalo and Khosla *et al*. (1987) in Surti buffaloes.The period-wise averages revealed that there was marked increase in LL from 302.94 ± 13.54days in period-Ito 355.05±9.97 days in period-III. Increase in LL over the periods is attributed to some environmental and managerial differences. The results of the present study revealed that the LL was not influenced by season of calving. Earlier Agarwal *et al.* (1987) and Neog *et al.* (1993) also observed non-significant effect of season of calving on LL in Murrah buffaloes and Arjawa Sharma and Basu (1985)in Nili buffalo.Sequence of lactation had a significant (P<0.01) effect on LL, which is in accordance with Rajenrda Kumar and Bhat (1978), Swain and Bhatnagar (1983) in Murarh buffalo; Garcha and Tiwana (1980)

in Indian buffalo. Average LL for first parity (367.16±9.46 days) was found significantly higher than that of others. Gradual decline in LL was observed from first to fifth lactation as age of the animal advances.

Peak yield (PY)

Overall average daily peak yield was found to be 13.02 ±0.33 kg (Table-1). The present findings showed highest daily peak yield in Jaffrabadi buffaloes than any other breeds of buffaloes reported.The period of calving on peak yield was highly significant (P<0.01) (Table-2) in Jaffrabadi buffaloes. The result is in conformity with that of Gajbhiye and Tripathi (1988), Singh *et al*. (1990) and Narasimha Rao and Rama Mohan Rao (1994) in Murrah buffaloes; Biradar (1990) in Surti buffalo; Verma and Yadav (1990) in Nili buffaloes. The differences in the peak yield due to seasons were non-significant. Earlier Anand Prakash and Tripathi (1987) in Murrah buffaloes; Chowdhary and Chaudhry (1981) in Mehsana and Surti buffaloes. However, significant results were observed by Gajbhiye and Tripathi (1988),Neog, *et al.* (1993),Narasimha Rao and Rama Mohan Rao (1994) in Murrah buffaloes. The results indicate that buffaloes calving in summer showed highest peak yield may be due to favourable climate and good quality and sufficient quantity of green fodder available during the post calving period (monsoon).Effect of parity on peak yield was highly significant (P<0.01) (Table-1). Similar results were reported by Gajbhiye and Tripathi (1988),Anand Prakash and Tripathi (1990), Narasimha rao and Rama Mohan Rao (1994) in Murrah buffaloes and Biradar (1990) in Surti buffalo. However, Chowdhary and Chaudhry (1981) noticed non-significant differences due to parity order on peak yield. Daily peak showed increasing trend from first to fourth lactation.

Days to attain peak yield

The overall days to attain peak yield was found to be62.69±6.46 days (Table-1). The effect of period of calving on days to attain peak yield was highly significant (P<0.01) (Table-2). These results were similar to the observations made by Garcha and Tiwana (1980) and Vij and Tiwana (1986) in North Indian buffaloes. Marked increase in days to attain peak yield was observed in period-III.A non-significant effect of seasons of calving on days toattain peak yield was observed which is in agreement with the findings of Anand Prakash and Tripathi(1987),Neog *et al.* (1993) and Narasimha Rao and Rama Mohan Rao(1994) in Murrah buffaloes,Chowdhary and Chaudhry (1981) in Mehsana and Surti buffaloes. However,Garcha and Tiwana (1980) in other buffaloes, Govindaiah and Rai (1986) and Gajbhiye and Tripathi (1988) in Murrah buffalo observed significant influence of season of calving on days to attain peak yield.Parity order was a highly significant (P<0.01) (Table-2) source of variation for days to attain peak yield.The present results are supported by findings of Anand Prakash and Tripathi(1987) and Gajbhiye and Tripathi (1988) in Murrah buffalo and Biradar (1990) in Surti buffalo.The number of days to reach peak yield was maximum in first lactation. There was gradual decrease in days to attain peak yield over the parity numbers. It is observed from the results that buffaloes attain peak yield earlier as the age advances. So it is concluded that daily peak yield increases and days to attain peak yield decreases with parity.

Table 1: Least-squares means for performance traits in Jaffrabadi buffalo.

Source of variation		300DMY (kg)	LL (days)	PY (kg)	Days to attain PY (days)	Persistency		CI (days)	DP (days)
	N	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE	N	Mean±SE	Mean±SE
Season of Calving									
Winter	98	1978.62±58.42	311.25±10.23	12.89±0.37	63.89±7.26	0.85±0.03	65	566.30±26.95	227.78±20.68
Summer	26	1922.56±107.34	344.92±18.30	13.44±0.68	52.53±13.34	0.76±0.05	27	521.31±41.18	213.88±31.40
Monsoon	186	1860.00±49.55	325.94±8.74	12.72±0.32	71.65±6.16	0.83±0.02	142	494.11±21.23	189.58±16.29
Period of calving									
I(1978-1982)	71	2244.95±78.90^{a}	302.94±13.54^{a}	14.74±0.50^{a}	51.03±9.81^{a}	0.77±0.04^{a}	67	454.59±31.29^{a}	175.47±24.01^{a}
II(1983-1987)	112	1770.19±64.16^{b}	344.11±11.24^{b}	12.85±0.41^{b}	52.16±7.58^{a}	0.78±0.03^{a}	107	558.33±25.69^{b}	233.04±19.71^{b}
III(1988-1992)	127	1746.04±56.94^{b}	355.05±9.97^{b}	11.49±0.36^{b}	84.89±7.08^{b}	0.89±0.03^{b}	60	568.80±28.40^{b}	222.74±21.79^{b}
Parity									
1st	106	1816.24±55.86	367.16±9.46^{a}	11.34±0.36^{c}	96.48±6.95^{a}	0.97±0.02^{a}	94	600.88±23.85^{a}	262.37±18.30^{a}
2nd	87	1855.10±59.39	333.71±10.46^{b}	12.39±0.38^{c}	78.43±7.38^{b}	0.83±0.03^{b}	70	506.06±25.69^{c}	193.49±19.71^{b}
3rd	55	2016.46±74.48	335.89±12.80^{b}	13.34±0.47^{bc}	64.03±9.26^{bc}	0.83±0.03^{b}	42	503.02±32.42^{c}	189.69±24.88^{b}
4th	35	1956.15±89.95	321.63±16.00^{b}	14.08±0.57^{ab}	60.75±11.18^{c}	0.82±0.04^{b}	18	537.48±47.16^{b}	216.07±36.19^{ab}
5th	18	1868.20±125.27	321.57±22.05^{b}	14.05±0.80^{a}	44.40±15.57^{d}	0.71±0.06^{c}	10	488.76±65.19^{c}	190.46±50.02^{b}
6th and above	9	2010.41±174.67	324.24±30.82^{b}	12.92±1.11^{c}	32.04±21.72^{d}	0.74±0.08^{c}			
Overall	310	1920.39±52.00	334.03±9.01	13.02±0.33	62.69±6.46	0.82±0.02	234	527.27±20.78	210.41±15.95

Means bearing same superscript did not differ significantly.

Table 2: Least-squares analysis of variance for performance traits.

Source of variation		300DMY	LL	PY	Days to attain PY	Persistency		CI	DP
	df	F-value	F-value	F-value	F-value	F-value	df	F-value	F-value
Season	**2**	**1.77**	**0.59**	**0.58**	**1.31**	**1.52**	**2**	**2.91**	**1.46**
Period	**2**	**24.76****	**7.97****	**21.60****	**9.70****	**8.27****	**2**	**6.86****	**3.06***
Parity	**5**	**1.40**	**2.45***	**5.82****	**4.50****	**6.77****	**4**	**2.90***	**2.67***
Error	**300**						**225**		

*Significant at 5% level (P<0.05); **Significant at 1% level (P<0.01).

Persistency

Overall mean persistency index was 0.82±0.02 (Table-1) which is similar to that observed by Garcha and Tiwana (1980) and Khan and Johar (1985). The period of calving affected the persistency of milk yield significantly (P<0.01) which is in conformity with those of Bhat *et al.* (1982), Malhotra *et al.* (1984) and Khan and Johar (1985) in Murrah buffalo. Season of calving had non-significant effect on persistency of milk yield. But the results showed that buffaloes calving during winter season were more persistent. This may possibly due to favourable climatic conditions and abundant supply of good quality green fodders. The lactation number had a highly significant (P<0.01) (Table-2) effect on persistency of milk yield. The result is in agreement with those reported by Bhat *et al.* (1982), Malhotra *et al.* (1984) in Murrah buffalo. The buffaloes in the first lactation were relatively more persistent. A decreasing trend was observed in persistency from first to fifth lactation.

Calving Interval (CI)

Overall average calving interval was observed to be 527.24 ± 20.78 days (Table-1). The result is in close agreement with those of Porwal *et al*. (1981) in Murrah buffaloes and Khan *et al*. (1990) in Nili-Ravi buffalo. It is cleared from the result of present study that calving interval of Jaffrabadi buffalo is slightly more than that of Murrah buffalo. Effect of period of calving interval was highly significant (P<0.01) (Table-1) which is in conformity with that of Roy *et al.* (1981) in Murrah buffaloes; Gautam Dutt and Yadav (1988) in Nili-Ravi buffaloes. Differences in CI might be attributed to the variation in feeding and management practices during different periods. The effect of season of calving on CI was found to be non-significant. The findings eare in agreement with those reported by Roy *et al.* (1981), Jain and Taneja (1982) in Murrah buffaloes. However, significant results have been reported by Swain and Bhatnagar (1983) and Narasimha Rao and Sreemannarayana (1994) in Murrah buffalo and Gautam Dutt and Yadav (1988) in Nili-Ravi buffaloes. Buffaloes calving in monsoon season had the shortest CI (494.11 ± 21.23 days) followed by summer calvers (521.31 ± 41.18 days) and winter calvers (566.30 ± 26.95 days). Hence buffaloes calving in summer and winter should be carefully watched for heat in order to maintain their CI. Effect of parity on CI was found to be significant (P<0.05) (Table-2) The present result was supported by the findings of Roy *et al*. (1981), Swain and Bhatnagar (1983) in Murrah buffaloes; Jain and Tailor (1994) in Surti buffaloes. CI was maximum for first calvers (600.88 ± 23.25) and showed declining trend from first to third parity.

Dry Period (DP)

Overall DP was observed to be 210.41 ± 15.95 days (Table-1). A significant (P<0.01) (Table-2) effect of season of calving on DP (Table 1) was observed, which is in accordance with the findings of Basu and Ghai (1981), Jain and Taneja (1982), Umrikar and Deshpande (1985) in Murrah buffalo; Gautam Dutt and Yadav (1986) in Nili buffaloes. However, Gogoi *et al.* (1986) observed non-significant results in Indian buffaloes. The trait was not significantly affected by season of calving. Earlier Jain and Taneja (1982) and Anand Prakash and Tripathi (1990) reported similar results in Murrah buffalo. But the results were not in agreement with those reported by Umrikar and Deshpande (1985) and Gogoi *et al.* (1986) in Murrah buffalo. Buffaloes calved in monsoon had the least DP (189.58 ± 16.29 days) and the buffaloes calved in winter and summer seasons had longer DP (227.78 ± 20.68 and 213.88 ± 31.40 days respectively). Influence of lactationnumber on DP was found significant (P<0.05) (Table-2), whichis in agreement with Basu and Ghai (1981) and Agarwal *et al.* (1987)

in Murrah buffaloes. It was least in third lactation (189.69 ± 24.88 days) and highest in first lactation (262.37 ± 18.30 days).

Conclusion

The least square means for economic traits, taken in the present study, were found to be comparable with findings of other studies.All the economic traits were significantly affected by periods; animals of first period (1978-1982) excelled in performance than those of other periods. The findings of the present study had shown that all the traits, considered in study, were not affected by seasonal variations. Productive and reproductive performances of pluriparous buffaloes were observed better than primiparous buffaloes. The effect of various environmental factors, viz. period and parity on economic traits was found to be significant in most of the cases, which indicates increased role of management in optimum utilization of livestock resources.

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