www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; SP-10(11): 635-638

www.thepharmajournal.com
Received: 10-09-2021
Accepted: 16-10-2021

Vikram Jakhar
Assistant Professor, AGB, KCVAS, Amritsar, Punjab, India

Abhay Singh Yadav
Prof & Head, AGB, LUVAS, Hisar, Haryana, India

Surender Singh Dhaka
Professor, AGB, LUVAS, Hisar, Haryana, India

Sandeep Kumar Sangwan
Assistant Professor, AGB, KCVAS, Amritsar, Punjab, India

Chandershekar Santosh Patil
Assistant Professor, AGB, LUVAS, Hisar, Haryana, India

Corresponding Author
Sandeep Kumar Sangwan
Assistant Professor, AGB, KCVAS, Amritsar, Punjab, India

Evaluation of non-genetic factors on phase traits in Murrah buffaloes

Vikram Jakhar, Abhay Singh Yadav, Surender Singh Dhaka, Sandeep Kumar Sangwan and Chandershekar Santosh Patil

Abstract
The data on performance records of 2959 Murrah buffaloes at Buffalo Resarch Center, Department of Livestock Production and Management, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar and Animal farm, CIRB Hisar, spread over a period of 24 years (1992-2015) were utilized for the present study. The overall mean of Lactation length (LL), Dry period (DP), Service period (SP) and Calving interval (CI) were 292.71±3.99 days, 117.41±2.09 days, 135.05±5.10 days and 445.05±5.10 days, respectively. Effect of parity, Period of calving and Season of calving were studied on different phase traits. Period of calving had highly significant effect on all the phase traits aunder study. Season of calving also had significant effect on different phase traits. Parity and farm also had significant effect on different phase traits.

Keywords: Parity, farm, season of calving, period of calving, Phase traits, Murrah buffaloes

Introduction

The knowledge of milk production parameters during various phases of lactation would help the breeder to have early and preliminary information for sire and buffalo evaluation, and early timely culling of poor performing animals. The phenotypic expression of an animal in term of production and reproduction is much affected by genetic and environmental fluctuations surrounding the animal (Collier *et al.*, 2006) [3]. The aim of any selection programme in dairy buffalo is to improve milk production and to reduce cost of milk production. Knowledge of genetic and non-genetic factors influencing the performance traits is essential to obtain unbiased estimates of genetic parameters. Therefore, the present investigation was planned to study non-genetic factors affecting phase traits in Murrah buffaloes.

Materials and Methods

In the proposed study breeding information spread over a period of 24 years from 1992 to 2015 was collected from the pedigree, breeding and performance records of Murrah buffaloes maintained at Buffalo Research Centre (BRC), Lala Lajpat Rai University of Veterinary and Animal Sciences and Central Institute for Research On Murrah Buffaloes (CIRB) Hisar. The lactation records of animals with yield less than 500 kg per lactation or with lactation length shorter than 100 days were considered as abnormal and were not included in the study. The phase traits considered were i.e. Lactation Length (LL), Dry Period (DP), Service Period (SP) and Calving Interval (CI). The entire period of 24 years was divided into Six periods each consisting of four consecutive years. Each year was further delineated into four seasons *viz.*, summer (April to June), Rainy (July to September), Autumn (October to November) and winter (December to March) depending on the ambient temperature and relative humidity. Abnormal records from the animals having abortion, mastitis, chronic illness, physical injuries etc. were also excluded from the present study. In order to overcome non-orthogonality of the data due to unequal subclass frequencies, least squares and maximum likelihood computer program of Harvey (1990) [7] using Henderson method 111 (Handerson, 1973) [8] will be utilized to estimate the effect of various tangible factors on various traits under study

$$Y_{ijkl} = \mu + s_i + h_j + C_k + b_1(X_{ijkl} - \overline{X}) + b_2(X_{ijkl} - \overline{X})^2 + e_{ijkl}$$

Where

Y_{ijkl}	= is the l[th] record of individual of the i[th] sire calved in j[th] period and k[th] season
μ	= is the overall population mean
s_i	= is the random effect of i[th] sire
h_j	= is the fixed effect of j[th] period of calving
C_k	= is the fixed effect of k[th] season of calving
b_1 and b_2	= are linear and quadratic partial regression coefficients of age at first calving.
X_{ijkl}	= is the age at first calving.
$\bar{X}$	= is the mean of age at first calving.
e_{ijkl}	= is the error associated with each observation and assumed to be normally and independently distributed with mean zero and variance $\sigma^2 e$

Duncan's multiple range test was used for making possible pair-wise comparison of means. Heritability estimates for different traits were obtained by paternal half-sib correlation method and genetic and phenotypic correlations were calculated from variance-covariance analysis and their standard errors by using the formula given by Snedecor and Cochran (1994) [14].

Results and Discussion

The analysis report on least square means and analysis of variance for different phase traits is tabulated in tables 1 and 2.

Lactation length (LL): It is the period of economic returns to animal breeder. It is an important trait as it reflects the periodicity of milk production and influences the milk yield to greater extent. the overall least-squares mean for LL was estimated as 292.71±3.99 days. The estimate obtained in the present study was in close agreement with Patel and Tripathi (1998) and Chaudhari, M. (2015) [2] in Surti and Murrah buffaloes, respectively. However, Gandhi *et al*. (2009) and Thiruvenkadan *et al*. (2010) reported lower least-squares means (273.54±2.64 and 289.06±2.37, respectively) in Murrah buffaloes. The analysis of variance revealed highly significant (<0.01) effect of farm on LL. The lactation length was highest on farm 2 as compared to farm 1. Similar results were reported by Cady *et al*. (1983) and Kumar, V. (2015). The analysis of variance revealed significant (p<0.05) effect of period of calving on LL. The lactation length showed decreasing trend across the periods. Suresh *et al*. (2004) and Thiruvenkadan *et al*. (2010) reported highly significant influence of period of calving on LL in Murrah buffalo. Aziz *et al*. (2001) and Chaudhari, M. (2015) [2] also found highly significant (p<0.01) effect of period of calving on LL in Egyptian buffalo and Murrah buffaloes, respectively. While, Kangdasamy (1987) and Aziz *et al*. (2001) reported non-significant effects of period of calving on LL in buffaloes. The effect of season of calving on LL was highly significant (<0.01). The lactation length was highest in summer calvers and lowest in autumn calvers. Patel and Tripathi (1998) and Singh *et al*. (2011) reported that season of calving significantly influenced the LL in buffaloes. Dhar and Deshpande (1995) and Chaudhari, M. (2015) [2] reported highly significant influence of season of calving on LL in Murrah buffaloes, respectively. However, Aziz *et al*. (2001) reported non-significant effect of season on LL in Egyptian buffaloes. The analysis of variance revealed highly significant (p<0.01) effect of parity on LL. The lactation length was highest in 1st parity and lowest in 4th parity. The lactation length showed decreasing trend across the parity. Dhar and Deshpande (1995), Hussain *et al*. (2006) and Chaudhari, M. (2015) [2] reported highly significant (p<0.01) influence of parity on LL in Murrah buffaloes, respectively. On the contrary, non-significant influence of parity on LL was observed by Bharat *et al*. (2004) and Thiruvenkadan *et al*. (2010) in light breed of buffaloes and Murrah buffaloes, respectively.

Dry period (DP): Dry period is the period during which animal remains out of milk production. So, dry period being nonproductive period needs to be reduced to the minimum in order to maximize the profits. The overall least-squares mean for DP was estimated as 168.45±4.08 days. However, Chaudhari, M. (2015) [2] and Thiruvenkadan *et al*. (2010) reported higher least-squares means (168.45±4.08 and 250.50±15.90) in Murrah buffaloes. The analysis of variance revealed highly significant (<0.01) effect of farm on DP. The dry period was highest on farm 2 as compared to farm 1. Similarly significant effect of farm was reported by Kumar, V. (2015) in Murrah buffaloes. The analysis of variance revealed highly significant (p<0.01) effect of period of calving on DP. Thiruvenkadan (2011), Singh *et al*. (2011) and Chaudhari, M. (2015) [2] reported significant effect of period on DP in buffaloes. However, non-significant effect of period on DP was reported by Kumar (2000) [10] in Murrah buffaloes. The differences in performance of the animals among different periods might be attributed to differences in management practices, sire used for breeding, environment condition such as ambient temperature, humidity, rainfall and variations in feed and fodder availability. The effect of season of calving on DP was highly significant (p<0.01). The dry period was highest in winter calvers and lowest in rainy calvers. Patel and Tripathi (1998), Aziz *et al*.(2001) and Chaudhari, M. (2015) [2] reported that season of calving significantly affect the DP in Surti buffalo, Egyptian buffalo and Murrah buffaloes respectively. However, Suresh *et al*. (2004) reported non-significant effect of season of calving on dry period in Murrah buffaloes. The analysis of variance revealed highly significant (<0.01) effect of parity on DP. The dry period was highest in 1st parity followed by 2nd parity and lowest in 4th parity. There was decrease in DP from 1st to 4th parity. Suresh *et al*. (2004) and Chaudhari, M. (2015) [2] reported non-significant effect of parity on DP in Murrah buffaloes. However, Aziz *et al*. (2001) and Bharat *et al*. (2004) reported significant effect of parity on DP in Egyptian buffalo and light breed of buffaloes (Surti, Mehsana, Surti×Mehsana), respectively. Similarly, Patel and Tripathi (1998) reported highly significant effect of parity on DP in Surti buffaloes. Effect of age at first calving (linear as well as quadratic) was found to be non-significant on DP. Thiruvenkadan (2011) reported non-significant effect of AFC on DP in Murrah buffaloes. However, Chaudhari, M. (2015) [2] reported non-significant effect of regression of AFC on DP in Murrah buffaloes.

Service period (SP): It is the period between calving and subsequent successful conception. Generally, an optimum period of 60 days is allowed as post-partum rest. Besides, managemental and environmental factors, it is generally regarded as the function of initiation and regularity of estrus and number of service per conception. The overall least-squares mean for SP was estimated as 135.05±5.10 days. However, Thiruvenkadan *et al*. (2010) and Chaudhari, M. (2015) [2] reported higher least-squares means (253.70 days and 171.04 days) in Murrah buffaloes. Gandhi *et al*. (2009) reported lower least-squares mean (112.25±2.87) in Murrah buffaloes. The service period in buffaloes is generally reported to be very long because of various causes like silent heat, an-ovulatory heat, seasonal ovarian inactivity, embryonic mortality and infertile services etc. The analysis of variance revealed highly significant (<0.01) effect of farm on SP. The service period was highest on farm 2 as compared to farm 1. Similar results was reported by Kumar, V. (2015). The analysis of variance revealed highly significant (<0.01) effect of period of calving on SP. Chaudhari, M. (2015) [2] reported non-significant effect of period of calving on SP in Murrah buffaloes. While, Suresh *et al*. (2004) and Thiruvenkadan *et al*. (2010) observed significant effect of period of calving on SP in Murrah buffaloes. The effect of season of calving on SP was highly significant (p<0.01). The service period was highest in winter calvers and lowest in rainy calvers. A significant effect of season of calving on SP was also reported by Suresh *et al*. (2004), Thiruvenkadan *et al*. (2010) and Chaudhari, M. (2015) [2] in Murrah buffaloes. However, Hussain *et al*. (2006) reported non-significant effect of season of calving on SP in Nili-Ravi buffaloes. The analysis of variance revealed highly significant effect (p<0.01) of parity on SP. The service period was highest in 1st parity and lowest in 4th parity. There was decrease in SP from 1st to 4th parity. Chaudhari, M. (2015) [2] reported significant effect of parity on SP. The service period was highest in 1st parity and lowest in 4th parity and 5th parity in Murrah buffaloes. However, Suresh *et al*. (2004) and Hussain *et al*. (2006) reported non-significant effect of parity on SP in Murrah and Nili-Ravi buffaloes. Effect of age at first calving (linear as well as quadratic) was found to be non-significant on SP. Kamaldeep (2014) reported similar result regarding regression of AFC on SP in Murrah buffaloes.

Calving interval (CI): Calving interval is the period between two consecutive calving. Calving interval has direct bearing on both reproduction and production efficiencies. Short calving interval along with early age at first calving are required for better efficiency of milk production. The overall least-squares mean for CI was estimated as 445.05±5.10 days. However, Patel and Tripathi (1998) and Chaudhari, M. (2015) [2] reported higher least-squares mean (556.0±11.90 days, 479.83±5.90 days respectively) in Murrah buffaloes. Gandhi *et al*. (2009) reported lower least-squares mean (428.30±3.54) in Murrah buffaloes. The calving interval has a great economic bearing on the lifetime production of dairy animal. In order to reduce the unproductive period and to enhance calf crop during the lifespan of dairy animals, reduction in the length of calving interval seems most important. The calving interval in farm animals mainly determined by service period. In general, better management to reduce service period will significantly shorten the calving interval. The analysis of variance revealed highly significant (<0.01) effect of farm on CI. The calving interval was highest on farm 2 as compared to farm 1. Cady *et al*. (1983) and Kumar, V. (2015) reported significant effect of farm on calving interval. The analysis of variance revealed highly significant (<0.01) effect of period of calving on CI. Dass and Sadana (2000), Suresh *et al*. (2004) and Thiruvenkadan *et al*. (2010) reported significant effect of period of calving on CI in Murrah buffaloes. However, Chaudhari, M. (2015) [2] reported non-significant effect of period of calving on CI in Murrah buffaloes. The effect of season of calving on CI was highly significant (p<0.01). The calving interval was highest in winter calvers and lowest in rainy calvers. Longer CI in winter season might be due to better feeding, management and seasonality of calving in buffaloes as winter calver wait longer to rebreed as compared to summer or rainy calver. Aziz *et al*. (2001), Lundstrom *et al*. (2007) and Chaudhari, M. (2015) [2] reported significant influence of season of calving on CI in Egyptian and Murrah buffaloes, respectively. On the contrary, Hussain *et al*. (2006) reported non-significant effect of season of calving on CI in Nili-Ravi buffaloes. The analysis of variance revealed highly significant (p<0.01) effect of parity on CI. The calving interval was highest in 1st parity and lowest in 4th parity. There was a consistently decrease in CI from 1st to 5th parity. Aziz *et al*. (2001), Bharat *et al*. (2004) and Chaudhari, M. (2015) [2] reported significant effect of parity on CI in Egyptian buffalo, light breed of buffaloes (Surti, Mehsana, Surti×Mehsana) and Murrah respectively. Similarly, Patel and Tripathi (1998) reported highly significant effect of parity on CI in Surti buffaloes. However, Suresh *et al*. (2004) reported non-significant effect of parity on CI in Murrah buffaloes. Effect of age at first calving (linear as well as quadratic) was found to be non-significant on CI. Similar results were reported by Kamaldeep (2015) in Murrah buffaloes. The results of the study indicated that the effect of season of calving was statistically significant ($p<$ 0.01) on all phase traits. Animals calved in summer season have higher value for LL and lowest value in autumn season. In case of DP and SP animals calved in winter months have higher value and lowest value in case of rainy season. Seasonal differences on phase traits revealed the favourable climatic conditions and abundant availability of green fodder during these seasons.

Table 1: Least squares analysis of variance for different Phase traits.

Source of variation	d.f.	Mean squares			
		LL	DP	SP	CI
Sire	219	6017.15	5342.22	10237.02	10237.02
Period	5	10281.97*	14291.73**	36809.79**	36809.79**
Season	3	86348.27**	125365.98**	226486.71**	226486.71**
Regression Linear	1	25551.81**	841.10	139.39	139.39
Regression Quadratic	1	498.13	78.00	2119.41	2119.41
Remainder	2721	3819.96	3477.08	7164.75	7164.75

* $p< 0.05$ and ** $p< 0.01$

Table 2: Least- squares means and their standard errors for different Phase traits

Source of variation	Obs.	LL (Days)	DP (Days)	SP (Days)	CI (Days)
Overall mean	2959	292.71±3.99	137.42±3.74	135.05±5.10	445.05±5.10
Periods: P_1(1992-95)	124	304.04^{a}±8.87	157.18^{a}±8.44	163.93^{a}±11.99	473.93^{a}± 11.90
P_2(1996-99)	454	288.32^{bc}±5.70	140.48^{b}±5.39	133.37^{b}±7.55	443.37^{b}±7.55
P_3(2000-03)	766	286.35^{c}±4.70	128.11^{de}±4.43	119.29^{d}±6.13	429.29^{d}±6.13
P_4(2004-07)	677	292.16^{bc}±4.94	137.35^{bc}±4.66	130.52^{bc}±6.47	440.52^{bc}±6.47
P_5(2008-11)	605	298.57^{b}±5.31	133.09^{cd}±5.02	139.42^{b}±7.60	449.42^{b}±7.00
P_6(2012-15)	333	286.82^{bc}±6.59	128.32^{e}±6.24	123.74^{cd}±8.80	433.74^{cd}±8.80
Seasons: Summer	428	305.08^{a}±5.05	136.06^{b}±4.77	139.50^{b}±6.63	449.50^{b}±6.63
Rainy	1167	283.36^{b}±4.24	124.48^{d}±3.98	117.19^{c}±5.46	427.19^{c}±5.46
Autumn	741	280.91^{b}±4.40	132.62^{c}±4.14	124.86^{c}±5.70	434.86^{c}±5.70
Winter	623	301.49^{a}±4.59	156.50^{a}±4.32	158.64^{a}±5.97	468.64^{a}±5.97
Regressions AFC (Lin.)		0.017±0.006	-0.003±0.006	0.001±0.009	0.001±0.009
AFC (Quad.)		00	00	00	00

Means superscripted by different letters differ significantly among themselves

Conclusion

From the above study it can be concluded that environmental factors like season, period and parity are significantly influencing most of the reproduction traits. The differences in the reproductive performances over different periods and seasons may be attributed to the differences in feeding and managemental practices at the farm as well as differences in the heat expression and detection in different seasons and periods. It is therefore important to emphasize the amelioration of husbandry practices, proper feeding of the animals in adverse environmental conditions and proper heat detection especially in summer.

Acknowledgment

the study was supported by department of livestock production and management and department of animal genetics and breeding LUVAS, HIsar and animal farm CIRB, Hisar.

References

1. Chakraborty D, Dhaka SS, Pander BL, Yadav AS, Danpat. Genetic studies on 305 days and test day milk yield records in Murrah buffaloes. Indian J. Anim. Sci. 2010;80(8):720-732.
2. Chaudhari. Genetic studies on production, fertility and longevity traits in Murrah and Nili-ravi buffaloes. Ph. D. Thesis, LUVAS, Hisar, India 2015.
3. Collier RJ, Dahl GE, Van Baale MJ. Major Advances Associated with Environmental Effects on Dairy Cattle. Journal of Dairy Science 2006;89(4):1244-1253.
4. Dev K. Genetic evaluation of early and lifetime performance traits of Murrah buffaloes. M.V.Sc. thesis. LUVAS, Hisar, India 2015.
5. Dev K, Dhaka SS, Yadav AS, Patil CS. Estimation of genetic parameters of lifetime performance traits in Murrah buffaloes. Journal of Anim. Res 2016;6(4):645-649.
6. Dutt T, Bhushan B, Kumar S. Genetic parameters of first lactation performance traits in Murrah buffaloes. Ind. J. Anim. Sci. 2001;71(4):394-395.
7. Harvey WR. User guide for LSMLMW and MIXMDL package. Mix model Least Squares and Maximum Likelyhood Computer Programme. pc–2 version. Mimeograph. Columbia, ohio, USA 1990.
8. Henderson CR. Sire evaluation and genetic trends. Proc. Anim. Breed and Genetics Symposium in honour of Dr. J. L. Lush, pp. 10-14. American Soc. Anim. Sci. Assoc. Champaign, Illinois. J. Anim. Sci. 41(7): 515-520. J. Anim. Sci 1973;82(5):501-504.
9. Jakhar V. Estimation of additive and multiplicative age correction factors for milk production in Murrah buffaloes. M.V.Sc. thesis, LUVAS, Hisar, India 2014.
10. Kumar A. Genetic studies on first lactation traits in Murrah buffaloes. M.V.Sc. thesis, H.AU., Hisar, India 2000.
11. Nath M. Breeding value evaluation for milk production in Murrah buffaloes. M.Sc. Thesis, NDRI, Deemed Univ. Karnal, India 1998.
12. Saha S, Sadana DK. Effect of genetic and non- genetic factors on reproductive traits in Murrah buffaloes. Indian J. Anim. Health 2000;39:41-42.
13. Singh CV, Barwal RS. Use of different animal models in prediction of genetic parameters of first lactation and herd life traits of Murrah buffaloes. Ind. J. Dairy Sci. 2012;65(5):399-404.
14. Snedecor GW, Cochran WG. Statistical Methods. 8th edn. East West Press Pvt. Ltd., New Delhi 1994.
15. Thiruvenkadan AK, Panneerselvam, Rajendrean R. Lifetime performance of Murrah buffaloes hot and humid climate of Tamil Nadu, India. Buffalo Bulletin 2015;34(1).