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Non Genetic Factors Affecting Production and Reproduction Traits of Graded Murrah Buffaloes

M. Srinivasa Reddy[1], V. Jagadeeswary[2], J. Sai Prasanna[3]

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ABSTRACT

Background: Environmental factors play a major role and influence the economically important traits in dairy animals. The present investigation was undertaken to study the influence of season on production and reproduction traits of graded Murrah buffaloes reared under farm conditions.

Methods: The data pertaining to 164 graded Murrah buffaloes was utilized to study influence of seasons on various climatic factors like maximum, minimum and mean temperature, relative humidity (morning and evening), rainfall, sunshine, wind speed, evaporation and production and reproduction traits like lactation length, lactation yield, days to attain peak yield, persistency, calving interval, birth weight and number of lactations.

Result: The present investigation revealed significant effect of season on all the meteorological parameters, production and reproduction parameters studied. The correlations among meteorological parameters and production and reproduction traits were also significant.

Key words: Buffaloes, Production traits, Reproduction traits.

INTRODUCTION

India ranks first in buffalo population in the world and has about 109.85 million buffaloes as per the 20th Livestock Census, representing 54 per cent of the world buffalo population. India possesses the best milch breeds of buffaloes. Out of the total milk production of India, buffaloes share is about 49 per cent. Among these, the Murrah is the most important and popular buffalo breed in the world, which is widely used for upgrading the local non-descript buffaloes. Milk yield, lactation period and dry period are low heritable traits influenced much by some environmental factors (Bhadoria *et al.*, 2003, Afzal *et al.*, 2007, Wondifraw *et al.*, 2013 and Elgersma *et al.*, 2018). The present study was undertaken to study the influence of season on production and reproduction traits of graded Murrah buffaloes.

MATERIALS AND METHODS

The data on 164 graded Murrah buffaloes utilized in the present study were obtained from the individual records of graded Murrah herd maintained at the Dairy Experimental Station, Rajendranagar, Hyderabad. All the animals were reared under uniform management conditions. The influence of seasons on various climatic factors like maximum, minimum and mean temperature, relative humidity (morning and evening), rainfall, sunshine, wind speed, evaporation; and production and reproduction traits like lactation length, lactation yield, days to attain peak yield, persistency, calving interval, birth weight and number of lactations was studied as per Snedecor and Cochran (1994). The meteorological data during the experimental period were collected from Agriculture Climate Research Center, ARI, Hyderabad, while the data on production and reproduction traits were collected from the history sheet/ daily farm registers maintained in the farm. The year was divided into 3 seasons as summer (March to June), rainy (July to October) and winter (November to February). The phenotypic correlations among various climatic factors on production and reproduction traits were also estimated.

RESULTS AND DISCUSSION

The results of analysis of variance of various climatic factors for the influence of seasons are presented in Table 1, while the overall and season wise means are detailed in Table 2.

[1]Department of Veterinary and Animal Husbandry Extension, College of Veterinary Science, PV Narsimha Rao Telangana Veterinary University, Rajendranagar-500 030, Hyderabad, Telangana, India.
[2]Department of Veterinary and Animal Husbandry Extension, Veterinary College, Hebbal, Bangalore-560 024, Karnataka, India.
[3]Department of Animal Genetics and Breeding, College of Veterinary Science, PV Narsimha Rao Telangana Veterinary University, Rajendranagar-500 030, Hyderabad, Telangana, India.

Corresponding Author: J. Sai Prasanna, Department of Animal Genetics and Breeding, College of Veterinary Science, PV Narsimha Rao Telangana Veterinary University, Rajendranagar-500 030, Hyderabad, Telangana, India.
Email: drsaiprasannareddy@gmail.com

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The influence of season was highly significant on all the climatic factors. The overall mean maximum and minimum temperatures were 32.67 and 19.98°C, respectively. The significantly highest mean temperatures were recorded in summer season (36.87 ± 0.41°C), while the lowest mean temperatures (14.05 ± 0.46°C) were found in winter season. The lowest mean temperature in winter season is conducive for higher production performance of buffaloes. The overall means for relative humidity in morning and evening were 78.65 and 43.48 per cent, respectively. The highest means for relative humidity in morning and evening were observed during rainy season followed by those in winter and summer seasons. The overall means obtained in the present study for rainfall, sunshine and wind speed were 7.67 ± 0.76 mm, 7.52 ± 0.21 hours and 3.77± 0.20 km/hour, respectively (Table 2). The overall mean evaporation was 5.13 ± 0.21 mm and it ranged from 3.71 in winter to 7.43 mm in summer season.

The results of analysis of variance of lactation length, lactation milk yield, days to attain peak yield, persistency, calving interval, birth weight and number of lactations are presented in Table 3, while the season wise and overall means of these factors are given in Table 4. The season had significant effect (P<0.01) on lactation yield, days to attain peak yield and calving interval. The mean lactation yield was significantly (P<0.01) high in winter (1967.67 L) when compared to summer (1470.04 L) and rainy season (1311.78 L). This trend may be attributed to optimum temperature and sunshine observed in winter compared to rainy and summer season and also due to availability of good quality green fodder in abundance during winter season. Similar results were obtained by Pawar *et al.,* 2012 and Eldawy *et al* 2021, where the highest milk yield was obtained in animals calving in winter season followed by rainy and summer season. Days to attain peak yield is significantly higher in summer season (49.46 days) compared to other two seasons and this may be due to non-availability of sufficient green fodder, high temperature and evaporation. Calving interval was longer in buffaloes, which calved during winter season (574.28 days) compared to summer (510.81 days) and rainy (484.12 days) seasons. This might be due to the fact that those animals, which have calved in winter, might exhibit heat symptoms in summer and as the buffaloes are silent heaters and also due to lack of sufficient fodder and high temperature the service period might be lengthened, hence the intercalving period might be significantly high. However, Ramadan, 2018, found that the best reproductive performance, as indicated by lower number of services per conception and shorter calving interval period was observed in buffaloes calved during winter season.

Table 1: Analysis of variance of various climatic factors.

Trait	Mean sum of squares	
	Between seasons (d.f = 2)	Error (d.f = 86)
Maximum temperature	443.64**	3.12
Minimum temperature	726.34**	4.60
Mean temperature	465.76**	3.70
Relative humidity - Morning	3075.95**	38.54
Relative humidity - Evening	7681.76**	75.59
Rain fall	780.80**	34.31
Sun shine	94.73**	1.80
Wind speed	39.83**	2.57
Evaporation	132.39**	1.10

**Significant at P<0.01.

Phenotypic correlations

The phenotypic correlations among the environmental effects, production and reproduction traits are presented in Table 5.

Lactation length

Correlation of lactation length with lactation yield was significant (P<0.01) and positive. The result indicated

Table 2: Means for maximum temperature, minimum temperature, mean temperature, relative humidity, rainfall, sunshine, wind speed and evaporation in different seasons.

Trait	Summer (n=32)		Rainy (n=29)		Winter (n=28)		Overall (n=89)	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Maximum temperature (°C)	36.87^{a}	0.41	30.68^{b}	0.19	29.94^{b}	0.31	32.67	0.38
Minimum temperature (°C)	23.23^{a}	0.44	22.1^{b}	0.23	14.05^{c}	0.46	19.98	0.49
Mean temperature (°C)	30.05^{a}	0.34	26.75^{b}	0.38	22.16^{c}	0.34	26.49	0.40
Relative humidity - Morning (%)	67.74^{c}	1.57	86.62^{a}	0.75	82.86^{b}	0.74	78.65	1.10
Relative humidity - Evening (%)	34.49^{b}	1.97	62.38^{a}	1.41	34.18^{b}	1.18	43.48	1.67
Rain fall (mm)	9.05^{a}	1.37	11.88^{a}	1.01	1.74^{b}	0.59	7.67	0.76
Sun shine (hours)	8.31^{a}	0.29	5.43^{b}	0.26	8.76^{a}	0.15	7.52	0.21
Wind speed (Km/hr)	4.32^{a}	0.32	4.50^{a}	0.36	2.37^{b}	0.13	3.77	0.20
Evaporation (mm)	7.43^{a}	0.25	3.97^{b}	0.14	3.71^{b}	0.15	5.13	0.21

Means in a row with same superscript do not differ significantly (P<0.05).

that higher lactation yield would certainly lengthen the lactation length. The findings are in agreement with those of Chaturvedi (1991) in Malvi cows, Bhadoria (2000) and Lakshmi *et al.*, 2010. The correlation of lactation length with sunshine was significant (P<0.01) and positive and with rainfall also was significant (P<0.01) but negative.

Table 3: Analysis of Variance of production and reproduction traits.

Trait	Between seasons		Error	
	d.f	MSS	d.f	MSS
Lactation length (days)	2	22032.52	171	12146.72
Lactation milk yield (L)	2	4971470.90**	102	361185.1
Days to attain peak yield	2	6609.45**	212	820.32
Persistency	2	599.03	212	579.74
Calving interval (days)	2	155255.33**	182	24167.96
Birth weight (kg)	2	20.95	134	9.46
Number of lactations	2	6.46	134	3.21

**Significant at P<0.01.

Days to attain peak yield

Days to attain peak had a significantly (P<0.01) negative correlation with persistency. The findings indicated that sooner peak yield is obtained automatically persistence period would be for a longer period. The correlation of days to attain peak with temperature maximum (P<0.01), rainfall (P<0.05) and wind speed (P<0.05) was significant and negative, while correlations with relative humidity (evening) (P<0.05) and evaporation (P<0.01) were negatively significant.

Persistency

Correlation of persistency with maximum temperature and rainfall (P<0.01) was significant and positive, while correlations with relative humidity (P<0.05) and sunshine (P<0.01) was negatively significant.

Lactation milk yield

Lactation yield had a significant (P<0.01) and positive correlation with relative humidity (Morning and Evening) and sunshine (P<0.01), while had significant (P<0.01) negative correlation with rainfall.

Table 4: Means for production and reproduction traits according to seasons.

Trait	Summer			Rainy			Winter			Overall		
	n	Mean	SE	n	Mean	SE	n	Mean	SE	n	Mean	SE
Lactation length (days)	35	317.31	11.95	63	314.35	12.78	76	347.42	14.92	174	329.39	8.39
Lactation milk yield (L)	17	1470.04[b]	136.03	38	1311.78[b]	111.68	50	1967.67[a]	76.33	105	1649.73	65.45
Days to attain peak yield	39	49.46[a]	5.43	93	31.43[b]	2.07	83	45.93[a]	3.71	215	40.30	2.02
Peak yield (L)	39	68.59	4.15	93	66.31	2.35	83	62.43	2.71	215	65.23	1.64
Calving interval (days)	32	510.81[a]	27.96	86	484.12[b]	15.03	67	574.28[a]	21.12	185	521.39	11.76
Birth weight (Kg)	23	32.3	0.65	76	32.45	0.37	38	31.18	0.44	137	32.07	0.27
No.of lactations	23	4.13	0.37	76	3.84	0.20	38	3.26	0.30	137	3.73	0.15

Means with same superscript do not differ significantly (P<0.05).

*Significant (P<0.05); **Significant (P<0.01).

Table 5: Phenotypic correlations among the environmental effects, production and reproduction traits.

Trait	Lactation length	Days to attain peak	Persis--tency	Lactation yield	Tmax	Tmin	Relative humidity (M)	Relative humidity (E)	Rain fall	Sun shine	Wind speed	Evapo-ration	Mean tempe-rature
LL	1.00	0.02	0.05	0.78**	0.11	-0.01	0.01	-0.06	-0.17**	0.23**	-0.01	0.00	-0.04
DAP	0.02	1.00	-0.19**	-0.02	-0.30**	0.06	0.02	0.15*	-0.14*	0.03	-0.15*	0.17**	0.12
Persistancy	0.05	-0.19**	1.00	0.18	0.15*	0.04	-0.02	-0.15*	0.25**	-0.24**	0.11	0.04	-0.12
LY	0.78**	-0.02	0.18	1.00	0.01	-0.01	0.19**	0.19**	-0.29**	0.42**	-0.06	-0.58	0.04
Tmax	0.11	-0.30**	0.15*	0.01	1.00	0.27**	-0.25**	-0.32**	0.29**	0.07	-0.33**	0.40**	0.17**
Tmin	-0.01	0.06	0.04	-0.01	0.27**	1.00	-0.33**	0.16**	0.44**	-0.35**	-0.29**	0.36**	0.39**
RH(M)	0.01	0.02	-0.02	0.19**	-0.25**	-0.33**	1.00	0.46**	0.01	0.43**	0.53**	-0.39**	-0.47**
RH(E)	-0.06	0.15*	-0.15*	0.19**	-0.32**	0.16**	0.46**	1.00	0.02	0.22**	-0.19**	-0.31**	0.49**
RF	-0.17**	-0.14**	0.25**	-0.29**	0.29**	0.44**	0.01	0.02	1.00	-0.76**	0.28**	-0.03	-0.09
SS	0.23**	0.03	-0.24**	0.42**	0.07	-0.35**	0.43**	0.22**	-0.76**	1.00	-0.17**	-0.01	0.00
WS	-0.01	-0.15*	0.11	-0.06	-0.33**	-0.29**	0.53**	-0.19**	0.28**	-0.17**	1.00	-0.63**	-0.89**
E	0.00	0.17**	0.04	-0.58	0.40**	0.36**	-0.39**	-0.31**	-0.03	-0.01	-0.63**	1.00	0.31**
MT	-0.04	0.12	-0.12	0.04	0.17**	0.39**	-0.47**	0.49**	-0.09	0.00	-0.89**	0.31**	1.00

*Significant (P<0.05); **Significant (P<0.01).

SUMMARY

The production and reproduction traits of 164 graded Murrah buffaloes and the effect of season, pertaining to Dairy Experimental Station, Rajendranagar, Hyderabad were analyzed. All the meteorological parameters were significant between the seasons. Lactation yield, days to attain peak and calving interval were highly significant between the seasons. The correlations among meteorological parameters and production and reproduction traits were significant.

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