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STUDY OF GROWTH PERFORMANCE AND MILK PRODUCTION TRAITS IN DHARWADI BUFFALO

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ABSTRACT

Dharwadi buffalo is a medium sized buffalo found in state Karnataka of Republic of India. Average body weight (BW, Kg), body length (BL, cm), height at withers (HW, cm) and chest girth (CG, cm) of Dharwadi she buffalo were 337.12±1.76, 114.71±0.28, 124.86±0.25 and 177.97±0.37, respectively. The average BW, BL, HW and CG at 2 to 3 months of age were 31.53±0.34, 67.69±0.50, 74.05±0.57 and 85.10±0.76, respectively in male and 31.22±0.37, 66.06±0.37, 74.20±0.38and 78.38±0.54, respectively in female. The average 305 days total milk yield was 1,041±14.04 litres and average peak yield was 6.18 litres attained on the 19th day of lactation.

Keywords: *Bubalus bubalis*, buffaloes, Dharwadi, length, weight, height

INTRODUCTION

India is a top producer of milk in the world. Total milk production is 146.3 million tons and per capita availability of milk is 322 g/ day (DAHDF, 2014). Uttar Pradesh has highest buffaloes population with share of 28.17% and Karnataka ranks at 10th position with share of 3.19% t (DAHDF, 2012).

Though, Popular breeds of buffaloes in India are thoroughly evaluated for their production performance, there are some buffaloes more popular in their breeding tract like Dharwadi which is less studied. Dharwadi buffaloes was recognized recently as a breed by ICAR breed Registration Committee, New Delhi, India during August 2021 (Accession number: INDIA_BUFFALO_0800_ DHARWADI_01018). In view of this, the present study was undertaken in Dharwadi buffaloes before it was recognized as a breed to analyse morphometric traits and to estimate lactation milk

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yield, peak milk yield and persistence in lactation using test day milk yields.

MATERIALS AND METHODS

Sample data from the recordings made under the Project 'Characterization of Dharwadi buffalo' by National Bureau of Animal Genetic Resources, Karnal (Haryana state, India) and the Department of Animal Science, University of Agricultural Sciences, Dharwad (Karnataka State, India) was used for study. The body measurement of 177 male calves, 159 female calves and 777 adult she buffaloes was used for the study. The data on buffalo calves were classified according to sex and further, within the sex the data was classified into three different Age groups, *viz*. 0 to 1, 1 to 2, 2 to 3 months. The data was analyzed using standard formulae (Snedecor and Cochran, 1989). Group differences were detected using "t Test".

Body weight of adult buffaloes was estimated using Shaffer's formula ($W = LG^2/ 300$ where, W: Weight of the animal is expressed in pounds, L: Length of the animal from point of shoulder to point of buttock in inches and G: is the chest girth of the animal in inches), which is an indirect method of estimating the body weight from body length and heart girth measurements.

For milk production analysis, test-day milk yield was taken. Test-day yield refers to the monthly milk measurements performed for 10 test days (TD1 to TD10). Each test-day milk yield is the sum of two times milking (morning and evening), recorded in a particular test date and expressed as litres per day. From Test-day milk yield, 305 days total milk yield was calculated using the following formula as per International Agreement of Recording Practices of International Committee for Animal Recording (ICAR, 2003).

$$LMY = I_0M_1 + I_1\frac{(M_1 + M_2)}{2} + I_2\frac{(M_2 + M_3)}{2} + \cdots + I_{n-1}\frac{(M_{n-1} + M_n)}{2} + I_nM_n$$

Where,

$M_1, M_2, \ldots M_n$: Milk yield in 24 hours of the recording day (litres)

$I_1, I_2, \ldots I_n$: Interval between the recording dates (days)

I_0: Interval between lactation period starts day and first recording date (day)

I_n: Interval between the last recording date and 305th lactation (day)

RESULTS AND DISCUSSIONS

Body measurements in adult Dharwadi buffalo

The average measurements namely body length (cm), height at withers (cm) and chest girth (cm) along with estimated average body weight (kg) for adult Dharwadi buffaloes aged 4 to 6 years are given in Table 1. The average body length of adult Dharwadi buffaloes was 114.71±0.28 cm, which was similar to findings in Dharwari (Govindaiah and Rai, 1984) and Surti (Jogi and Patel, 1990) buffaloes. Dharwadi buffalo had shorter body length when compared to Mehsana (Pundir *et al*., 2000), Bhadwari (Pundir *et al*., 1997) and Nagpuri (Gubbawar *et al*., 2012) buffaloes.

The average height at withers of Dharwadi buffaloes was 124.73±0.27 cm. The height reported in the present study was similar to the earlier findings in Dharwari buffalo (Govindaiah and Rai, 1984). Further, the study revealed that the Dharwadi buffalo was as tall as Mehsana (Singh *et al*., 1995; Pundir *et al*., 2000) and Bhadwari (Pundir *et al*., 1997) buffaloes. The Dharwadi buffalo was

taller than Nagpuri buffalo (Gubbawar *et al*., 2012) and shorter than Nili-Ravi buffalo (Nivsarkar *et al*., 2000).

The average chest girth of adult female Dharwadi buffaloes was 177.97±0.37 cm. The chest girth obtained in the present study are similar to the values reported in buffaloes like Dharwari (Govindaiah and Rai, 1984), Bhadwari (Pundir *et al*., 1997), Nagpuri (Gubbawar *et al*., 2012). The chest girth recorded in Dharwadi buffalo in the present study was smaller when compared to those reported in *Nili-Ravi* buffalo (Nivsarkar *et al*., 2000).

The body weight of female Dharwadi buffalo was estimated using the Shaffer's formula. The estimated body weight was 337.12±1.76 kg. Female Dharwadi buffalo body weight was similar to Surti (Taneja, 1999) and Nagpuri (Nandedkar, 2002) buffaloes. The Dharwadi buffalo had lower body weight when compared to Mehsana (Pundir *et al*., 2000) and Nagpuri (Gubbawar *et al*., 2012) buffaloes.

Body measurements in Dharwadi buffalo calves

Average body weight (kg) and body measurements (cm) for Dharwadi buffalo calves at different age groups are presented in Table 2. The average body weight, body length, height at withers and chest girth in male calves aged 2 to 3 months were 31.53±0.34, 67.69±0.50, 74.05±0.57 and 85.10±0.76, respectively, while respective values in female calves were 31.22±0.37, 66.06±0.37, 74.20±0.38 and 78.38±0.54, respectively. The statistical analysis of these data revealed significantly broader chest girth ($P<0.01$) and longer body length ($P<0.05$) in male than female calves. The values of body weight and height at withers were statistically similar in male and female calves of Dharwadi buffalo. The Dharwadi buffalo male calves at 3 months of age had lower weight when compared to Surti buffaloes (Sorathiya *et al*., 2009; Pandya *et al*., 2015).

Statistical analysis of body weight and body measurement traits in 1 to 2 months old Dharwadi buffalo calves revealed significantly higher height at withers ($P<0.05$) and chest girth ($P<0.01$) in males than female calves. Interestingly, the same 1 to 2 months old female Dharwadi buffalo calves had significantly higher body weight ($P<0.05$) than male calves. Similarly, the statistical analysis of body weight and body measurement traits in 0 to 1 months old Dharwadi buffalo calves revealed significantly higher chest girth ($P<0.05$) in males than female calves and values of all other traits were statistically similar among male and female Dharwadi buffalo calves.

Lactation milk yield and peak milk yield

The estimated 305 days total milk yield for different parities and average 305 days total milk yield per lactation is presented in Table 3. The average 305 days total milk yield estimated as per International Agreement of Recording Practices of International Committee for Animal Recording was 1,030±14.12 litres in Dharwadi buffaloes. This estimated average lactation milk yield in Dharwadi buffalo was comparatively higher than that was reported in the same breed by Govindaiah and Rai (1984). The milk production of Dharwadi buffaloes is in the same range as that recorded in Surti buffalo (Govindaiah and Rai, 1987; Tailor *et al*., 1992).

Average peak milk yield observed in Dharwadi buffaloes was 6.18 litres and the days to attain this peak yield were 19. The peak milk yield observed in Dharwadi buffaloes was comparatively lower than that observed in Murrah (Chhikara *et al*., 1998; Dass and Sadana, 2000), Surti (Patel,

Table 1. Body measurements of Dharwadi buffaloes (N=777).

Parameter	Mean ± SE
Body length (cm)	114.71±0.28
Height at withers (cm)	124.86±0.25
Chest girth (cm)	177.97±0.37
Body weight (Kg)	337.12±1.76

Table 2. Body weight (kg) and body measurement (cm) of different age groups of Dharwadi buffalo calves.

Parameter	0 to 1 month		1 to 2 months		2 to 3 months	
	Male (N=46)	Female (N=60)	Male (N=69)	Female (N=49)	Male (N=62)	Female (N=50)
Body weight (Kg)	25.00±0.37	25.17±0.23	27.52*±0.35	28.80*±0.37	31.53±0.34	31.22±0.37
Body length (cm)	61.70±0.37	61.27±0.29	64.17±0.44	64.18±0.38	67.69*±0.50	66.06*±0.37
Height at withers (cm)	67.80±0.63	66.71±0.46	71.35*±0.55	69.65*±0.46	74.05±0.57	74.20±0.38
Chest girth (cm)	73.54*±0.72	71.46*±0.51	78.08**±0.61	75.76**±0.56	85.10**±0.76	78.38**±0.54

**Significant at P<0.01 and *significant at P<0.05.

Table 3. 305 days total milk yield (litres) in Dharwadi buffaloes.

Parity	305 days total milk yield (litres)
I	991±33.09
II	1,014±23.88
III	1,071±23.76
IV	1,072±35.75
Average	1,030±14.12

1992), Mehsana (Singh *et al*., 1986) and Nagpuri (Sirothia *et al*., 2004) buffaloes. Average days to attain peak yield in Dharwadi buffalo was 19th day which was comparatively earlier than in Murrah (Chhikara *et al*., 1998), Surti (Govindaiah and Rai, 1986; Biradar, 1990) and Mehsana (Singh *et al*., 1986) buffaloes. The probable reason for Dharwadi buffaloes attaining peak yield early was that most of the calvings took place in winter and had lot of green fodder immediately after calving. Earliyieldsyieldsports shows that peak milk yield and days to attain peak yield were significantly affected by season of calving in Murrah buffaloes with high peak yield in winter than monsoon season (Chhikara *et al*., 1998).

Persistency of lactation

Study on persistency of lactation using ANOVA showed that there was non-significant difference between average test day milk yields during first 4 months and then there was significant reduction in test day milk yields in subsequent months indicating that milk yield remained same during the first 4 months of lactation and slowly declined in 5th, 6th and 7th month and followed by rapid decline in subsequent months. Similar to present study in Dharwadi buffaloes, Chakraborty *et al*. (2010) had reported that milk yield remained same for five months and sharp decline in subsequent months in Murrah buffaloes.

CONCLUSIONS

Dharwadi buffaloes are medium sized buffaloes with linear body measurements (cm) namely body length, height at withers and chest girth as 114.71±0.28, 124.73±0.27 and 177.97±0.37, respectively. Estimated average body weight of Dharwadi buffaloes was 337.12±1.76 kg. They are good producer of milk with an average 305 days total milk yield of 1,041±14.04 litres and average peak yield 6.18 litresattained on the 19th day of lactation. The milk yield remained same during the first 4 months of lactation and showed decline in 5th, 6th and 7th month and followed by rapid decline in subsequent months.

REFERENCES

Biradar, U.S. 1990. Factors affecting peak yield and days to attain peak yield in Surti buffaloes. *Indian J. Dairy Sci*., **43**(1): 32-34.

Chakraborty, D., S.S. Dhaka, B.L. Pander, A.S. Yadav, S. Singh and P.K. Malik. 2010. Prediction of lactation milk yield from test day records in Murrah buffaloes. *Indian J. Anim. Sci*., **80**(3): 244-245.

Chhikara, S.K., N. Singh and S.S. Dhaka.1998. Effect of some non-genetic factors on peak yield and days to attain peak yield in Murrah buffaloes. *In Proceedings of the 6th World Congress on Genetics Applied to Livestock Production*, Armidale, Australia. p. 481-484.

DAHDF, Department of Animal Husbandry, Dairying and Fisheries. 2012. *The 19th Livestock Census-2012 All India Report*, Ministry of Agriculture, Government of India, KrishiBhawan, New Delhi, India.

DAHDF, Department of Animal Husbandry Dairying and Fisheries. 2014. *Annual Report 2014*. Ministry of Agriculture, Government of India, KrishiBhawan, New Delhi, India.

Dass, G. and D.K. Sadana. 2000. Factors affecting some economic traits in Murrah buffaloes. *Indian J. Anim. Res*., **34**(1): 43-45.

Farate, N.A., R.P. Barbind, R.L. Korake and S.S. Bhutkari. 2012. Study of linear body measurement and body weight of Marathwadi buffalo. *Vet. Sci. Res. J.*, **3**(1&2): 20-22. Available on: https://connectjournals.com/file_html_pdf/1587201H_3_20-22_A.pdf

Gavit, D.P., R.P. Barbind, R.L. Korake and P.R. Mule. 2013. Studies on linear body measurement of Marathwadi buffalo on field scale. *Research Journal of Animal Husbandry and Dairy Science*, **4**: 10-12. Available on: https://researchjournal.co.in/upload/assignments/4_10-12-33.pdf

Govindaiah, M.G. and A.V. Rai. 1984. *Preliminary Studies on Milk Yield Potentialities of Dharwad Buffaloes*. National Dairy Research Institute (Deemed University) Karnal, Haryana, India.

Govindaiah, M.G. and A.V. Rai. 1986. Effect of month of calving on lactation parameter in Surti buffaloes. *Indian J. Anim. Sci.*, **39**: 226-230.

Gubbawar, S.G., R.R. Shelke, S.D. Chavan. and S.R. Pohare. 2012. Phenotypic characteristics of Gaolao strain of Nagpuri buffalo breed. *Asian J. Anim. Sci*., **7**(1): 6-14. Available on: https://researchjournal.co.in/upload/assignments/7_6-14.pdf

ICAR, 2003. *International Agreement of Recording Practices*, International Committee for Animal Recording, Interlaken, Switzerland.

Jogi, R.V.K. and U.G. Patel. 1990. Various body measurements and their correlation with milk yield and fat percentage: 2. studies on Surti buffaloes. *Buffalo Bull*., **9**(2): 35-38. Available on: https://kukrdb.lib.ku.ac.th/journal/BuffaloBulletin/search_detail/result/285850

Nandedkar, P.V. 2002. *Study of some morphometric traits of Nagapuri (Berari) buffaloes under field conditions*. M.V.Sc. Thesis, Maharashtra Animal and Fishries Sciences University, Nagpur, India.

Nivsarkar, A.E., P.K. Vij and M.S. Tantia. 2000. *Animal Genetic Resources of India: Cattle and Buffalo*. Directorate of Information and Publications of Agriculture, Indian Council of Agricultural Research, New Delhi, India.

Pandya, G.M., C.G. Joshi, D.N. Rank, V.B. Kharadi, B.P. Bramkshtri, P.H. Vataliya, P.M. Desai and J.V. Solanki. 2015. Genetic analysis of body weight traits of Surti buffalo. *Buffalo Bull*., **34**(2): 189-196. Available on: https://kukrdb.lib.ku.ac.th/journal/BuffaloBulletin/search_detail/result/310295

Patel, A.K. 1992. *Evolving selection criteria for the genetic improvement of Surti buffaloes*. Ph.D. Thesis, National Dairy Research Institute (Deemed University) Karnal, Haryana, India.

Pundir, R.K., R.V. Singh, P.K. Vij, R.K. Vijh and A.E. Nivsarkar. 1997. *Characterisation of Bhadawari buffaloes*. National Bureau of Animal Genetic Resources, Karnal, India.

Pundir, R.K., G. Sahana, N.K. Navani, P.K. Jain, D.V. Singh, S. Kumar and A.S. Dave. 2000. Characterization of Mehsana buffaloes in India. *Anim. Genet. Resour.*, **28**: 53-62. DOI: 10.1017/S101423390000136X

Singh, D.V., V.N. Tripathi and A.S. Dave. 1995. Studies on morphological traits in Mehsana buffalo cows. *Indain J. Dairy Sci*., **48**(1): 33-38.

Singh, K.P., G.M. Siddiquee, J.P. Patel and N.S. Radadia. 1986. Effect of non-genetic factors on production traits in Mehsana buffaloes.

Indian J. Anim. Res., **20**: 76-78.

Singh, S. and S.P Tailor. 2013. Prediction of 305 days first lactation milk yield from fortnightly test and part yields. *Indian J. Anim. Sci*., **83**(2): 166-169. DOI: 10.56093/ijans.v83i11.34785

Sirothia, A.R., N.H. Fuke, K.A. Sirothia, G. Singh, and P.K. Singh. 2004. *Final Report of Survey, Evaluation and Characterization of Nagpuri Buffalo*. National Bureau of Animal Genetic Resources, Department of Animal Genetics and Breeding, Nagpur Veterinary College, Maharashtra Animal and Fisheries Sciences University, Maharashtra, India.

Snedecor, G.W. and W.G. Cochran. 1989. *Statistical Methods*, 8th ed. Iowa State University Press, Ames, Iowa, USA.

Sorathiya, L.M., A.B. Fulsoundar and V.B. Khadri. 2009. Environmental and genetic effect on body weight in Surti buffalo calves. *Indian J. Anim. Sci*., **79**(11): 1176-1177.

Tailor, S.P., L.S. Jain and M. Tusavara. 1992a. Analysis of milk yield, lacation length, and dry period Surti buffalo. *J. Anim. Sci*., **62**: 479.

Taneja, V.K. 1999. Dairy breeds and selection. *Excerpt from Smallholder Dairying in the Tropics*, International Livestock Research Institute, Nairobi, Kenya.