

Growth Based Strategy Formulation for Selection of Murrah Buffalo at Early Ages

Jay Prakash Gupta*, Gulshan Kumar Sachdeva, Ravinder Singh Gandhi, Rajesh Sudhakar Wakchaure, Atish Kumar Chakravarty

National Dairy Research Institute, Karnal, Haryana, India

(Received 30 Juli 2011/ Accepted 28 September 2011)

Abstract

Buffaloes form the backbone of farmers in Indian dairy industry. The birth weight and weight at different age of an animal characterizes expression of animals' genotype and serves as reliable aid to selection for efficient performance of livestock. The data on body weight were collected on 726 new born female calves and 642 male calves of livestock farm, NDRI, Karnal. Growth curves for both male and female buffalo calves were prepared by plotting mean of the body weight against age in weeks and Growth band were prepared by computing upper and lower limits of average body weights (95% confidence limit), from birth to 6 month of age, at weekly interval. The growth curves were found to be linear for both male and female buffalo calves. Growth band was narrow at the birth, but it goes on widening with age at successive weeks. The presentation of growth band is expected to be useful in making an efficient decision for proper management of animals at various ages.

Keywords: Murrah Buffaloes, Growth Curve, Growth Band

Introduction

Buffalo is the main dairy animal of Indian sub continent and India is regarded as a treasure house of world's best buffalo germplasm. Moreover, buffaloes form the backbone of the farmers in Indian dairy industry. The birth weight and weight at different age of an animal are important parameter of its life. Each of these characteristics is an expression of its genotype and serves as reliable aid to selection for efficient performance of livestock. It is expected that the animals growing faster in terms of body weight, may also initiate physiological functioning of reproduction and milk production, earlier. To a manager, the estimate of growth will help in satisfactory management of animals in the herd. Selection of calves on the basis of their growth parameters at an early age can be used as one of the selection criteria. Very scanty information is available on growth based selection in buffaloes. Fitting of growth curves and construction of growth bands can be used effectively for select-

ing the calves at early ages. The growth band is expected to be useful as an aid in making efficient decision for proper selection and management of the animals at early age. The present study will help to formulate suitable evaluation procedures especially at field level for improvement in the economic rearing of this breed.

Materials and methods

The data used in the present study were collected from weight registers of Murrah buffalo herd maintained at the farm of National Dairy Research Institute (NDRI), Karnal, India. All available data on body weight starting from birth to 6 month of age (weekly interval) were recorded. Body weight data was collected on 726 new born female calves and 642 male calves, born during 1993 to 2007 at livestock farm of NDRI, Karnal.

Growth curves for both male and female buffalo calves were prepared by plotting mean of the body weight against age in weeks. Growth band were prepared by computing upper and lower limits of average body weights (95% confidence limit), from birth to 6 month of age, at weekly interval.

Upper limit = $W_i + 2 SD_i$

*Corresponding author: Jay Prakash Gupta
Address: Division of Animal Genetics, Indian Veterinary Research Institute, Izatnagar, Bareilly-243122 (UP)
E-mail address: drgulshanksachdeva01@gmail.com

Lower limit = $W_i - 2 SD_i$

Where,

W_i = Average body weight at i th age.

SD_i = Standard deviation of the body weight at the i th age.

The upper and lower limits were plotted against age, separately for both the sexes and the band between the curve of the upper limits and curve of the lower limits constituted the growth band.

Results

Growth curves:

Growth curves can describe the entire growth process in terms of a few parameters having a biological interpretation (Agustín Blasco et al., 2003). The growth curves were found to be linear for both male and female buffalo calves. The growth curve depicted in the Figs.1 & 2 represents the averages of body weight at different weeks for male and female buffalo calves respectively. The developed growth curves were found to be similar to those developed by Nautiyal and Bhat (1977) in Murrah and Nili-Ravi buffalo calves, Sharma and Basu (1984) in Nili buffaloes and Kirmani *et al.* (1985) in Murrah buffalo calves. Growth curves can be applied in determining food requirement so as to get desired growth (Kulluru, 2000). The results indicated that the linear curve based upon unadjusted data of weekly body weight up to 26 weeks of age gave better fit. However, the prediction of adult body weight using nonlinear functions can be accurate when growth curve parameters and their (co)variance components are estimated jointly (Forni *et al.*, 2009).

Linear equations obtained were:

$$y = 2.8959x + 27.695 \quad (R^2 = 0.99) \text{ in males,}$$

$$y = 2.7894x + 25.744 \quad (R^2 = 0.99) \text{ in females.}$$

Where,

Y = Body weights in Kg.

X = Age in weeks.

Accuracy of these developed linear equations was estimated to be approximately 99%.

Growth bands:

It would normally be expected that at a given age, some of the animals would have body weights above the growth curve and other animals would have body weights below the growth curve. These

expectations are made under the assumption that the body weights of animals at a given age are normally distributed. Thus the growth curves do not tell much about the fact whether an animal is “overweight” or “underweight” at a given age. Therefore, at 95 % (i.e. \pm twice Standard deviation) confidence interval of the body weights at various ages ranging from 0 to 26 weeks of age, at weekly interval was computed separately. The band between the curves of upper limits and lower limits constituted the growth band. These growth bands of males and females are presented separately (Fig. 3 & 4).

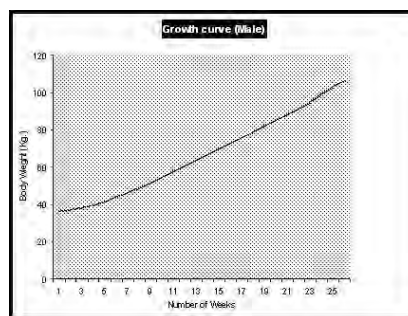


Fig. 1. Growth curve (Male)

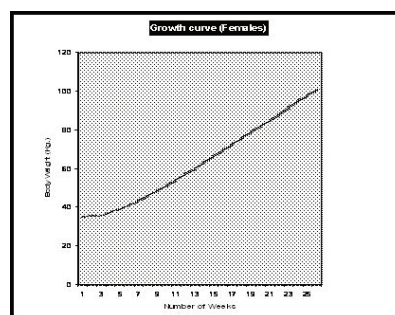


Fig. 2. Growth curve (Female)

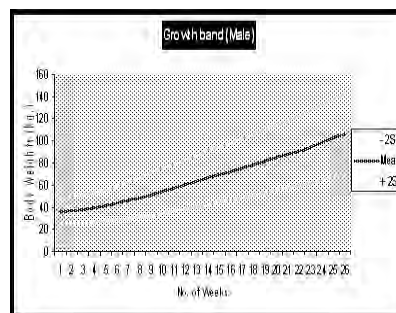


Fig. 3. Growth band (Male)

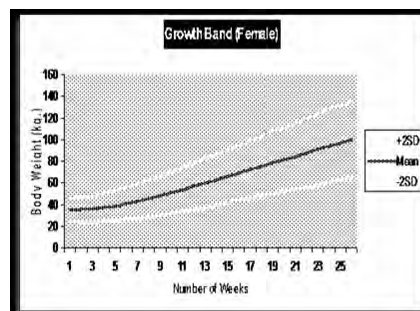


Fig. 4. Growth band (Female)

Discussion

It can be seen from the figures that the growth band is narrow at the birth, but it goes on widening with age at successive weeks. The present finding was in agreement with those of Singh (1978) in Brown-Swiss crossbreds. This may be due to increase in the variance of body weights at successive ages which may be attributed due to the larger role of environment. Pribyl *et al.* (2008) also found that the variance increases with the age of the animals.

The presentation of growth band is expected to be useful in making an efficient decision for proper management of animals at various ages, i.e. suppose an animal is falling below the lower limit of growth band, it would be expected to be an abnormally "underweight" calf and improved management in terms of individual feeding and care of such a calf would be warranted. If the improved care and feeding management of any such abnormal female calves does not improve the body weight within the reasonable time, and if body weight of such animal do not come in the range of growth band, the farm manager may decide to cull such animal, because individual rearing of such an animal will result in will result in great economic loss.

In a manner similar to above if body weight of animal, at a given age, is greater than the upper limit of the growth band, which could indicate that such an animal, may be overeating and so is "overweight" animal. The cost of feeding can be reduced by reducing the feed availability to such an "overweight" animal. If the weight of such an animal continues to be above growth band range this would indicate that such an animal has genetically fattening tendency and that such an animal may not be of dairy type and could be profitably culled for the beef purpose. The above results and interpretation of this need to be further fortified by investigations on the relevance of upper and lower limits of the growth bands on mortality, reproductive and productive performances. For example, animal below the growth band would be expected to be highly susceptible to disease and there would be higher mortality among such animals. Even if such animal survives, it would be expected that age at first calving will be high and milk production performances will be low. Similarly animals above the growth band range are expected to have proper reproductive efficiency and being non dairy type are

expected to have lower milk production.

Conclusion

The present study was based upon the data comprised of weekly body weights of both male and female Murrah buffalo calves from birth to six month of age at weekly interval. Growth curves were found to be linear for both male and female Murrah buffalo calves up to age of six month. Growth band constructed for both male and female buffalo calves showed gradual widening with advancement of age. Gradual widening of growth band indicates higher variance in body weight with advancement of age. Concept of growth band can suitably be applied in economic management of farm.

Acknowledgement

We thank the Director, National Dairy Research Institute, Karnal, for providing necessary facilities and ICAR for financial support in carrying out this research work.

References

- Balasco, A., Piles, M., Varona, L., 2003. A Bayesian analysis of the effect of selection for growth rate on growth curves in rabbits. *Genetics Selection Evolution* 35, 21-41
- Forni, S., Piles, M., Balasco, A., Varona, L., Oliveira, N.H., Lobo, R.B., Albuquerque, L.G., 2009. Comparison of different nonlinear functions to describe Nelore cattle growth. *Journal of Animal Science* 87, 496-506.
- Kirmani, S.M.S., Rao, G.N., Sharma, P.L.N., 1985. A note on the body weights from birth to two years of age in graded Murrah buffaloes. *Indian Veterinary Journal* 62, 619-621.
- Kolluru, R., 2000. On some aspects of growth patterns of crossbred cattle. Unpublished MSc. Thesis, Indian Agricultural Research Institute, New Delhi.
- Nautiyal, L.P., Bhat, P.N., 1977. Growth curve in Indian buffaloes. *Indian Journal of Animal Sciences* 47(9), 517.
- Pribyl, J., Krejčová, H., Příbylova, J., Míšťal, I., Tsuruta, S., Mielenz, N., 2008. Models for evaluation of growth of performance tested bulls. *Czech Journal of Animal Sciences* 53 (2), 45-54.
- Sharma, A., Basu, S.B., 1984. Genetic architecture of Nili buffaloes. 1. Growth. *Indian Veterinary Journal* 61, 227-232.
- Singh, D., 1978. Growth bands of Brown-Swiss crossbred cattle. MSc. Thesis, Kurukshetra University, Kurukshetra, India.