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Prediction of age and body weight by linear muzzle measurements in Karan Fries crossbred cattle

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There are several methods in vogue to predict the age and production performance of dairy animals. But none of them is foolproof as there is scope for tampering and misuse. Moreover, their application is limited to organized farms. It is very difficult for the dairymen and farmers to adopt such methods because of certain limitations. Therefore, to overcome the related limitations, study of the measurements of muzzle can be used as an easy method of predicting the age of individuals in a species and further solving the vetero-legal cases in forensic science. In Indian condition, where, in most of the cases animal records are absent, age determination in animals is difficult. The prediction of age is important, as the life span of farm animals is relatively short. Also, the optimum age of animals at which productive performance remains on peak, declines with the advancement of age.

Therefore, muzzle measurements, which can easily be recorded, can be tried for predicting the body weights at various age groups (Gilbert *et al.* 1993). The first thing, which strikes our mind, is why we should go for the muzzle measurements? It is so because it is easy to obtain. Further, it provides closer supervision of animals by which a farmer or manager can study their animals perfectly. Muzzle measurements can be used for determining the age of cattle up to the age of 3 years (Pandey 1981). Muzzle measurements can also be used in an unorganized herd (Pandey 1982).

The muzzle measurement has tremendous practical importance in the field of animal husbandry. However, very less effort has been made to use the findings on this subject in the field of animal science. The reason may be due to the lack of extensive scientific study on the muzzle patterns on animals. Therefore, keeping in view of the above points, the objective of the experiment was to find the accurate and reliable method for prediction of age and body weight of Karan Fries cattle on the basis of muzzle measurements.

Present investigation was conducted on 276 Karan Fries (Holstein-Friesian crossbred) cows maintained at Cattle Yard of the National Dairy Research Institute, Karnal. The linear muzzle measurements of Karan Fries cows of different categories (day old to till the completion of fourth lactation) were taken as suggested by Mishra (1994) and Singh and Patel (2001).

(a) Basal length (X_1): It is the distance between right and left length of the base of muzzle, (b) Upper length (X_2): It is the distance of the upper part of muzzle covering the black area in length, (c) Central length (X_3): It is the distance between the centre of upper line of muzzle and centre of basal line of the muzzle, (d) Distance between nostrils (X_4): It is the distance between two nostrils. It is also called as muzzle width or muzzle span, (e) Muzzle length (X_5): It is the distance between the base (bottom) line and the peak curve of the upper (top) line, (f) Muzzle area (X_6): It is the length of muzzle multiplied by the muzzle width.

The records of the Karan Fries cows of known pedigree and with normal lactation were included in the present study. A normal lactation was considered as one, which was at least 100 days long and the cows have calved and dried under normal physiological conditions.

Statistical analysis: The degree of association between two different variables / traits was estimated by calculating the correlation coefficient (Steel and Torrie 1981). Only significantly correlated traits were used for development of regression model.

Correlation of muzzle measurements with age and body weight

The correlations of age and body weight with various muzzle measurements, viz., basal length, upper length, central length, muzzle span, muzzle length and muzzle area in Karan Fries cows have been described in Table 1 and were found to be significantly positive ($P<0.05$).

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Table 1. Correlation coefficients of age and body weight with various linear muzzle measurements in Karan Fries cattle

Particular	No. of observations	Muzzle measurements					
		Basal Length	Upper Length	Central Length	Muzzle Span	Muzzle Length	Muzzle Area
Age	276	0.79**	0.87**	0.86**	0.81**	0.83**	0.85**
Body weight	276	0.89**	0.94**	0.91**	0.90**	0.93**	0.94**

**, P<0.01.

Prediction equation for age determination

Simple regression equations

Since, there were varying magnitudes in increase of various muzzle measurements with the advancement of age, the various regression equations were developed for determining the age (Y_1).

	R^2 Value (%)
$Y_1 = (-1941.73) + 43.19\ X_1$	61.94
$Y_1 = (-2110.72) + 37.38\ X_2$	75.62
$Y_1 = (-1608.53) + 34.44\ X_3$	66.59
$Y_1 = (-1842.72) + 68.58\ X_4$	65.08
$Y_1 = (-1714.98) + 39.11\ X_5$	68.80
$Y_1 = (-652.17) + 0.55\ X_6$	72.34

Multiple regression equation

To increase the reliability of prediction equation, multiple regressions were fitted by including all the muzzle measurements (basal length, upper length, central length, muzzle span, muzzle length and muzzle area). The multiple regression equation is as follows with its R^2 value:

$Y_1 = 1194.81 + (-0.10)\ X_1 + 38.69\ X_2 + (-5.76)\ X_3 + (-91.55)\ X_4 + (-50.19)\ X_5 + 1.42\ X_6$

$R^2 = 80.88\ \%$

The significant magnitude (P<0.01) of correlation coefficients of age with various muzzle measurements in KF cattle indicated the parallel increase in various muzzle measurements to the age of animal. Similar findings on age with muzzle measurements were also reported by Mishra *et al.*, (1997), Mishra and Dave (1989), Singh *et al.* (1997) and Singh (1998) in Holstein-Friesian × Tharparkar crossbred animals, while Yadav (1991) observed the similar type of trend in crossbred calves up to 6 months of age. Similar reports were found by Singh (1998) in crossbreds, Jersey, Holstein-Friesian, Gir, Kankrej cattle and Surti and Jaffarabadi buffalo. Similar reports by Jain (2001) showed that association of age with muzzle print in crossbred calves up to the age of 90 days was significant (P<0.01).

Prediction equations for body weight determination

Simple regression equations: Since, there were varying magnitudes in increase of various muzzle measurements with the advancement of body weight, the various regression equations were developed for determining the body weight (Y_2).

	R^2 Value (%)
$Y_2 = (-348.87) + 8.90\ X_1$	78.95
$Y_2 = (-357.63) + 7.399\ X_2$	88.78
$Y_2 = (-278.84) + 7.08\ X_3$	84.47
$Y_2 = (-319.37) + 13.93\ X_4$	80.59
$Y_2 = (-298.45) + 8.00\ X_5$	86.70
$Y_2 = (-75.29) + 0.11\ X_6$	87.96

Multiple regression equation: To increase the reliability of prediction equation, multiple regressions were fitted by including all the muzzle measurements (basal length, upper length, central length, muzzle span, muzzle length and muzzle area). The multiple regression equation is as follows with its R^2 value:

$Y_2 = (-69.06) + (-0.04)\ X_1 + 4.27\ X_2 + 0.66\ X_3 + (-6.91)\ X_4 + (-2.32)\ X_5 + 0.12\ X_6$

$R^2 = 91.79\ \%$

The significant magnitude (P<0.01) of correlation coefficients of body weight with various muzzle measurements in Karan Fries cattle indicated the parallel increase in the various muzzle measurements to the body weight of animal. Being a new approach, the references were not available on the relationship between muzzle measurements and body weight in dairy animals

Muzzle measurements are better predictor of body weight (R^2 = 91.79%) than that of age (R^2 = 80.88%). Also, except basal length other linear muzzle measurements (upper length or muzzle length or muzzle span) can alone be used for prediction of body weight, as there is not much appreciable improvement in R^2 value by multiple regression equations.

SUMMARY

The present study was conducted on 276 Karan Fries cows of different categories maintained at Cattle Yard, National Dairy Research Institute, Karnal, Haryana, to predict the age, body weight of Friesian crosses by muzzle measurement technique. Various muzzle measurements [basal length (X_1), upper length (X_2), central length (X_3), muzzle span (X_4), muzzle length (X_5) and muzzle area (X_6)] were taken. The correlations of age and body weight with all muzzle measurements were significantly positive (P<0.01) and muzzle measurements are better predictor of body weight (R^2 = 91.79%) than that of age (R^2 = 80.88%).

Multiple regression equation for prediction of age (Y_1) was:

$Y_1 = 1194.81 + (-0.10)\ X_1 + 38.69\ X_2 + (-5.76)\ X_3 + (-91.55)$

$X_4 + (-50.19) X_5 + 1.42 X_6$

$R^2 = 80.88\ \%$

Multiple regression equation for prediction of body weight (Y_2) was:

$Y_2 = (-69.06) + (-0.04) X_1 + 4.27 X_2 + 0.66 X_3 + (-6.91) X_4 + (-2.32) X_5 + 0.12 X_6$

$R^2 = 91.79\ \%$

REFERENCES

Gilbert R P, Bailey D R C and Shannon N H. 1993. Body dimensions and carcass measurements of cattle selected for post-weaning gain fed two different diets. *Journal of Animal Science* **71**: 1688–98.

Jain M K. 2001. Age determination in crossbred calves using different techniques. *Indian Journal of Animal Sciences* **71**(11): 1058–61.

Mishra R, Singh V P and Singh N P. 1997. Determination of age by dermatoglyphics of muzzle in buffalo calves. *Indian Journal of Animal Production and Management* **13**(2): 109–11.

Mishra S. 1994. 'Studies on the characteristics of muzzle dermatoglyphics in dairy cattle and buffalo.' Ph.D. Thesis, National Dairy Research Institute (Deemed University), Karnal, India.

Mishra S and Dave B K. 1989. An investigation into age determination by muzzle printometry technique. *Indian Journal of Animal Production and Management* **5**(4): 140–45.

Pandey S N. 1981. Note on a comparative study of cattle and buffalo muzzle prints. *Indian Journal of Animal Sciences* **51**(3): 391–93.

Pandey S N. 1982. Note on muzzle printometry for determining age of cattle. *Indian Journal of Animal Sciences* **52**(11): 1102–04.

Singh N P. 1998. 'Identification, prediction of age and production performance in bovines using muzzle printometry technique.' Ph.D. Thesis, Gujarat Agricultural University, S.K. Nagar, Gujarat, India.

Singh N P. and Patel A M. 2001. Muzzle measurements and characteristics of Surti and Jaffarabadi buffalo and its applicability in predicting the age and production performance. *Indian Journal of Animal Sciences* **71**(11): 1062–65.

Singh N P, Singh V P, Belsare V P and Patel A M. 1997. Association of age, age of first calving and rest day milk yield with muzzle print. *Proceedings of National Symposium on Biotechnology in Animal Health and Production for Economic Development in Asia in respect to Global Scenario; Pune University Campus*. Pune, Maharashtra, Jan. 22-23, 1997, p.126.

Steel R G D and Torrie J H. 1981. *Principle and Procedure of Statistics: A Biometrical Approach*. 2nd edn., McGraw Hill Book Company.

Yadav P C. 1991. 'Muzzle printometry as a tool of age determination in cattle.' M.V.Sc. & A.H. Thesis, J.N.K.V.V., Jabalpur, Madhya Pradesh, India.