The Pharma Innovation Journal 2023; SP-12(12): 758-760

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; SP-12(12): 758-760

www.thepharmajournal.com
Received: 09-10-2023
Accepted: 12-11-2023

Siddhartha Sankar Sharma
Department of Animal Genetics & Breeding, College of Veterinary Science, Assam Agricultural University, Assam, India

Galib Uz Zaman
Department of Animal Genetics & Breeding, College of Veterinary Science, Assam Agricultural University, Assam, India

Arpana Das
Department of Animal Genetics & Breeding, College of Veterinary Science, Assam Agricultural University, Assam, India

Subimal Laskar
Department of Animal Genetics & Breeding, College of Veterinary Science, Assam Agricultural University, Assam, India

Bula Das
Department of Animal Genetics & Breeding, College of Veterinary Science, Assam Agricultural University, Assam, India

Arundhati Phookan
Department of Animal Genetics & Breeding, College of Veterinary Science, Assam Agricultural University, Assam, India

Corresponding Author:
Siddhartha Sankar Sharma
Department of Animal Genetics & Breeding, College of Veterinary Science, Assam Agricultural University, Assam, India

Prediction of adult body weight using body measurements in Nageswari ducks of Assam

Siddhartha Sankar Sharma, Galib Uz Zaman, Arpana Das, Subimal Laskar, Bula Das and Arundhati Phookan

Abstract
The purpose of this study was to predict 20 weeks body weight and adult body weight of 'Nageswari' duck of Assam from body measurements *viz*., shank length, body circumference and keel length by developing different linear and multiple regression equations. A total of 128 ducks comprising 22 male and 106 female reared traditionally were used for the study. Highest R^2 values of 97.89 and 98.59 percent were observed in the equation incorporating all the three body measurements to predict 20 week and adult body weight respectively. Thus, multiple regression equations that included a combination of these three linear body measurements are more suitable for predicting body weight of Nageswari duck populations.

Keywords: Linear body measurements, body weight, prediction equation, Nageswari duck

1. Introduction
Meat production from ducks can make a significant contribution in providing high-quality nutritional food needs and family duck farmers with limited capital contribute significantly to food security, poverty alleviation, and the ecologically sound management of natural resources [1]. Raising ducks, compared with that of chicken, has several advantages like lower replacement costs, reduced space requirements, lesser feeding, exigencies and higher disease resistance, tremendous market potential considering its elite nutrient make up and nearly organic system of production [2]. Asia is the leading continent in duck meat production with a share of 82.2 percent [1]. Duck meat is also a part of Indian cuisine, particularly in North East India. Body weight plays an important role in the determination of market price in farm animal [3]. The increase in body size or weight is one of the important criteria to select the ducks as meat animals [4]. Kabir *et al*. [5] reported that the relationship between body weight and shank length, a parameter of leg development, has important bearing on table quality of chickens. Prediction of the corresponding marketing weight using earlier live body performance traits would be profitable as a tool for saving feeding costs, which normally account for approximately 70 percent of total production cost in poultry production [6]. The regression equations have been developed to estimate body weight from body measurements by different researchers in different livestock and poultry species [7-12]. The usefulness of these regression models was to allow a fact evaluation of the body weight of an animal and in selection criteria [13, 14].

In the present investigation an attempt was made to predict 20 weeks body weight and adult body weight of 'Nageswari' duck, popularly known as 'Nagi', an important indigenous duck found only in a few areas of the Cachar and Karimganj districts of Assam using body measurements *viz*., shank length, body circumference and keel length by developing different linear and multiple regression equations.

2. Materials and Methods
Data from a total of 128 ducks comprising 22 male and 106 female Nageswari ducks belonging to Katigora Block of Cachar district and Ratabari Block of Karimganj district of Assam reared traditionally under free range system of management were used for the study. Linear as well as multiple regression equations were developed for the prediction of two important economic traits *viz*., 20 weeks body weight and adult body weight from shank length, body circumference and keel length and their reliability were tested by the statistic R^2 as per the method given by Steel *et al*. [15]. The form of regression equation used as follow:

$\hat{Y} = a + b_1 x_1 + b_2 x_2 + \text{----------} + b_n x_n$

Where,
$\hat{Y}$ = Predicted value of the dependent variable Y
A= Intercept
b_1----------b_2 = Partial regression coefficient
x_1----------x_2 = Records of the independent variables

3. Results and Discussion

In the present study, the R^2 value was obtained as 95.60 percent when only shank length (x_1) was included in the equation to predict 20 weeks body weight. While the R^2 value was obtained as 97.73 percent when two body measurements *viz*., shank length (x_1) and body circumference (x_2) were included in the prediction equation. However, the R^2 value was found to be highest (97.89%) when all the three body measurements *viz*., shank length, body circumference and keel length (x_3) were considered in the prediction equation to predict the body weight at 20 week of age in Nageswari duck of Assam. The developed linear and multiple regression equations considering all possible combinations along with R^2 values are given in Table 1.

Table 1: Linear and multiple regression equations for prediction of 20 week body weight using linear body measurements along with their coefficient of determination (R^2 values) in Nageswari ducks of Assam

Regression equation	R^2 value (%)
$\hat{Y} = -70.9114 + 198.6643\ x_1$	95.60
$\hat{Y} = -1989.6010 + 103.4539\ x_2$	93.14
$\hat{Y} = -366.6358 + 99.7554\ x_3$	84.13
$\hat{Y} = -921.1008 + 121.4512\ x_1 + 43.6351\ x_2$	97.73
$\hat{Y} = -182.1312 + 160.9069\ x_1 + 22.5434\ x_3$	96.44
$\hat{Y} = -1655.1310 + 77.9525\ x_2 + 28.8630\ x_3$	94.52
$\hat{Y} = -879.0790 + 112.2329\ x_1 + 38.7880\ x_2 + 10.6249\ x_3$	97.89

x_1: Shank length, x_2: body circumference, x_3: keel length

Prediction equations developed to predict adult body weight from body measurements are presented in Table 2.

Table 2: Linear and multiple regression equations for prediction of adult body weight using linear body measurements along with their coefficient of determination (R^2 values) in Nageswari ducks of Assam

Regression equation	R^2 value (%)
$\hat{Y} = -529.9896 + 270.1299\ x_1$	82.34
$\hat{Y} = -1674.3580 + 93.4235\ x_2$	97.89
$\hat{Y} = -866.3646 + 130.3851\ x_3$	78.97
$\hat{Y} = -1567.1000 + 50.9407\ x_1 + 79.2490\ x_2$	98.57
$\hat{Y} = -705.7348 + 181.1255\ x_1 + 46.9205\ x_3$	83.63
$\hat{Y} = 1652.0200 + 82.2647\ x_2 + 20.0987\ x_3$	98.37
$\hat{Y} = -1579.4900 + 42.0702\ x_1 + 78.5769\ x_2 + 5.6563\ x_3$	98.59

x_1: shank length, x_2: body circumference, x_3: keel length

Higher R^2 value (97.89%) was obtained while attempt was made to predict adult body weight based on body circumference (x_2). However, comparatively better R^2 values (98.57 and 98.59%) were obtained when shank length (x_1) and body circumference (x_2) as well as the three body measurements were used to predict adult body weight.

Ojedapo *et al*. [16] reported that body weight could be well predicted form the various body measurements like chest girth, keel length, body length and shank length with high coefficient of determination (R^2 values) ranging from 85 to 99 percent in commercial strain of chicken and agreed well with the present findings. On the other hand, Goswami [17] reported R^2 value as
32.37 percent to predict adult body weight of Khaki Campbell, desi and graded duck of Assam based on the combination of shank length, heart girth and keel length which is much lower than the present R^2 value. Negash [12] reported that shank length best predicted body weight in both male and female birds with 58.00 percent coefficients of determination in Ethiopian indigenous chicken. Combining shank length with other body measurements (body length, chest circumference, and shank circumference) generally improved the predictive power of the equation as reported by them.

Gouda *et al*. [10] conducted a study for the prediction of marketing weight at 12 weeks of age employing three early live body performance traits *viz*., keel length, breast girth and body weight at 2, 4 and 6 weeks of age and revealed that marketing weight appeared to be predictable from early live body performance traits especially with keel length in Sudani ducklings and body weight in Muscovy ducklings. A gradual increase in R^2 values from 84 to 91 percent was observed in their study when combining keel length with body weight at 2, 4 and 6 weeks to predict body weight at 12 week of age. Ologbose *et al.* [4] reported the values of the coefficient of determination (R^2) ranged from 88.60 to 97.00 percent and 81.80 to 90.30 percent in Muscovy and Mallard, respectively to predict body weight at 4 weeks from body measurements *viz*., body height, body length, breast circumference, thigh length, bill length, wing length and shank length, while the reported values ranged from 58.70 to 92.00 percent and 80.10 to 86.90 percent in Muscovy and Mallard respectively to predict body weight at 8 weeks.

Gueye *et al.* [18] opined that the circumference of chest and the body length are most suitable for the prediction of the body weight of indigenous chickens in Senegal, however Ogah [8] reported that chest circumference had the highest predictive power (R^2=55.8%) in live weight estimate while conducting study in indigenous guinea fowl. According to Ozoje and Mgbere [19] since the final body weight of an animal reflects the total of the weight of its component parts, predictive equations provides a readily available tool in estimating body weight, especially in rural communities and in the areas where standard weighing scales or balances are lacking or unavailable.

4. Conclusions

From the present study it may be concluded that body weight is directly influenced by body measurement traits like shank length, body circumference and keel length and 20 week body weight and adult body could be predicted with higher accuracy from these body measurement traits in Nageswari duck of Assam.

5. References

1. Ismoyowati, Sumarmono J. Duck production for food security. IOP Conf. Series: Earth and Environmental Science. 2019;372:012070. doi:10.1088/1755-1315/372/1/012070.
2. Joshi D, Azad AZ. Duck farming: Important aspects and complete management. Livestock & Poultry Middle East; c2021. Available from: https://livestockmiddleeast.com › Industry Updates. Accessed December 7, 2023.
3. Momoh OM, Kershima DE. Linear body measurements

as predictors of body weight in Nigerian local chickens. ASSET Series A. 2008;8:206-212.
4. Ologbose FI, Benneth HN, Ajayi FO. Breeds influence on growth ability and predicting body weight from linear body measurements of ducks at various ages. World News of Natural Sciences. 2020;29(3):282-289.
5. Kabir M, Oni OO, Akpa GN, Adeyinka TA. Heritability estimates and the interrelationships of body weight and shank length in Rhode Island Red and white chicken. Pakistan Journal of Biological Sciences. 2006;9(15):2892-2896.
6. Ravindran V. Poultry feed availability and nutrition in developing countries. In Poultry Development Review; c2013. p. 60-63. Rome, Italy: FAO.
7. Singh PN, Mishra AK. Prediction of body weight using conformation traits in Barbari goats. Indian Journal of Small Ruminant. 2004;10(2):173-178.
8. Ogah DM. *In vivo* prediction of live weight and carcass traits using body measurements in indigenous Guinea fowl. Biotechnology in Animal Husbandry. 2011;27(4):1827-1836.
9. Assan N. Bioprediction of body weight and carcass parameters from morphometric measurements in livestock and poultry. Scientific Journal of Review. 2013;2:140-150.
10. Gouda GF, Ali WAH, Ali KAA. Using early live body performance traits of ducks to predict marketing weight. Egyptian Poultry Science Journal. 2016;36(IV):895-904.
11. Lukuyu MN, Gibson JP, Savage DB, Duncan AJ, Mujibi FDN, Okeyo AM. Use of body linear measurements to estimate live weight of crossbred dairy cattle in smallholder farms in Kenya. Springer Plus. 2016;5:63. doi:10.1186/s40064-016-1698-3.
12. Negash F. Predicting body weight of Ethiopian indigenous chicken populations from morphometric measurements. Turkish Journal of Agriculture - Food Science and Technology. 2021;9(6):1138-1143.
13. Amao SR, Ojedapo LO, Sosina AO. Effect of strains on some growth traits of meat type chickens reared in derived savanna environment of Nigeria. Journal of Agriculture and Veterinary Sciences. 2010;2:56-64.
14. Ojedapo LO, Adedeji TA, Ameen SA, Amao SR. Interrelationship between body weight and other body linear measurement in Anak strain of commercial broiler. Proceedings of 15th Annual Conference of Animal Science Association of Nigeria. Uyo. 2010; p. 172-174.
15. Steel RGD, Torrie JH, Dickey DA. Principles and procedures of statistics. A biometrical approach, 3rd Edition, McGraw-Hill Book Company, New York; c1997.
16. Ojedapo LO, Amao SR, Ameen SA, Adedeji TA, Ogundipe RI, Ige AO. Prediction of body weight and other linear body measurements of two commercial layer strain chickens. Asian Journal of Animal Sciences. 2012;6(1):13-22.
17. Goswami N. Studies on genetic group differences in some performance and morphological traits of desi, Khaki Campbell and graded duck. MVSc Thesis, Assam Agricultural University, Khanapara; c1998.
18. Gueye EF, Ndiaye A, Branckaert RDS. Prediction of body weight on the basis of body measurements in mature indigenous chickens in Senegal. Livestock Research for Rural Development, 1998, 10(3). http://www.lrrd.org/lrrd10/3/sene103.htm. Accessed December 8, 2023.
19. Ozoje MO, Mgbere OO. Coat pigmentation effects in West African Dwarf goats: live weights and body dimensions. Nigerian Journal of Animal Production. 2012;29:5-10.