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Performances of Turkey birds under backyard system in agro-climatic condition of Assam

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ABSTRACT: Records pertaining to 600 nos. of Broad Breasted Bronze (*Meleagris gallopavo*) and Broad Breasted White variety of Turkey reared at farmers' house under On Farm Trial (OFT) programme of KVK, Baksa; KVK, Nalbari and KVK, Dhemaji for 3 years were utilized to carry out the present study. Each of the sixty nos. of farmers reared 10 nos. of turkey birds under the OFT programme. The mean body weights (g) at 7th days, 1st, 2nd, 3rd, 4th, 5th, 6th and 7th month of age were 118.65±0.72, 325.78±0.22, 1064.47±0.49, 2113.76±0.66, 3577.93±2.95, 4920.85±3.11, 6847.56±4.13 and 9161.74±5.88, respectively. The average daily weight gain (g) during the period of 7th days to 7th month of age was 43.69±0.43. The average age at first egg was 213.99±3.02 days and average egg weight was found to be 71.36±0.71 g. The average annual egg production of Turkey birds was 98.25±0.54 nos. and average hatchability percentage in natural hatching was 62.80±0.72. The average dressing percentage was 68.85±0.75 and the average feed conversion ratio (FCR) during the period of 7th days to 7th month was 1.30±0.06. The average benefit cost ratio (B:C Ratio) of turkey birds reared for meat production was 3.35±0.03, thus it indicated rearing of turkey birds is a profitable venture.

Key words: Age at first egg, B:C ratio, body weight, egg weight, FCR, hatchability, Turkey

Turkey farming has an ample scope for self-employment for educated rural youth. It has a reliable market as there is a consistent demand for turkey meat, especially during festive seasons like Christmas, New year- celebration etc. In addition to meat, its feathers are being used in preparation of various crafts and beautiful items for decoration purpose. Due to higher market price as compared to other birds, the return from turkey farming is more. Turkey meat considered to be a lean meat with 24% protein, 6.6% fat and 162 calories energy per 100 gm of meat. Potassium, calcium, magnesium, iron, selenium, zinc and sodium are also present and rich in essential amino acids and vitamins like niacin, vitamin B6 and B12. Turkey meat is low in cholesterol and rich in unsaturated fatty acids and essential fatty acids. Reproductive and productive traits are two important facets which directly influences the profitability of a farm. Scientific studies of these traits are important from the view point of reduction in production cost, proper labour

utilization, reducing generation interval and increasing genetic gain per unit of time. Knowledge of the reproductive and productive traits can be used in maximizing the profitably of any livestock & poultry farm including turkey farm. Efficient farm management and proper planning are the key factors for maximum production and long-term sustainability. Data pertaining to various productive and reproductive traits of turkey birds under backyard conditions of Assam were very less. Therefore, some scientific study on various economic traits of Turkey birds under field conditions of Assam is paramount important in order to formulate strategy and breeding plan for enhancement of productivity of existing population of the region which will contribute to sustainable egg and meat production and livelihood of the farmers. In this context, the present study was undertaken to record the reproductive and productive performances of turkey birds in backyard system of rearing under agro-climatic condition of Assam.

MATERIALS AND METHODS

The data pertaining to the productive and reproductive traits of 600 nos. of Broad Breasted Bronze and Broad Breasted White variety of Turkey birds reared at farmers' backyard under On Farm Trail (OFT) programme of KVK Baksa, KVK Nalbari and KVK Dhemaji of Assam Agricultural University for last 3 years were utilized to carry out the study. A total of 60 nos. of farmers, comprising 20 farmers from each KVK, were selected randomly on the basis of their experience in rearing other indigenous and improved varieties of poultry and each farmer was given to rear 10 numbers of 7 days old turkey birds under the OFT programme. The sex ratio of the birds was 50:50. The birds were maintained under backyard system like other local and improved poultry birds like *Kamrupa*, *Kuroiler*, *Sonali* etc, initially providing 40 gm during 2nd to 4th weeks of age and 100 gm of commercial broiler feeds during 5th and 7th months of age and then totally on fodders and other food-items available in farmers households. Body weights of birds were measured with the help of weighing balance initially at 7th day and then at monthly interval. The daily body weight gains during 7th day to 7th month of age were calculated by following method (Brody, 1945)

$$\text{Average daily body weight gain} = \frac{W_2 - W_1}{T_2 - T_1}$$

Where,

W_1 and W_2 are initial body weight and final body weight respectively.

T_1 and T_2 are initial and final time units at which W_1 and W_2 are measured, respectively.

The age at first egg of individual bird was recorded in days and age at first egg of 5% birds was recorded and weight of every egg in gram was also noted in various laying stages. The feed conversion ratio (FCR) from 7th day to 7th months of age was calculated by dividing the total feed intake during the period by the total body weight gain of birds. Total feed included were concentrate feed and average fodder intake. The 100 numbers male birds were slaughtered at average 5th month of age.

Dressing percentages was calculated by dividing the carcass weight by pre slaughter live weight and multiplying the result with 100 and Hatchability percentage was calculated by dividing the egg hatched by number of hatching egg and multiply by 100.

The benefit cost ratio (B:C ratio) for meat production was estimated by dividing the total income from selling birds by cost of production during the period. The total income was calculated by selling male birds, unproductive female birds and egg. Data were analyzed by standard statistical methods. (Snedecor and Cochran, 1989).

RESULTS AND DISCUSSION

Body weight and daily weight gain: The mean body weights (g) at 7th days, 1st, 2nd, 3rd, 4th, 5th, 6th and 7th month of age were 118.65±0.72, 325.78±0.22, 1064.47±0.49, 2113.76±0.66, 3577.93±2.95, 4920.85±3.11, 6847.56±4.13 and 9161.74±5.88, respectively. Adikari *et al.* (2016) observed the body weight (kg) of Bourbon Red turkey at 34th, 68th, 159th and 231th days as 0.703±0.04, 1.984±0.10, 6.447±0.29 and 10.124±0.34 in Toms and the corresponding values for hens raised at Turkey farm of the Department of Animal and Poultry Science, Virginia Tech, USA as 0.522±0.04, 1.539±0.12, 3.987±0.32 and 4.865±0.37, which were higher in comparison to the present study. In another investigation, Thomas *et al.* (2014) reported lower body weights than the present findings in Broad Breasted White Turkey with the average values (kg) of 0.250±0.06, 0.456±0.18, 1.508±0.45, 3.107±0.69, 4.514±0.64, 6.080±0.89 and 7.527±0.75 at 1st, 2nd, 3rd, 4th, 5th, 6th and 7th months of age, respectively in semi-intensive system of management. Ghosh and Saha (2023) reported the body weight (g) of turkey birds at 7th, 28th, 63th, 91st, 119th and 140th days of age as 80.6±0.4, 319.6±43.61, 1100±41.83, 2212±83.14, 3736±77.48 and 4762±66.36, respectively in backyard rearing system. In a study on growth performance of Nandanam II Turkey under intensive system, Ilavarasan *et al.* (2020) reported that turkey had 391.71±4.60, 1289.75±15.84, 2235.15±16.43 and 3209.42±34.73

Table 1: Productive and reproductive performances of Turkey birds

Sl. No	Parameters	Results
1	Average body weights (g) 7 th days	118.65±0.72
2	Average body weights (g) at 1 st month	325.78 ± 0.22
3	Average body weights (g) at 2 nd month	1064.47±0.49
4	Average body weights (g) at 3 rd month	2113.76 ± 0.66
5	Average body weights (g) at 4 th month	3577.93 ± 2.95
6	Average body weights (g) at 5 th month	4920.85 ± 3.11
7	Average body weights (g) at 6 th month	6847.56 ± 4.13
8	Average body weights (g) at 7 th month	9161.74 ± 5.88
9	The average daily body weight gain (g) during 7 th day old to 7 th month of age	43.69± 0.43
10	Average age at first egg (days)	213.99 ± 3.02
11	Average egg weight at different laying stages (g)	71.36 ± 0.71
12	Average annual egg production (Nos.)	98.25±0.54
13	Dressing percentage of male birds at 5 th months of age	68.85 ± 0.75
14	Average hatchability (%)	62.80±0.72
15	Average feed conversion ratio (FCR)	1.30±0.06
16	Average benefit cost ratio (B:C Ratio) of turkey birds reared for meat production	3.35±0.03

g body weight at 4th, 8th, 12th and 16th weeks of age, respectively. The differences in body weights of turkey birds in above studies might be due to differences in breeds, feeding regimen as well as place and system of rearing.

The average daily weight gain (g) during the period of 7th days to 7th month of age was found to be 43.69±0.43 and presented in Table 1. Adikari *et al.* (2016) reported overall daily weight gain during 1-309 days of Bourbon Red Turkey as 0.034±0.001 and 0.017±0.001 kg in toms and hens, respectively and the corresponding values for commercial strain were 0.031±0.001 and 0.017±0.001 kg in toms and hens, respectively.

Age at first egg and egg weight

In the present study, the average age at first egg for turkey hens was 213.99±3.02 days. Miah *et al.* (2020) reported that the hens of Black, White and Bronze variety Turkey birds started laying from 210 days onwards in Bangladesh, which corroborated with the findings of the present study. Contrary to the present observation, Siopes (2010) reported that Large White turkey breeder hens became sexually mature and lay eggs as early as about 22 week of age. Haunshi and Doley (2011) also informed lower age at first egg (200.80±1.59 days) than the present finding in turkey birds, which might be due to variation in rearing season as well as the nutrients given to them as the duration of day length and

quantity and quality of feeds provided influence the age at first egg and occurrence of sexual maturity in poultry.

Perusal of the Table 1 indicated that the average egg weight at different laying stages was found to be 71.36±0.71 g. Anandh and Jagatheesan (2015) recorded an average egg weight (g) of 69.79± 0.01 and 71.21±0.01 in Beltsville Small White and Broad Breasted Bronze Turkey (*Meleagris gallopavo*), respectively under hot and humid climatic condition in Tamilnadu, which was almost similar to the findings of the present study. In another study, Anandh *et al.* (2012) found that the average egg weight of Beltsville small White and Broad breasted bronze turkey was 68.72±0.15, 70.56±0.13 and 72.70±0.18 g in free range system, semi-intensive system and intensive system of management, respectively. Contrary to the present finding, the lower average egg weight of 68.95±0.75 g was recorded by Haunshi and Doley (2011) in Turkey birds.

Annual egg production and hatchability

In the present investigation, the average annual egg production of Turkey birds was recorded to be 98.25±0.54 nos. Lower annual egg production of only 70 nos. was reported by Miah *et al.* (2020) in three varieties of Turkey raised under semi-intensive system in Bangladesh. The average percentage of hatchability in natural brooding of turkey birds under backyard system of management in the present study

was recorded to be 62.80 ± 0.72 . Anandh and Jagatheesan (2015) observed total hatchability (%) of 81.78 ± 0.01 and 73.44 ± 0.01 in Beltsville small White and broad breasted bronze turkey, respectively under the hot and humid climatic condition of Tamilnadu, which was higher than the findings of the present study.

Dressing percentage and Feed Conversion Ratio

The average dressing percentage of 100 numbers of 5th month aged male turkey birds slaughtered under the study was found to be 68.85 ± 0.75 . Ghosh and Saha (2023) reported the average dressing percentage as 66.68 ± 0.45 and 67.08 ± 0.3 in male and female Beltsville small white turkey, respectively under backyard system of rearing, which were slightly lower than the findings of the present study. Gibril *et al.* (2013) recorded the higher average dressing percentage of 77.15 ± 1.38 79.68 ± 3.32 in male and female British United Turkey (BUT Big 6), respectively in the Sudan, the difference in variety, system of rearing and management might be the reason for the same.

In the present study, the average feed conversion ratio (FCR) during the period of 7th days to 7th month was found to be 1.30 ± 0.06 . The total feed intake included total concentrate feed and average green fodder intake. Poor feed conversion ratio (3.02) at the 16th week age was reported by Ilavarasan *et al.* (2020) in Nandanam II turkey birds under intensive system. In another study on production performance of Turkey in Northeastern Region, Haunshi and Doley (2011) reported that the feed conversion ratio of turkey birds was 2.96, 3.22, 3.37, 3.31, 3.12, 3.17, 3.34, 3.30, 3.52 and 3.99 during the 4th, 5th, 6th, 7th, 8th, 10th, 12th, 14th 16th and 18th week of age, respectively. Higher feed conversion ratio of Bourbon Red turkey during 34-68, 69-159, 160-231 and 34-231 days were found to be 2.37 ± 0.30 , 5.02 ± 0.26 , 7.29 ± 1.25 and 6.12 ± 0.40 in Toms and the corresponding values for hens were 3.11 ± 0.33 , 6.15 ± 0.28 , 14.08 ± 1.39 and 9.54 ± 0.44 , respectively as reported by Adikari *et al.* (2016). The low FCR in the present study was due to poor managerial practices of the farmers.

Benefit cost ratio

The average benefit cost ratio (B:C Ratio) of turkey birds reared for meat production under the study was 3.35 ± 0.03 . Rashid *et al.* (2020) estimated lower cost benefit ratio in turkey farming reared under free range farming system in Bangladesh compared to the present study, which stood at 1.38. Maikasuwa *et al.* (2014) also recorded the capital turn over (CTO) 1.58 only in turkey production in Nigeria. Very higher benefit cost ratio in this study compared to other reports might be due to lower feed cost as the birds were reared mainly in backyard system utilizing low-cost natural feed resources leading to low production cost.

CONCLUSION

The present investigation on the reproductive and productive performances of turkey birds and estimation of benefit cost ratio of the same under commonly adopted rearing system i.e., extensive or backyard system of rearing indicates the turkey farming as a profitable and economically viable enterprise in Assam under field conditions.

REFERENCES

- Adikari, A.M.J.B., Nayananjalie, W.A.D., Xu, J. and Smith, E.J. (2016). Phenotypic variations of growth and reproductive performances among Turkeys (*Meleagris gallopavo*). *Asian J. Poult. Sci.*, 10(2): 86-95.
- Anandh, M.A., Jagatheesan, P.N.R., Kumar, P.S., Paramasivam, A., and Rajarajan, G. (2012). Effect of Rearing Systems on Reproductive Performance of Turkey. *Vet. World*, 5 (4): 226-229.
- Anandh, M.A. and Jagatheesan, P.N.R. (2015). Reproductive performance of Beltsville small White and Broad Breasted Bronze Turkeys (*Meleagris gallopavo*) under hot humid climatic condition. *Indian J. Anim. Res.*, 49(6): 847-850.
- Brody, S. (1945). Bioenergetics and growth, with special reference to the efficiency complex in domestic animals. Reinhold Publishing Corporation, New York.
- Ghosh, S. and Saha, M. (2023). Growth performance

- and meat quality of Turkey birds produced by the small-holders in south 24 parganas district of West Bengal, India. *Explor. Anim. Med. Res.*, 13(2): 184-190.
- Gibril, S., Shamseldin, R.M., Yassin, O.E., Hassan, A.A. and Atta, M. (2013). Body gain and carcass characteristics of Turkeys (*Meleagris gallopavo*) under extensive system of management in the Sudan. *Int. J. Appl. Poult. Res.*, 2(2): 23-26.
- Haunshi, S. and Doley, S. (2011). Production performance of Turkey in Northeastern Region. *Indian Vet. J.*, 88 (3): 48-50.
- Ilavarasan, S., Jaishankar, S., Reetha, T.L., Sheeba, A. and Priya, R. J. (2020). A Study on Growth Performance of Nandanam II Turkey under Intensive System. *Int. J. Curr. Microbiol. App. Sci.*, 9(12): 3520-3523.
- Maikasuwa, M.A., Ala, A.L. and Baba, M.D. (2014). Economic analysis of turkey production Inzuru Emirate, Kebbi State, Nigeria. *Int. J. Modn. Res. Revs.*, 2(7): 229-234.
- Miah, G., Khanom, M.F., Lima, A., Sohel, M.S.H. and Hossain, M.A. (2020). Comparative performance of three varieties of Turkey (*Meleagris gallopavo*) raised under semi-intensive system. *Bangladesh Journal of Veterinary and Animal Sciences*, 8(1): 29-34.
- Rashid, M. A., Rasheduzzaman, M., Sarker, M.S.K., Faruque, S., Palash, M.S. and Sarker, N.R. (2020). Small-Scale Turkey farming in Bangladesh: Farming Practices, Profitability and supply chain mapping. *Agricultural Science*, 2(2): 28-41.
- Siopes, T.D. (2010). Initiation of egg production by turkey breeder hens: Sexual maturation and age at lighting. *Poultry Science*, 89(7): 1490-1496.
- Snedecor, G.W. and Cochran, W.G. (1989). Statistical methods. Eighth Edition. Iowa State Univ. Press, Ames, USA.
- Thomas, K.S., Reetha, T. L. and Babu, M. (2014). Growth performance of Turkey under field condition. *Indian J. Field Vet.*, 9(4):82.

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