



Growth Performance and Meat Quality of White Pekin Ducks Reared in Backyard Farming System

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ABSTRACT

Background: The growth and popularity of white pekin duck farming is increasing among farmers due to assured return and marketing linkages in peri-urban areas. The growth performance and meat quality of pekin ducks under backyard farming was evaluated in the present study.

Methods: Body weight and feed consumption data of 140 white pekin ducks managed under rice bran-based feeding in backyard farming, were recorded weekly up to 8th week of age. Gompertz's growth model was used to calculate growth parameters. Meat quality parameters were recorded after slaughter on 56th day.

Result: White pekin ducks attained 2.003 kg at 56 days of age with 3.2 FCR (Feed conversion ratio). The asymptote weight calculated from Gompertz's equation was 4513.25 g. Inflection points of bodyweight and time was determined as 1659.28 g and 49.9 days respectively. The maximum growth rate was 58.17 g/day. The high growth rate of pekin ducks in backyard condition indicates suitability of rice bran-based diet in this farming system. Dressing percentage (57.9%) of eviscerated carcass was however less than earlier reports. Lipid peroxidation activity of breast-meat was measured and found to be less than previous reports. Reduced lipid peroxidation in muscle might be due to liberal access to natural feeding system by pekin ducks that is unique in backyard farming.

Key words: Backyard farming, Feed efficiency, Meat quality, White pekin duck.

INTRODUCTION

White pekin ducks are epitomised for its good quality meat and raised worldwide in the commercial duck farms. The global production of duck meat has increased remarkably during the last five years, up to about 4.85 million tons in 2019 (FAOSTAT, 2019). White pekin duck meat has become very popular to urban consumers in different parts of India mainly due to emergence of value-added ready to eat duck meat products and frozen meat sector in the metro cities (Biswas *et al.* 2019). In India, traditional duck growers including various women self-help groups in the villages are adopting white pekin duck farming very fast due to the market demand coupled with its easy forward marketing linkages and appreciable economic return (Ghosh *et al.*, 2021). In various parts of India, duck farming is preferred over chicken farming due to less disease incidences, low mortality and easy management in ducks. The rise in duck meat production in India in recent times is mostly because an overwhelming number of women farmers are being attracted to white Pekin farming day by day in villages and peri-urban areas. Under traditional system of backyard duck farming in coastal areas of India, ducks are raised by rice bran-based diets with supplemental green feedings (Naik *et al.* 2020). In most of the times, to avoid high-cost involvement of commercial feeds, duck growers in villages use a single diet approach in which duck feed, comprising rice bran, broken rice with other locally available feed materials are used for the entire life cycle of the ducks (Mavromichalis, 2014). It is well-known that management and feeding conditions are crucial determinants for growth and meat characteristics in food animals (Mir *et al.*, 2017). Management and feeding conditions alter the growth pattern

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and meat quality by diverse metabolic pathways (Lebre, 2008; Park *et al.* 2018) either alone or in combinations.

Meat quality of pekin ducks is an important factor to be considered as the meat of this duck breed is generally sold in frozen meat sector in packaged form. Lipid oxidation during the prolonged storage time may alter the taste and texture of the meat (Biswas *et al.* 2019).

Although considerable literatures (Stęczyński *et al.*, 2017; Kokoszyński *et al.*, 2019; Rabbani *et al.*, 2019) are available for various aspects of white pekin duck production under the commercial feeding regime in the confined system, little is known about growth and meat quality from this duck breed raised under backyard farming system with rice bran-based feeding. The present study aims to explore growth pattern and meat quality of white pekin ducks in backyard farming condition.

MATERIALS AND METHODS

Area of study

The study was conducted at two villages namely Balarampur and Kustia in South 24 Parganas district of West Bengal, India during August, 2021 to October, 2021. The villages were adapted by Sasya Shyamala Krishi Vigyan Kendra (KVK), South 24 Parganas for technology disseminations.

Birds and their management

A total of 140 white pekin ducklings procured from CPDO, Bangalore, India was equally distributed to 14 beneficiaries under Front Line Demonstration (FLD) program of the Krishi Vigyan Kendra. The beneficiaries were chosen based on the trainings received and their prior knowledge of local duck production. Body weight and feed consumption data of 140 pekin ducks were recorded weekly upto 8th week. All the ducks were fed commercial duck starter mash (Epic Feed) up to the age of 2 weeks. Later, from two weeks onward, all the birds were fed with homemade feed mixture (Table 1) from locally available resources and fresh azolla @ 7 g per bird per day. From fourth week onwards, ducks were offered small sized snails, collected from paddy fields @ 5g per bird twice in a week. Proximate composition of the homemade feed mixture is analysed by standard method (AOAC, 1990) and given in Table 1. Routine deworming with piperazine liquid was done at 25 day of age and vaccination against duck cholera and duck plague was applied at 30 day and 45 day of age respectively.

Sampling and analysis of meat

Ducks were slaughtered manually on 56th day. Two ducks from each household were selected randomly and accordingly a total of 28 ducks were represented for this study.

Carcass traits were recorded for whole carcass and for individual cut up parts (results not shown). Dressing percentage was calculated by the following formula:

$$\text{Dressing \%} = \frac{\text{Dressed weight}}{\text{Live weight}} \times 100$$

Physio-chemical parameters of the breast meat sample were measured as per the standard methods. Breast meat (about 15 g) was collected from the carcass for determination of pH. It was measured after 24 hours of slaughter (pH_{24h}) using a handheld pH meter (EUTECH, UK). Drip loss of the meat sample (about 30 g) was analysed by gravimetric method (Honikel 1998). Cooking loss of the meat samples was analysed according to Abdulla *et al.* (2017). Lipid peroxidation of the meat samples was measured according to Witte *et al.* (1970) and expressed as MDA (mg)/kg meat. All the meat samples were analysed in triplicates.

Statistical analysis

Data were statistically analysed for mean and standard error using Microsoft Excel program. Body weight prediction curve was constructed by Curve Expert 1.4 program

(Hyams, 2010) for Windows using Gompertz's non-linear regression model. The mathematical expression in Gompertz's model is.

$$W_t = Ae^{-e^{-B/k(t-t_i)}}, W_i = A/e, t_i = B/k, MGR = W_i \times k$$

Where,

W_t = Predicted weight (g).

A = Asymptomatic weight (g) when time goes to infinity.

B = Constant of integration.

k = Maturing rate (g/day).

t = Time unit (day).

e = Natural constant (2.72).

W_i = Weight of inflection.

t_i = Time of inflection.

MGR = Maximum growth rate (g/day).

RESULTS AND DISCUSSION

White pekin ducks are meat type ducks with rapid growth potential. Body growth is an important factor from economic perspective as well. Devaki *et al.* (2019) compared growth characteristics between *Deshi* duck and white pekin ducks

Table 1: Feed ingredient composition in the diet (DM%).

Rice bran	45%
Broken rice	30%
Soybean meal	20%
Fish meal	4%
Vitamin premix	1%
Chemical composition (%)	
Crude protein	15.65
Crude fiber	11.24
Ether extract	11.58
Ash	6.98

Table 2: Growth performance (Mean±SE) of white pekin ducks.

Variables (n=140)	Values
Final body weight at 56 days (g)	2003.33±29.05
Total feed intake/bird (g)	6427±163.81
Feed conversion ratio (FCR)	3.20±0.05

Table 3: The growth parameters for body weight in white pekin ducks as deduced by Gompertz's model.

Variables	Values
A	4513.25
B	1.75
k	0.04
W_i	1659.28
t_i	49.9
MGR	58.17
R ²	0.99

A: Asymptotic weight (g); B: Constant of integration; k: Maturing rate; W_i : Weight of inflection (g); t_i : Time of inflection (days). MGR: Maximum growth rate (g/day); R²: Coefficient of determination.

in farmers' field in Tamil Nadu. They reported average body weight of white pekin ducks around 1.78 kg at 60 day of age. Similar results in final body weight were obtained from white pekin ducks in an intensive management study (Rabbani *et al.*, 2019) where pekin ducks were reared in the confinement. They reported average body weight of 1.595 kg at 56 days of age in the maize based experimental diet. However, in the present study, pekin ducks attained average body weight of 2.003 kg at 56 day of age (Table 2) that is quite remarkable in the backyard farming condition. The better final body weight gain in the present study might be due to better protein supplementation in the home-made diet in the form of azolla.

Feed conversion ratio (FCR) was calculated as 3.2 in the present study (Table 2). Rabbani *et al.* (2019) reported similar FCR (3.16) in their study on white pekin. Rice bran and broken rice are major by-products from rice mills. These two ingredients are cheap and easily available locally in South 24 Parganas district. The present study indicates that rice bran-based diet can offer good feed efficiency in white pekin ducks similar to maize based and wheat-based diet.

The growth parameters obtained from Gompertz's growth curve (Fig 1) are shown in Table 3. Asymptote weight (A) value calculated in the present study is 4513.25 g. It is the maximum weight that could be achieved by white pekin ducks in their life span when reared under backyard farming system. Susanti and Purba (2018) reported asymptote value of Muscovy ducks 2591.3 g which is lower than that of Pekin ducks in the present study. Inflection weight (W_i) and inflection time (t_i) are important variables in the growth analysis. Inflection points are spot in the growth curve where there is a shift from growth acceleration to retardation. In the present study, W_i and t_i values are 1659.28 g and 49.9 days respectively. Inflection time (t_i) of pekin ducks is closely similar to Muscovy ducks (Susanti and Purba, 2018). However, there was dearth of literatures for comparing the inflection points in pekin ducks in different farming systems.

MGR of pekin ducks in the present study is calculated as 58.17 g/day which is more than earlier reports (Susanti, 2015) in pekin ducks. The higher growth rate in pekin ducks in backyard farming indicates that rice bran-based diets may be economically viable option for farming community where paddy-based economy prevails. High R^2 value (0.99) denotes reliability of the Gompertz's model for determining the growth parameters.

Average daily weight gain (ADG) and average daily feed intake (ADFI) of white pekin ducks are presented in Fig 2. ADG (g) is maximum for 43-56 days period followed by 29-42 days period. Similarly, ADFI (g) is highest for 43-56 days period. ADG (g) and ADFI (g) in the present study are less compared to earlier report (Chen *et al.*, 2015).

Dressing percentage and meat quality parameters are described in Table 4. In our study, average dressing percentage was calculated as 57.9% which was lower than earlier studies (Steczny *et al.*, 2017; Kokoszynski *et al.*, 2019). This low dressing percentage might be due to feed composition and farming condition. pH is an important meat quality parameter and average pH of the breast muscle post 24 hours after slaughter falls within normal limits (Kokoszyński *et al.*, 2019). Drip loss and cooking loss are measure of water holding capacity of meat. In the present study, these two parameters were in line with Starčević *et al.* (2021) who observed that housing system significantly affected drip loss and cooking loss in white pekin ducks. Lipid peroxidation value (TBARS) in breast muscle of white

Table 4: Dressing % and meat characteristics (Mean±SE) of white pekin ducks.

Variables (n=140)	Values
Dressing %	57.9±0.55
pH _{24 hrs}	5.93±0.11
Drip loss (%)	1.53±0.07
Cooking loss (%)	28.75±2.68
TBARS value (MDA mg/kg meat)	0.09±0.03

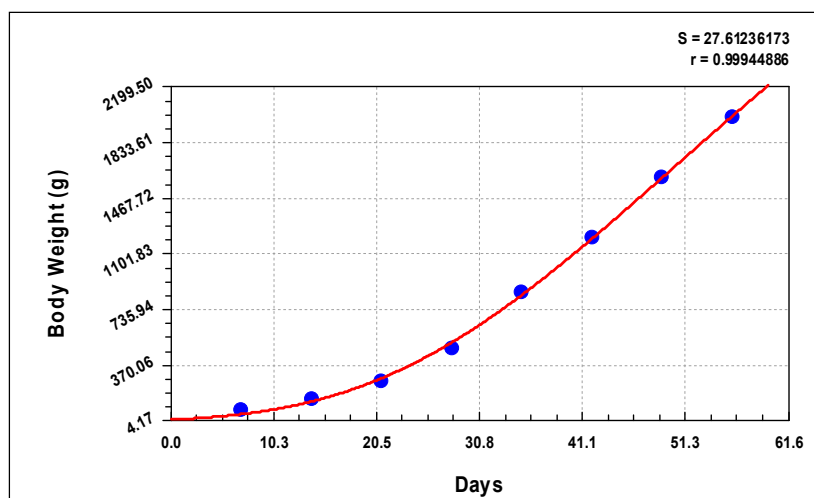


Fig 1: Body weight curve of white pekin ducks.

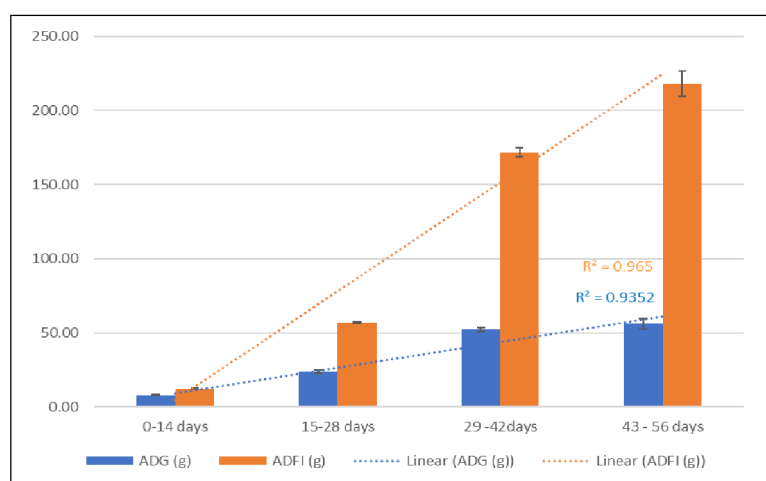


Fig 2: Average daily growth and average daily feed intake of white pekin ducks.

pekin ducks was 0.09 MDA mg/kg meat in the present study. TBARS value in the present study is lower than reported in an earlier study (Ali *et al.* 2007). Less TBARS value of the pekin duck meat in the present study might be due to the fact that ducks were kept in backyard management system and regularly fed with azolla and live snails. This natural feeding system may substantially contribute to antioxidant status of white pekin duck meat in backyard system.

CONCLUSION

The present study has characterised the growth pattern of white pekin ducks under backyard system. Maximum growth rate (MGR) of the pekin ducks was 58.17 g/day. This growth rate is better than Muscovy ducks indicating that pekin ducks have superior genotype for achieving faster growth. This further implies that rice bran-based feeding system has the potential for augmentation of growth in pekin ducks in backyard farming condition. Meat quality parameters were at par with other studies. However, more research is needed in future on growth, blood biochemistry and meat quality of pekin ducks in different farming systems to understand the real potential of this remarkable bird to optimize farmers' income.

Conflict of interest: None.

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