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A comparative study of production and reproductive performance of Kamrupa and indigenous chicken in the intensive system of management

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Abstract
The present study was undertaken to investigate the productive and reproductive performance of Kamrupa and Indigenous chicken under intensive system of management. The study was conducted at AICRP on poultry breeding, Khanapara, Guwahati, Assam with 100 numbers each of Kamrupa and indigenous chicken that were brooded in battery cage up to 4 weeks of age. In the present study the body weight till 72nd week of age, FCR at 8th week of age, shank length, keel length and breast angle at 5th week of age, egg weight and egg production till 72nd week of age, different egg quality traits and carcass traits were recorded. Results showed that the mean body weight of Kamrupa birds (combined sex) were significantly (p<0.05) higher over indigenous birds at different ages. Egg production differed significantly (p≤0.05) amongst indigenous and Kamrupa chicken. However, no significant (p≥0.05) difference was observed for fertility and hatchability. Therefore, it can be concluded that Kamrupa chicken breeds has the production potential for higher productive and reproductive traits.

Keywords: Kamrupa, Indigenous chicken, performance, egg quality, carcass characteristics

Introduction
Backyard poultry in Assam is based on conventional practices with little or no dependence on external inputs, which serves as livelihood security and animal protein source to the farmers. As per the 19th livestock census Assam's total poultry population was recorded as 27.2 million in 2012 which showed an astonishing 71.63% change in the 20th livestock census to reach 46.7 million in 2019 (DAHD, 2019) [1]. The poultry sector plays a major role in the upliftment of the socio-economic status of the rural people of India. There is a huge demand for poultry and poultry products in Northeast India. The indigenous birds of Assam and the North-eastern region usually have better resistance capacity to various diseases, can escape easily from predators, having multicolour plumage and more preferred among the consumer hence fetch more money than that of the exotic birds. However indigenous chicken is inferior in reproductive and production traits. Accordingly, the Kamrupa – a multicolour dual-purpose new chicken variety was developed under AICRP on poultry Breeding, Directorate of Research, Khanapara. The present investigation is an attempt to study and compare the different productive and reproductive traits along with egg and meat quality traits, of newly developed variety of chicken Kamrupa with indigenous birds of Assam under intensive and free-range system of rearing.

Materials and Methods
The present study was conducted at the AICRP on poultry breeding, Deptt. Of Poultry Science, AAU, Khanapara, Ghy-22. A total of 100 numbers of each Kamrupa and indigenous chickens were brooded in battery cages up to 4 weeks of age thereafter both the birds were reared under the intensive system with standard managerial practice in the experimental unit of AICRP on poultry breeding, Khanapara. Vaccination and deworming of the birds were done as per standard schedule in both the system.
Body weight at day old, 5th, 20th, 40th, 52nd and 72nd weeks were measured with the help of a digital weighing balance up to the nearest accuracy of 5g. Conformation traits of birds were measured with the help of scale and breast meter at 5 weeks of age. The age at sexual maturity is considered when 50% of the pullet starts laying eggs. The annual egg production and egg weight at 32nd, 40th, 52nd and 72nd weeks were also recorded. A total of 50 eggs from each group were collected at 40 weeks of age for egg quality assessment. To evaluate carcass characteristics a total of 20 birds of each group both male and female at random were

slaughtered at the 20th week of age. Eggs were collected within 7 days of laying, incubated for estimation of fertility and hatchability (TES and FES). Standard statistical methods were implied to analyze the data. (Snedecor and Cochran 1994) [10].

Result and Discussion

The body weight of Kamrupa and indigenous birds under the farm condition are presented in Table 1. The result showed that body weight of Kamrupa birds (combined sex) were significantly ($p<0.05$) higher over indigenous birds at different ages, Haunshi *et al.* (2009) [2] reported lower body weight in indigenous, similar body weight in Gramapriya and higher body weight in Vanaraja chicken compared to present study. Ramana *et al*. (2010) [7] reported similar body weight in Vanaraja birds. Vij *et al*. (2015) [11] reported similar body weight in Harringhata black breed of chicken.

The mean age at first egg recorded in Kamrupa (158.52±5.80 days) birds were significantly ($p\leq0.05$) lower than Desi (183.89±4.30 days) birds (Table 1). The significant difference of mean age at first egg among indigenous and Kamrupa might be due to differences in the genetic potential of both the birds. The present findings agreed with the results of several workers Haunshi *et al.* (2009) [2] reported lower age at sexual maturity in indigenous and higher age at sexual maturity in Gramapriya and Vanaraja breed of chicken. Islam *et al*. (2014) [3], Kalita *et al*. (2016) [4] reported similar age at sexual maturity in Indigenous and Kamrupa chicken.

The mean egg production differed significantly ($p\leq0.05$) amongst indigenous and Kamrupa chicken, which might be due to differences in the genetic makeup of birds. The mean egg production was significantly higher in Kamrupa compared to indigenous chicken at different ages. The egg production at various weeks of age in Kamrupa reported in the present study is in accordance with the finding of Kalita *et al*. (2012) [5] and Islam *et al*. (2014) [3]. Similarly, mean egg production in indigenous chicken has also corroborated the finding of Sarma *et al*. (2017) [9]. Egg weight data also showed a significant ($p\leq0.05$) difference amongst indigenous and Kamrupa birds (Table 1). The weight of Kamrupa and indigenous eggs were presented in table 1. The present findings were in accordance with the findings of Islam *et al*. (2014) [3] in Vanaraja and indigenous chicken and Sarma *et al*. (2020) [6]. This variation in egg weight might be due to genetic make-up. Lower egg weight was recorded by Vij *et al.* (2015) [11] in indigenous chicken.

Fertility and Hatchability: While recording, percent fertility and hatchability, there was no significant ($p\leq0.05$) difference among the two groups of birds (Table 1). The present findings were in accordance with the findings of Islam *et al*., (2014) [3]. Kalita *et al*. (2012) [5] reported a lower rate of hatchability in indigenous chickens of Assam. Besides, Kalita *et al*. (2016) [4] also reported similar fertility and hatchability in Kamrupa in Assam.

Egg shape index estimated as 73.56±2.51% and 73.51±2.13% in Kamrupa and Indigenous, respectively. Similarly, Ramana *et al*. (2010) [7] estimated the shape index in accordance with the present study. The albumin index was recorded as 0.085±0.002 and 0.081±0.003 in Kamrupa and Indigenous, respectively. In the present study yolk index, Haugh unit and Shell thickness were recorded as 0.44±0.33, 81.69±2.31 0.34±0.008 and 0.47±0.27, 79.98±0.27, 0.31±0.010 respectively for Kamrupa and Indigenous birds.

Confirmation traits: The shank length, keel length and breast angle were recorded as 51.20±3.50 mm, 49.30±4.10 mm and 48.39±4.10 degree in Kamrupa and 45.23±3.43 43.85±4.17 mm, and 52.12±7.10 degree in indigenous chicken, respectively. There were no significant differences between the conformation traits in both the breed of chicken. In comparison to these 3 conformation traits, Kalita *et al*. (2016) [4] recorded lower shank length and breast angle in Indigenous birds.

Carcass characteristics: The carcass characteristics of Kamrupa and Indigenous are presented in table 2. There was no significant difference between all the traits excepts the live weight and dressed weight. However, Kalita *et al.* (2012) [5] reported lower live weight at slaughter compared to present study.

From the present study, it may be concluded that Kamrupa birds are well suited and adapted to the agro-climatic condition of Assam. Thereby, this breed has a potential for livelihood, nutritional and food security to the farmers.

Table 1: Body weight, conformation, production and egg quality traits of Kamrupa and indigenous Chicken.

Traits	Kamrupa	Indigenous
Body Weight in Gram		
Day old	37.60^{a}±2.80	34.10^{a}±2.90
5th week	280.60^{a}±46.90	140.60^{b}±51.80
20th week	1310.50^{a}±170.40	1180.90^{b}±105.30
40th week	2270.30^{a}±510.60	1690.60^{b}±125.30
52nd week	2310.10^{a}±520.30	1720.20^{b}±132.50
72nd week	2380.20^{a}±430.10	1910.90^{b}±152.20
Conformation Traits at 5th week of age		
Shank Length (mm)	51.20^{a}±3.50	45.23^{a}±3.43
Keel Length(mm)	49.30^{a}±4.10	43.85^{a}±4.17
Breast Angle (°)	48.39^{a}±4.10	52.12^{a}±7.10
Age At First Egg (days)	158.52^{a}±5.80	183.89^{b}±4.30
FCR (at 8th week of age)	2.35	3.46
Egg production (no) up to		
40th week	51.20^{a}±3.60	27.40^{b}±3.10
52nd week	93.30^{a}±4.50	53.30^{b}±3.90
72nd week	153.50^{a}±6.20	82.10^{b}±7.10
Egg weight (g) at		
32nd week	50.90^{a}±5.10	36.60^{b}±2.60
40th week	56.40^{a}±4.30	37.60^{b}±4.80
52nd week	58.50^{a}±6.10	40.60^{b}±4.30
72nd week	61.90^{a}±6.70	42.45^{b}±3.20
Egg Quality Traits		
Shape Index	73.56±2.51	73.51±2.13
Albumen Index	0.085±0.002	0.081±0.003
Yolk Index	0.44±0.33	0.47±0.27
Haugh unit	81.69±2.31	79.98±3.19
Shell thickness(mm)	0.34±0.008	0.31±0.010
Fertility (%)	88.60±3.50	90.06±2.40
Hatchability (%) (TES)	83.31±3.60	85.60±3.10
Hatchability (%) (FES)	88.40±4.30	87.40±4.60

Table 2: Carcass quality traits of Kamrupa and indigenous Chicken.

Traits	Kamrupa	Indigenous
Live weight(g)	1460.45^{a}±170.46	1310.26^{b}±155.74
Dressed weight (g)	1080.48^{a}±115.15	940.61^{b}±95.56
Dressing %	73.50±3.21	72.28±2.27
Cut up parts %		
Breast	30.20±1.25	29.10±1.56
Back	16.10±1.69	14.80±2.01
Legs	26.10±2.15	25.70±1.84
Wings	12.10±0.86	11.56±1.42
Giblet	6.89±0.75	5.65±0.74
Heart	0.78±0.11	0.76±0.13
Liver	1.98±0.42	2.10±0.49
Gizzard	2.45±0.57	2.51±0.52

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