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Carcass and Meat Quality Characteristics of Native Kamrupa Chicken Reared in India

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ABSTRACT

Kamrupa is a new variety of chicken developed by crossing three different types of strains, *i.e.,* Assam local, coloured broiler (PB-2), and Dahlem red, in the All India Co-ordinated Research Project on Poultry Breeding, CVSc, AAU, Khanapara, with the objective of being reared as a backyard bird. A study was undertaken to evaluate the carcass characteristics from two age groups, i.e., 12 and 54 weeks, and from both sexes of Kamprupa chicken. The carcass of 54 weeks of Kamrupa chicken had shown significantly better ($p<0.05$) carcass traits for all the parameters, such as carcass weight, dressing percentage, meat bone ratio, and weight of whole sale cuts, when comparison was made with the carcasses of 12 weeks of age. However, sexes were found to have no influence on the wholesale cuts in both age groups of birds. Body weight and carcass weight influenced the yield of both edible (giblet) and inedible by-products, and thus, birds in the 54-week age group gave a higher yield of by-products. Although no significant differences were observed between the mean values of inedible by-products for both sexes in the 12-week age group, the corresponding values at 54 weeks of age group showed contrasting results, as the male birds generated significantly more inedible by-products than the female. From this study, it can be concluded that to achieve better carcass quality, slaughter should be done at a higher age.

HIGHLIGHTS

- There is huge demand for poultry products in Assam and the North Eastern Region (NER) of India.
- The carcass of Kamrupa chicken is a very good source of protein.
- Carcass obtained from Kamrupa chicken has better carcass characteristics.

Keywords: Kamrupa chicken, Carcass trait, By-products, Dressing percentage, By-products

The Indian poultry industry, which was once considered a small, backward venture, is now standing as a self-sustaining giant and vibrant agribusiness. It is considered one of the fastest-growing segments of the agricultural sector, with an average growth rate of 8–10% per year (Hazarika, 2016). It is now accepted as a popular and profitable vocation by all sectors of society. The poultry industry has not only provided much-needed animal protein to the non-vegetarian population but also generated great livelihood opportunities for our educated youth. India produces 4.78 million tonnes of broiler meat and 129.60 billion eggs per year (BAH and FS, 2019); however, per capita consumption of meat and eggs is the lowest in the world, standing at 3.1 kg per year and 95 eggs per year, respectively. The trend of poultry marketing is different in India, as 90–95 percent constitutes the live market and the chicken meat market constitutes around 5–10 percent.

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However, demand for processed chicken products is growing between 15-20 percent per year. Thus, India stands as the second-fastest processed meat and poultry market (Das, 2017). In India, some of the important breeds and varieties that have been documented are Aseel, Ankaleshwar, Bursa, Chittagong, Daothigir, Denki, Ghagus, Haringhatta black, Kadaknath, Kalasthi, Kashmir Favorella, Miri, Punjab Brown, Tellichery, Titri, Teni, Nicobari, Naked Neck, and Frizzle Fowl (Anonymous, 2011). Beside this, many nondescript desi chicken breeds are also reported.

There is huge demand for poultry products in Assam and the North Eastern Region (NER) of India. Poultry contributes a major share in terms of animal protein supplementation from eggs and meat. It also provides rich organic manure. The poultry industry is pivotal to both income and employment for millions of farmers and other persons engaged in allied activities of our country. The NER is known for its higher consumption of non-vegetarian diets, and thus the region is known as the meat consumption zone of India. Assam and N.E. states are not self-sufficient in the production of poultry meat and eggs, and a wide gap still prevails in demand and supply of these commodities, resulting in the import of large volumes of meat and eggs to the region from outside. So, the present study was conducted to determine the carcasses and meat quality characteristics of Kamrupa chickens that were reared in Assam and the north-east region of India.

MATERIALS METHODS

Collection, slaughtering and dressing of chicken

Kamrupa chickens were collected from the All India Coordinated Research Project (AICRP) on a poultry breeding farm and brought to the Department of Livestock Products Technology for slaughter. Birds were kept on fasting overnight prior to slaughter. Forty Kamrupa chickens (20 males and 20 females) were slaughtered at various ages (12 weeks and 54 weeks). Following slaughter, the chickens were scalded in hot water (62-64°C for 1 minute), and their feathers were manually plucked in the departmental laboratory. They were then eviscerated and hand-dressed under rigorous sanitary circumstances. Blood was obtained in a pre-weighed beaker for analysis. Dressed weight was taken immediately after de-feathering, evisceration, and removal of the head and feet.

Evaluation of carcass quality, wholesale cut and By-product

Dressing percentage

Dressing percentage was calculated by using the following formula as per the standard method:

$$\text{Dressing Percentage} = \frac{\text{Weight of the carcass}}{\text{Weight of live birds}} \times 100$$

Wholesale cuts

Carcasses were divided into wholesale cuts as per BIS (1977), i.e., breast, back, thigh, drumstick, wings, and neck. After making the cuts, they were weighted separately and kept in the refrigerator after being packed in a medium-density polyethylene (0.926–0.940 g/cm^3) bag for further processing.

Yield of edible and inedible by-products

After evisceration, the edible part, i.e., Giblet (heart, liver, and gizzard), and the inedible (lungs and trachea, GIT, etc.), were weighted with a weighing balance and expressed in gram.

Meat bone ratio

After wholesale cut preparation, the cuts were deboned manually in meat science laboratory of department. After deboning meat and bones were weighed separately. Meat bone ratio was determined to find out the quantitative relation between meat and bone.

$$\text{Meat bone ratio} = \frac{\text{Weight of meat}}{\text{Weight of bones}}$$

STATISTICAL ANALYSIS

Duplicate samples were taken for each parameter and 3 trials were conducted for each experiment. A total six observations were taken (n=6) for consistency of the results. The results were analyzed statistically for variance

and Least Significant Difference (LSD) test as per Snedecor and Cochren (1989) and Means were compared by using Duncan's Multiple Range test (Duncan, 1995). Statistically analyzed data using SPSS-25 software were tabulated and interpreted.

RESULTS AND DISCUSSION

Carcass quality characteristics

The carcasses quality characteristics of Kamrupa chicken were given in Table 1. The live body weight and carcass weight of native chickens were significantly higher ($P<0.01$) in both sexes at 54 weeks than those of 12-week-old birds. However, when comparisons were made between male and female birds of specific age groups, the live and carcass weights of male birds were found to be higher in both age groups without any significant ($P>0.01$) difference. The differences probably arise from metabolic differences and sex dimorphism (Kalita *et al.,* 2017). Similarly, Kalita *et al.* (2017) found differences between sexes in live weight when conducting a study on comparative evaluation of various traits of PB-2 × Indigenous and Dahlem red chickens under an intensive system of rearing. Jatoi *et al.* (2015) and Kalita *et al.* (2017) found that birds in higher age groups always have a higher carcass weight. Shafey *et al*. (2013) observed that male birds have a higher carcass weight than females in similar age groups. Portillo-Salgado *et al*. (2022) determine carcass weight of native Mexican turkeys rose under an extensive production system and found that male turkey had more carcass (3.8 kg) weight than female 2.8 kg).

The dressing percentage was found to be higher in 54-week age groups than in 12-week age groups. This difference may be due to metabolic differences (Kalita *et al*., 2017), underdeveloped muscle, fat, and managemental factors. The male birds had a higher dressing percentage than the female birds, which are used as by-products during slaughter. This may be due to the higher proportion of non-carcass components, especially the ovum and oviduct, in females. Uhlířová *et al.* (2018) determine the dressing percentage in 16 week age geese and found that male birds have higher (73%) dressing percentage than female birds (71.8%). Dressing percentage is a function of the amount of edible tissue in the carcass; thus, the growth and development of edible tissues might be greater in male Kamrupa chickens at a higher age. Therefore, achieving a higher dressing percentage in Kamrupa birds slaughtered at a higher age could be recommended.

The meat-bone ratio was found to be higher in 54-week age groups than in 12-week age groups. It had also been observed that male birds had a higher meat-to-bone ratio from both age groups. It may be due to the higher development of muscles in male chickens. Muscle fibre biochemical and structural characteristics can be independently manipulated by intrinsic and extrinsic factors to achieve production efficiency and improve meat quality (Listrat *et al.,* 2016). Male sex hormones like testosterone may also be related to the higher development of certain muscles in the body (Fennel and Scanes, 1985).

Wholesale cuts

The yield of wholesale cuts was given in Table 2. The yield of all the whole sale cuts of native chicken (breast, back, thigh, drumstick, wing, and neck) of 54-week-old birds was higher ($P<0.01$) than that of 12-week-old birds. It may be because during the production cycle, wholesale cuts continuously increase as a percentage of body weight. A similar pattern was recorded by Acar *et al*.

Table 1: Carcass characteristics of Kamrupa chicken (MEAN ± SE)

Variables	12 weeks		54 weeks	
	Male	Female	Male	Female
Live body weight (gm)	$724.80^{a} \pm 58.70$	$688.80^{a} \pm 69.97$	$1354.12^{b} \pm 37.24$	$1331.80^{b} \pm 73.24$
Carcass weight (gm)	$442.60^{a} \pm 40.53$	$391.60^{a} \pm 40.94$	$907.40^{b} \pm 37.81$	$858.21^{b} \pm 49.04$
Dressing (%)	$60.75^{ac} \pm 2.38$	$56.81^{a} \pm 1.54$	$66.49^{b} \pm 1.47$	$62.27^{bc} \pm 0.86$
Meat bone ratio (%)	$1.52^{ac} \pm 0.03$	$1.39^{a} \pm 0.11$	$1.85^{b} \pm 0.08$	$1.69^{bc} \pm 0.05$

Means with superscript bearing similar alphabet (small letter) does not differ significantly ($P<0.01$).

Table 2: Wholesale cuts of Kamrupa chicken (MEAN ± SE)

Variables	12 weeks		54 weeks	
	Male	**Female**	**Male**	**Female**
Breast (gm)	$105.20^{a} \pm 11.62$	$88.42^{a} \pm 6.58$	$224.2^{b} \pm 10.21$	$222.00^{b} \pm 12.63$
Back (gm)	$89.60^{a} \pm 6.91$	$80.60^{a} \pm 12.19$	$187.10^{b} \pm 15.37$	$192.40^{b} \pm 14.08$
Thigh (gm)	$64.80^{a} \pm 4.16$	$59.83^{a} \pm 6.30$	$156.21^{b} \pm 10.18$	$121.31^{c} \pm 11.39$
Drumstick (gm)	$68.20^{a} \pm 5.13$	$63.00^{a} \pm 7.37$	$151.60^{b} \pm 10.26$	$119.44^{c} \pm 12.31$
Wings (gm)	$61.22^{a} \pm 4.80$	$59.622^{a} \pm 7.16$	$109.50^{b} \pm 7.19$	$111.80^{b} \pm 12.49$
Neck (gm)	$29.60^{a} \pm 2.32$	$24.00^{a} \pm 2.41$	$63.42^{b} \pm 6.85$	$60.10^{b} \pm 8.08$

Means with superscript bearing similar alphabet (small letter) does not differ significantly (P<0.01).

Table 3: By-products estimation of Kamrupa chicken (MEAN ± SE)

Variables	12 weeks		54 weeks	
	Male	**Female**	**Male**	**Female**
Blood (gm)	$31.40^{a} \pm 4.13$	$28.43^{a} \pm 3.85$	$52.40^{b} \pm 2.98$	$39.8^{a} \pm 1.24$
Head (gm)	$33.40^{a} \pm 1.60$	$32.81^{a} \pm 2.83$	$60.4^{b} \pm 70.09$	$36.84^{a} \pm 1.53$
Feather (gm)	$23.42^{a} \pm 0.51$	$20.20^{a} \pm 0.86$	53.20 ± 3.33^{b}	35.80 ± 2.70^{c}
Feet (gm)	$28.61^{a} \pm 2.42$	$31.01^{a} \pm 30.53$	$62.80^{b} \pm 1.43$	$54.80^{b} \pm 6.47$
Liver (gm)	19.20 ± 1.49^{a}	18.20 ± 2.88^{a}	25.60 ± 3.03^{a}	31.60 ± 6.07^{a}
Heart (gm)	$4.40^{a} \pm 0.24$	$4.40^{a} \pm 0.40$	$6.80^{b} \pm 0.20$	$8.20^{b} \pm 0.80$
Gizzard (gm)	$19.60^{a} \pm 0.68$	$22.80^{a} \pm 3.21$	$35.10^{b} \pm 1.48$	$41.80^{b} \pm 4.91$
Weight of viscera (gm)	$85.40^{a} \pm 14.80$	$79.20^{a} \pm 6.03$	$131.20^{b} \pm 13.67$	$195.40^{c} \pm 3.94$

Means with superscript bearing similar alphabet (small letter) does not differ significantly (P<0.01).

(1993) in broiler chicken and Nalla *et al*. (2017) in Rajasri chicken. The higher muscle growth and higher carcasses of older birds were also observed by Young *et al.* (2001). Similar findings were observed by Faria *et al.* (2010) in broilers reared under a semi-extensive system. Similarly, when comparisons were made between sexes, the yield of wholesale cuts (breast, thigh, back, and drumstick) was higher in male chicken than female chicken at 54 weeks of age. However, there were no significant (P > 0.01) differences observed in the yield of wings and necks between different sexes. Similar findings were also observed by Singh and Pathak (2017) in the Kadaknath, Aseel, and Vanraja breeds of chicken. Young *et al*. (2001) also found that there was no difference observed in the yield of wings and necks when they compared wholesale cuts between different sexes.

Percentage yield of by-Products

The yield of by-products (edible and inedible) was given in Table 3. The yield of by-products (head, blood, and feather) of native chickens was found to be significantly (P<0.01) higher in 54-week-old birds than in 12-week-old birds. Another observation in this age group was that male chickens had significantly (P<0.01) higher weights of by-products (blood, feather, and head) than female chickens. However, there were no significant differences observed between the sexes of 12-week-old birds. The yield of blood weight was higher in birds with a higher body weight (Medway and Kare, 1959). The higher age group has a higher head weight, which is also reported by Muthulakshmi *et al.* (2016).

Higher slaughter age (54 weeks) influences the yield of feet and giblets significantly (P<0.01) compared to the yield of

those organs slaughtered at 12 weeks of age. However, no significant ($P > 0.05$) difference was observed in the yield of feet and giblets. Nalla *et al*. (2017) recorded the yield of feet in Rajasri chickens, and they found that when the age of the chickens increases simultaneously, the yield of feet increases, but it does not depend on sex. Hazarika and Baruah (1993) also observed a similar trend in the yield of feet and giblets in Rhode Indian Red poultry carcasses.

The mean visceral weight of Kamrupa chickens was found to be significantly ($P<0.01$) higher in 54-week-old age group birds. Another observation also found that among the 54-week-old age group, females had significantly ($P<0.01$) higher visceral weights than male chickens. This was due to the presence of immature eggs in the reproductive tract of female birds and a relatively higher amount of abdominal fat (Musundire *et al.*, 2017) in female carcasses.

CONCLUSION

On the basis of the present study, it may be concluded that slaughtering Kamrupa chickens at a higher age may offer better quality meat and facilitate better marketing and economic gain by drawing higher consumer attention. The data generated so far may be utilised to some extent for planning, policymaking, and entrepreneurship development in the future.

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