***Original Research Article***

**Study on Some Important Morphometric Traits of *Kamrupa* Chicken**

**ABSTRACT**

An experiment was conducted during March-August, 2024 at the experimental shed under the project ICAR-All India Coordinated Research Project (AICRP) on Poultry Breeding, Directorate of Research (Veterinary), AAU, Khanapara, Guwahati, Assam to study some important morphometric traits of *Kamrupa* chickens reared under deep litter system at 22 weeks of age. A total 20 *Kamrupa* chickens (10 males and 10 females) were selected randomly and altogether 17 morphometric traits, viz. body weight, body length, body girth, wingspan, scull length, neck length, neck circumference, wing length, tail length, comb length, comb height, wattle length, beak length, breast angle, keel length, shank length and shank circumference were measured. The findings revealed significant (P<0.05) sexual dimorphism in most of the traits, with males exhibiting larger body dimensions compared to females. The body length was significantly (P<0.05) higher in males than females. There was no significant (P<0.05) difference between body girth of males and females. The neck length and shank circumference were significantly (P<0.05) higher in females than in males. There was no significant (P<0.05) difference in breast angle among male and female birds. Moreover, beak length did not show any significant (P<0.05) difference between male and female Kamrupa chickens. The shank length was also significantly (P<0.05) higher in males as compared to females. Hence, it could be concluded that comparing with other indigenous and commercial varieties highlighted, *Kamrupa*’s robust morphometric features suggesting its potential for adaptability, growth rate and suitability for rural poultry farming. Further DNA-based research could be recommended to validate the present morphometric variations to and enhance conservation and breeding strategies.

**KEYWORDS:** *Kamrupa* chicken, morphometric traits, body length, shank length, keel length

**Introduction**

Backyard poultry farming is an important tool for poverty alleviation among the most under privileged section of the Indian society particularly the rural tribe (Islam et al., 2022). Backyard poultry farming is characterized by its low-cost inputs, minimal infrastructure requirements, and the utilization of available resources within a household’s immediate environment (Saikiran et al., 2025).The productivity of native indigenous chickens is relatively low because of their naturally limited genetic potential (Islam et al., 2020).Hence,to improve the productivity of indigenous chicken under backyard system, various improved varieties of backyard chicken have been developed by different ICAR institutes, which gives promising productive and reproductive performances under backyard system with no or minimum inputs. *Kamrupa* is an improved dual type of backyard chicken developed by three-way crosses (Assam native chicken (25%) with a broiler parent PB-2 (25%) and layer parent Dalhem Red (50%)) at Assam Agricultural University, Khanapara, Guwahati under the project “ICAR-AICRP on Poultry Breeding” and successfully introduced under backyard system of rearing. These birds are hardy, can escape predator and can easily adopt under different agro-climatic zones of Assam (Kalita et al., 2016) and in the entire north-east regions of the country. *Kamrupa* chicken plays a pivotal role in reducing poverty, empowering rural women and providing livelihood and nutritional security for rural tribes (Kalita and Talukdar, 2022). Growth is normally attained by a systematic sequence of maturational changes and involves deposition of protein and increase in length and size of morphometric parts (Edward, 2000). A number of morphological characteristics are known to be the pointers of body growth and market value of chicken apart from body weight (Edward, 2000). Morphometric parameters could be an important aspect of information in designing selection and genetic improvement programs for poultry birds, which primarily depends on the variations within and between breeds or populations (Parte et al., 2024). Moreover, body weight and body morphometric in chickens have been used in differentiating native chicken from exotic chicken as well as commercial breeds and in establishing phenotypic correlations among various genetic groups (Yakubu et al., 2009). The information is also thought to be crucial for conservation and utilization of the chicken genetic resources. Genetic characterization is the most accurate method for evaluating genetic diversity, but it requires advanced technology and is expensive. Researchers also use characterization methods based on morphometric traits that are easy to measure, cost-effective, and provide valuable information (Al-Atiyat, 2009). Keeping in view that, it is need of the time to work on getting baseline information regarding morphometric traits of *Kamrupa* chickens of different phenotypes in local climatic condition of Assam. The present study aims to gather valuable information on the genetic variations among and within the *Kamrupa* chickens’ genetic resources.

**Materials and Methods**

The experiment was conducted from March to August, 2024 at the experimental shed under the project ICAR-All India Coordinated Research Project (AICRP) on Poultry Breeding, Directorate of Research (Veterinary), AAU, Khanapara, Guwahati, Assam to study some important morphometric traits of *Kamrupa* chickens reared under deep litter system at 22 weeks of age.Ten males and 10 females *Kamrupa* chickens, thus a total of 20 chickens were selected randomly to study their morphometric characters. The birds were reared under deep litter system and were fed as per standard chick (18% CP and 2800 ME Kcal/kg) and grower (16% CP and 2600 ME Kcal/kg) ration (Annon, 2013) and their morphometric traits were measured at 22 weeks of age. The body weight of each bird (g) was recorded by using electronic balance, breast angle (degree) was measured with the help of a goniometer and all other morphometric traits (length and breadth) were measured with the help of a digital vernier calliper while circumference was measured by using measuring tape in mm. Altogether seventeen (17) morphometric traits of *Kamrupa* chickens were recorded as per the methods mentioned below:

Body weight: Live body weight (Annon, 2012)

Body length: Length between the tip of the rostrum maxillaries (beak) and that of the cauda (tail, without feathers); the bird’s body should be completely drawn throughout its length (Annon, 2012).

Girth of the body: It was measured at the point of keel bone and wingspan by extending the wing when the bird was in standing posture (Negassa et al., 2014)

Wingspan: Length between tips of right and left wings after both are stretched out in full (Annon, 2012).

Skull length: The distance between the posterior edge of the nostril to the back of bird head (Negassa et al., 2014)

Neck length: The length between the first and last cervical vertebrae before the thoracic vertebrae (Negassa et al., 2014).

Neck circumference: Measured at the middle of the neck (Negassa et al., 2014)

Wing length: The length from the bend of the wing to the tip of the longest primary feathers (Negassa et al., 2014)

Tail length: The distance between the base of the tail to the tip of the longest feathers (Negassa et al., 2014)

Comb length: The length between the insertion of comb in beak to end of combs’ lobe (Negassa et al., 2014)

Comb height: It was measured from the base to tip of the spikes of comb (Negassa et al., 2014)

Wattle length: The vertical distance from the base to the furthest end of the wattle (Negassa et al., 2014)

Beak length: The length of the beak was measured from the anterior edge of the nostril to the tip of the beak (Negassa et al., 2014)

Breast angle: It was measured at the point of keel bone (Negassa et al., 2014)

Keel length: The distance between the tip of the keel bone and the joint of the sternum (Negassa et al., 2014)

Shank length: Length of the shank from the hock joint to the spur of either leg (FAO, 2012)

Shank circumference: Taken at the middle of the shank of either leg (FAO, 2012)

**Data analysis**

The data generated from this experiment were entered in Microsoft Excel 2013 worksheet, organized and processed for further analysis. Mean, standard errors (SE) and correlations were estimated with the help of Statistical Package for Social Science (SPSS, 2008)

**Results and Discussion**

Table 1 depicts different morphometric traits of *Kamrupa* chickens at 22 weeks of age under deep litter system. The study indicated that most of the traits were significantly (P<0.05) different between male and female *Kamrupa* chickens except body girth, beak length and breast angle (Table 1). It was also found that almost all the morphometric parameters recorded in males were significantly (P<0.05) higher than their female counterparts. In contrast, neck length and shank circumference were significantly (P<0.05) higher in females than males. The mean body weights of *Kamrupa* chickens at 22 weeks of age were almost similar with body weights of indigenous chickens of Western Ethiopia in both sexes at one year and above of age (Assefa and Melessa, 2018). The mean skull lengths of *Kamrupa* chickens were found to be higher than indigenous chickens of different agro-ecological zones of Ethiopia in both sexes (Markos et al., 2024). The mean beak length recorded among *Kamrupa* male chicken at 22 weeks age was lower than the beak length of Aseel male chicken at the same age (Churchil et al., 2019). Similarly, the mean beak length recorded at 22 weeks of age for both male and female *Kamrupa* chickens were found to be lower than frizzle feathered chicken of both sexes at 20 weeks of age (Somajpati et al., 2023) and Punjab brown chickens (Parte et al., 2024). The *Kamrupa* chickens at 22 weeks of age had shorter comb length as compared to indigenous chickens Ethiopia at six months of age in both sexes (Markos et al., 2024).

Table 1: Morphometric traits of *Kamrupa* chickens under deep litter system at 22nd week of age

|  |  |  |  |
| --- | --- | --- | --- |
| Sl. No | Parameters | Male | Female |
| 1 | Body weight (g) at 22nd week | 1611.03±8.92a | 1432.11±7.88b |
| 2 | Body length (mm) | 575.04 ± 3.77a | 477.4 ± 5.53b |
| 3 | Body girth (mm) | 281.2 ± 1.32 | 277.01 ± 2.35 |
| 4 | Wingspan (mm) | 723.11±7.67a | 674.43±7.06b |
| 5 | Skull length (mm) | 92.4 ± 1.44a | 83.2 ± 1.98b |
| 6 | Neck length (mm) | 172.4 ± 1.91a | 185.8 ± 3.48b |
| 7 | Neck circumference (mm) | 113.4 ± 4.06a | 86.2 ± 3.54b |
| 8 | Wing length (mm) | 322.4 ± 7.24a | 277.4 ± 2.82b |
| 9 | Tail length (mm) | 279.6 ± 1.86a | 133.8 ± 1.32b |
| 10 | Comb length (mm) | 85.8 ± 1.56a | 22.4 ± 0.81b |
| 11 | Comb height (mm) | 67.6 ± 1.52a | 8.8 ± 0.86b |
| 12 | Wattle length (mm) | 50.6 ± 2.46a | 14.8 ± 1.22b |
| 13 | Beak length (mm) | 23.4 ± 1.78 | 22.2 ± 1.83 |
| 14 | Breast angle º | 49.01 ± 1.31 | 49.86 ± 1.41 |
| 15 | Keel Length (mm) | 104.4 ± 2.29a | 95.11 ± 2.45b |
| 16 | Shank length (mm) | 97.02 ± 2.49a | 80.8 ± 1.32b |
| 17 | Shank circumference (mm) | 39.02 ± 1.18a | 46.03 ± 1.27b |

Means with different superscripts along the same row are significantly (P≤0.05) different.

The comb heights among Kamrupa male chickens were found to be higher than corresponding value among Aseel male chicken (Churchil et al., 2019). The wattle lengths were also found to be shorter in *Kamrupa* chickens than the indigenous chickens of Ethiopia in both sexes (Markos et al., 2024). In contrast, comb and wattle dimensions of *Kamrupa* chickens were higher than the indigenous chickens of western Ethiopia (Assefa and Melessa, 2018). The bigger comb and wattle dimensions of *Kamrupa* chickens indicated better tolerance for hot agroclimatic conditions. The mean body length of male *Kamrupa* chicken was higher than the body length recorded in male Aseel chicken, however the mean body girth of male Aseel chicken was higher than the male *Kamrupa* chickens of same age (Churchil et al., (2019). Similarly, the body length among *Kamrupa* male and female chickens at 22 weeks of age were found to be higher than the corresponding values for frizzle feathered chickens in both sexes at 20 weeks of age (Somajpati et al., 2023) and Punjab brown chickens at 22 weeks of age (Parte et al., 2024). Markos et al. (2024) reported the overall body lengths of indigenous chickens of Ethiopia at six months of age were found to be lower than the body lengths recorded for *Kamrupa* at 22 weeks of age in both sexes. It was also found that *Kamrupa* had almost similar body girth with the chest girth of frizzle feathered chicken at 20 weeks of age (Somajpati et al., 2023). The shank length, shank circumference, keel length of both male and female *Kamrupa* chickens at 22 weeks of age were shorter in comparison with the native chickenat 20 weeks of age maintained at Hosur, Tamil Nadu (Thirunavukkarasu et al., 2024). The male Aseel chicken also had similar shank length (Churchil et al. (2019) with male *Kamrupa* chicken. However, mean shank lengths of *Kamrupa* chickens at 22 weeks of age were higher than the shank length of frizzle feathered chickens at 20 weeks of age in both sexes (Somajpati et al., 2023), Punjab brown chickens at 22 weeks of age (Parte et al., 2024) and indigenous chicken (6.94 cm in female and 8.41 cm in male) ecotypes of Northern Ethiopia (Belay et al., 2024). In contrast, Markos et al. (2024) recorded higher overall shank lengths among indigenous chickens of Ethiopia at six months of age than *Kamrupa* chickens at 22 weeks of age in both sexes. As shank length has strong positive correlation with body weight and skeletal development of chickens (Faruque et al., 2010). Higher shank length among *Kamrupa* chickens indicated better body weight gain, improved bone strength and better ability to escape from the predators. Parte et al. (2024) recorded higher shank circumference of Punjab brown chickens than *Kamrupa* chickens at 22 weeks of age. The breast angle was also found to be narrower among *Kamrupa* chickens than the native chicken of Tamil Nadu at 20 weeks of age (74.8º±0.36) maintained at Hosur under intensive system (Thirunavukkarasu et al., 2024) and Aseel (60.75º) and Kadaknath (57.92º) chicken under backyard system of rearing (Kumar et al., 2022) at 24 weeks. However, Churchil et al. (2019) recorded much lower breast angle among male Aseel chickens as compared to male *Kamrupa* chicken of same age. The keel length was higher in Aseel (16.81 cm) and Kadaknath (16.21 cm) chicken (Kumar et al., 2022) at 24 weeks of age than male *Kamrupa* chicken at 22 weeks of age. In contrast, mean keel length of *Kamrupa* chicken of both sexes at 22 weeks of age were higher than the keel length recorded for frizzle feathered chicken at 20 weeks of age for both sexes (Somajpati et al., 2023) and almost similar (9.5+1.37 cm in male and 11.3±1.2 cm in female) with indigenous chicken ecotype of Northern Ethiopia (Belay et al. 2024). The keel length is an important trait for muscle development and is highly correlated with shank length. However, they also reported that other morphometric traits like body length, wingspan and neck length were longer in *Kamrupa* chicken than the native chicken at 20 weeks reared at Hosur, Tamil Nadu (Thirunavukkarasu et al., 2024). Markos et al. (2024) recorded shorter overall neck lengths among indigenous chickens of Ethiopia at six months of age than the *Kamrupa* chickens in both sexes. Similarly, wingspan recorded in *Kamrupa* chickens at 22 weeks of age were higher than the corresponding values for frizzle feathered chicken at 20 weeks of age (Somajpati et al., 2023) and indigenous chickens of western Ethiopia (Assefa and Melessa, 2018). However, the mean wingspan of male Aseel chicken was almost similar with wingspan of male *Kamrupa* chicken at 20 weeks of age (Churchil et al., 2019).The wings of *Kamrupa* chickens in both sexes at 22 weeks of age were found to be longer than the wings of frizzle feathered chicken at 20 weeks of age in both sexes (Somajpati et al., 2023) and Punjab brown chickens (16.40 cm) at 22 weeks of age (Parte et al., 2024). The observed variation might be due to differences in genotypes, feed availability and other environmental factors. The variations in quantitative traits among different chicken populations in different areas might be attributed to genetic variations, rearing environments, isolation by physical barriers, agroecology, significant geographical distances, human selection pressures, breeding programs, and genetic interactions within the populations (Markos et al., 2024).

**Conclusion**

Significant quantitative morphological variations were observed between different sexes of *Kamrupa* chickens. However, most morphometric traits like body weight, body length, shank length, breast angle etc. showed robust morphometric features suggesting its potential for adaptability, growth rate and suitability for rural poultry farming. Moreover, comb and wattle dimensions of *Kamrupa* gives an indication of better tolerance to hot agro-climate of Assam. Further DNA-based studies could be recommended to validate the observed morphological variations *Kamrupa* chicken, supporting conservation efforts and facilitating genetic improvement

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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