



Description of Native Chicken in Belgaum Division of Karnataka State

B G Veeranna Gowda¹, B U Umesh, G M Satheesha, Hemanth Gowda, M M Venkatesh and M Bharat Bhushan

Veterinary College, Vinobanagar, Shivamogga
Karnataka Veterinary Animal and Fisheries Sciences University, Bidar, Karnataka, India

ABSTRACT

The production of native chickens in India constitutes approximately 42% of the total chicken production and contributes around 24% to the overall meat and egg production. Identifying and characterizing non-descript indigenous chicken breeds is crucial. A recent comprehensive study was conducted in the Belgaum division of Karnataka State, India, to address this need. Hatching eggs were sourced from 180 villages across Bijapur, Belgaum, and Dharwad districts within the Belgaum division. These eggs were then hatched and reared separately using the deep litter system and following standard management practices. Phenotypic characterization was conducted according to NBAGR guidelines when the birds reached 20 weeks of age. The average shank length of male birds ranged from 93.66 ± 0.55 to 96.91 ± 1.72 mm, while in female birds, it ranged between 81.53 ± 0.65 to 83.08 ± 0.31 mm. Significant differences ($P < 0.05$) were observed among the three districts studied. Similarly, the average keel length of male birds varied from 114.04 ± 0.67 to 123.75 ± 1.67 mm, and in female birds, it ranged from 112.79 ± 0.33 to 119.90 ± 0.50 mm, with significant differences noted ($P < 0.05$). The average breast angle of male birds ranged from $79.29 \pm 0.22^\circ$ to $80.85 \pm 0.25^\circ$, while in female birds, it varied between $77.78 \pm 0.29^\circ$ to $81.06 \pm 0.39^\circ$, showing significant differences ($P < 0.05$). Furthermore, the average body weight at 20 weeks for male birds ranged from 1577.58 ± 11.99 to 1669.04 ± 9.20 g, and for female birds, it ranged from 1054.11 ± 5.25 to 1063.43 ± 4.92 g, also displaying significant differences ($P < 0.05$).

Key Words: Breast angle, chicken, Comb type and color, Keel length, Phenotypic characterization, Plumage pattern, Shank length.

INTRODUCTION

India possesses rich biodiversity, including a diverse range of poultry genetic resources, with 19 indigenous breeds and numerous subtypes among the 72 breeds found in Asia, contributing significantly to the country's rural economy (Padhi *et al*, 2016). Indigenous chicken breeds are reservoirs of genetic diversity, hosting various genomes and important genes relevant to tropical conditions. India and its neighbouring countries are recognized as the native habitat of the Red Jungle Fowl (*Gallus gallus*), the ancestor of present-day domestic poultry.

Recognizing the significance of indigenous poultry breeds within backyard farming systems, efforts are underway to characterize, document, and utilize these breeds to enhance the socio-economic status of rural communities (Pundir *et al*, 2013). Conserving

these breeds is crucial as they serve as a source of genetic variation for future poultry breeding programs. Moreover, native germplasm holds great potential for backyard poultry production in India. The current study focuses on systematically analyzing the morphological characteristics and economic traits of indigenous chicken from the Belgaum division of Karnataka. This research aims to uncover the potential of indigenous chicken breeds in developing new varieties with improved adaptability and production capacity, characterized by multicolored plumage, long legs for predator evasion, and resemblance to native birds.

MATERIALS AND METHODS

The aim of this study was to characterize and classify indigenous chicken breeds from three districts within the Belgaum division of Karnataka State based on their morphological features.

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Table 1. Shank length (mm), Keel length (mm), Breast angle (°) and Body weight (gm) at 20 weeks of age in indigenous chicken.

Parameter	Sex	District			
		Bijapur	Belgaum	Dharwad	Overall Mean
Shank length (mm)	Males	96.91±1.72 ^b	95.97±0.53 ^{ab}	93.66±0.55 ^a	95.51±0.63
	Females	81.53±0.65 ^a	82.02±0.54 ^{ab}	83.08±0.31 ^b	82.20±0.30
	Combined sex	89.22±1.20	88.99±0.80	88.37±0.62	88.86±0.52
Keel length (mm)	Males	123.75±1.67 ^b	121.81±0.82 ^b	114.04±0.67 ^a	119.87±0.74
	Females	111.90±0.50 ^a	113.66±0.29 ^b	112.79±0.33 ^{ab}	112.78±0.22
	Combined sex	117.83±1.05 ^b	117.74±0.60 ^b	113.42±0.38 ^a	116.32±0.43
Breast angle (°)	Males	79.29±0.22 ^a	80.85±0.25 ^b	80.43±0.23 ^b	80.19±0.14
	Females	77.78±0.29 ^a	81.06±0.39 ^b	80.63±0.24 ^b	79.82±0.21
	Combined sex	78.54±0.20 ^a	80.96±0.23 ^b	80.53±0.16 ^b	80.00±0.12
Body weight (gm)	Males	1669.04±9.20 ^b	1604.17±10.62 ^a	1577.58±11.99 ^a	1616.93±7.59
	Females	1063.43±4.92	1063.38±4.29	1054.11±5.25	1060.30±2.79
	Combined sex	1154.28±17.70	1144.50±15.82	1132.63±15.58	1143.80±9.45

Males (N=50), Females (N=50) and Combined sex (N=150).

Means bearing at least one common superscript within a column not differ significantly ($P \leq 0.05$)

Hatching eggs of native chicken were collected from 180 selected villages across Bijapur, Belgaum, and Dharwad districts in Karnataka, where the indigenous chicken population was approximately 0.27 million, 0.66 million, and 0.13 million respectively. A total of 1979 chicks were hatched, wing-banded, and reared separately under the deep litter system with standard management practices.

Phenotypic evaluation was conducted by recording morphometric traits in both male and female birds at 20 weeks of age, following guidelines from ICAR-NBAGR, Karnal. Shank length was measured as the distance between the hock joint and the tarso metatarsus using digital Vernier calipers with an accuracy of 0.1mm. Keel length was measured from the tip of the keel bone to the joint of the sternum, also using digital vernier calipers with an accuracy of 0.1 mm. Breast angle was measured using a breast meter or protractor with an accuracy of one degree, taken at the midpoint of the breast region.

Additional morphological characteristics included feather morphology, presence of structural variations in feathers such as normal, frizzled, and silky feathers, feather distribution, plumage color, plumage pattern, skin color, shank

color, ear lobe color, eye color, comb type, comb color, presence or absence of wattles, and body weights. The collected data underwent statistical analysis according to the methods outlined by Snedecor and Cochran (1984) using the SPSS 17.0 statistical package.

RESULTS AND DISCUSSION

Shank length in Male birds

At the 20th week of age, the shank length varied from 93.66±0.55 mm in Dharwad district to 96.91±1.72 mm in Bijapur district. There was a significant difference observed between the birds from Bijapur and Dharwad districts. These findings align with those of Rajakumar (2013) who also noted similar results in the Bangalore division, with values ranging from 86.06±0.44 mm to 97.56±1.29 mm. In contrast, Gopinath (2013) reported lower values in the Mysore division, ranging from 82.98±0.94 mm to 92.61±0.26 mm. The longer shank length observed in our study was attributed to the narrower width of the shank and lighter body weight, which showed a negative correlation with shank length. This longer shank length enables native birds to swiftly evade predators while foraging in field conditions.

Shank length in females

At the 20th week of age, shank length varied from 81.53 ± 0.65 mm in Bijapur district to 83.08 ± 0.31 mm in Dharwad district, with Dharwad district birds showing a significant difference from those in Bijapur district. These findings contrast with those of Rajakumar (2013), who reported lower values in the Bangalore division, ranging from 69.02 mm to 77.20 ± 0.49 mm. Similarly, Gopinath (2013) also reported lower values in Mysore division birds, ranging from 72.82 ± 0.53 mm to 75.76 ± 0.65 mm.

Keel length in male birds

At the 20th week of age, the average keel length of males varied from 114.04 ± 0.67 mm in Dharwad district to 123.75 ± 1.67 mm in Bijapur district. Birds from Bijapur and Belgaum districts exhibited significant differences compared to those from Dharwad district. These findings differed from those of Rajakumar (2013), who reported values in the Bangalore division that were similar to Dharwad district, ranging from 122.61 ± 0.69 mm in Ramanagar district to a higher value of 132.43 ± 2.29 mm in Bangalore Rural district. Gopinath (2013) reported lower values than those observed in the present study, ranging from 75.78 ± 0.87 mm to 83.06 ± 0.24 mm. The variation in keel length measurements may be attributed to differences in chicken types, nutrition, and management practices in the present study.

Keel length in female birds

At the 20th week of age, the average keel length ranged from 111.90 ± 0.50 mm in Bijapur district to 113.66 ± 0.29 mm in Belgaum district. Birds from Belgaum district exhibited a significant difference from those in Bijapur district. These findings were consistent with Rajakumar's (2013) observations in the Bangalore division, where values ranged from 108.45 ± 0.64 mm to 116.95 ± 0.81 mm. In contrast, Gopinath (2013) reported lower values than those found in the

present study for birds in the Mysore division, ranging from 66.14 ± 0.52 mm to 68.65 ± 0.65 mm. The variations in keel length may be attributed to the bird types in the Belgaum region and the management practices implemented.

Breast angle in male birds

At the 20th week of age, the average breast angle (°) of males ranged from $79.29 \pm 0.22^\circ$ in Bijapur district to $80.85 \pm 0.25^\circ$ in Belgaum district. Birds from Belgaum and Dharwad districts exhibited a significant difference compared to those from Bijapur district. These findings were consistent with those of Rajakumar (2013). Gopinath (2013) reported slightly higher values in the Mysore division, ranging from $84.38 \pm 0.46^\circ$ to $85.21 \pm 0.28^\circ$.

Breast angle in female birds

At the 20th week of age, the average breast angle (°) ranged from $77.78 \pm 0.29^\circ$ in Bijapur district to $81.06 \pm 0.39^\circ$ in Belgaum district. Birds from Belgaum and Dharwad districts exhibited a significant difference compared to those from Bijapur district. These findings were consistent with those of Gopinath (2013). Rajakumar (2013) reported slightly higher values in the Bangalore division, ranging from $78.62 \pm 0.66^\circ$ to $86.81 \pm 0.64^\circ$.

Body weight at 20th weeks of age in male birds

At the 20th week of age, the average body weights of males were 1669.04 ± 9.20 gm, 1604.17 ± 10.62 gm, and 1577.58 ± 11.99 gm in Bijapur, Belgaum, and Dharwad districts, respectively. Birds from Bijapur exhibited significantly higher body weights compared to those from Belgaum and Dharwad districts. Rajakumar (2013) reported lower body weights in indigenous chicken from the Bangalore division, ranging from 1249.76 ± 19.71 gm to 1480.14 ± 43.93 g. Similarly, Gopinath (2013) also reported lower body weights in indigenous chicken from the Mysore division, ranging from

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1250.00±28.58 gm to 1366.06±24.33 g. Thakur *et al* (2006) reported even lower body weights in Kadaknath breed (906.21±8.11 gm), while Haunshi *et al* (2009) reported 1297.83±20.85 gm in males of the Miri type of chicken.

Body weight at 20th weeks of age in female birds

At the 20th week of age, the body weights of females ranged from 1054.11±5.25 gm in Dharwad district to 1063.43±4.92 g in Bijapur district, with no significant differences observed among the three districts. These findings were consistent with those of Gopinath (2013). Rajakumar (2013) reported values in the Bangalore division, ranging from 944.29±14.70 g to a higher value of 1131.19±28.30 g in Chikkaballapur district. The results of the present study indicated higher values compared to those reported by Thakur *et al* (2006) for Kadaknath (846.02±6.49 g).

Morphological Features

Feather morphology

In the male birds of Belgaum division, it was observed that 91.66 per cent exhibited normal feather morphology, while 8.33 per cent showed frizzle feather morphology. Among females, 92.64 per cent displayed normal feather morphology, while 7.35 per cent exhibited frizzle feather morphology. In contrast, Gopinath (2013) found that all birds, regardless of sex, in the Mysore division displayed 100 per cent normal feather morphology. Similarly, Rajakumar (2013) reported that all birds in the Bangalore division exhibited 100 per cent normal feather morphology.

Feather distribution

In the male birds of Belgaum division, 87.4 per cent exhibited normal feather distribution, while 12.49 per cent showed naked neck distribution. Among females, 94.11 per cent

displayed normal feather distribution, while 5.88 per cent exhibited naked neck distribution. In contrast, Gopinath (2013) found that in the Mysore division, the combined sex had 93.27 per cent normal feather distribution and 6.71 per cent naked neck distribution. Similarly, Rajakumar (2013) reported in the Bangalore division that in males, the values were 96.55 per cent normal, 3.14 per cent naked neck, and 0.30 per cent feathered shank, while in females, it was 97.39 per cent normal, 2.33 per cent naked neck, and 0.27 per cent feathered shank. The majority of birds evaluated in the present study displayed normal feather distribution, with a lower per centage showing naked neck distribution under farm conditions.

Plumage color and plumage pattern

Plumage color and patterns in poultry are influenced by sex, known as sexual dimorphism. In the current study, male birds in the Belgaum division exhibited six predominant plumage color groups, with brown being the most common (33.33%), followed by red (23.61%), multi-color (22.22%), black (15.28%), white (4.17%), and blue (1.39%). Similarly, females predominantly displayed brown plumage (35.54%), followed by red (23.28%), black (18.87%), multi-color (17.65%), white (3.68%), and blue (0.98%).

Regarding plumage patterns, male birds were categorized into seven groups, with solid being the most predominant (54.16%), followed by dull (41.6%), barred (9.71%), mottled (6.94%), striped (5.55%), spotted (5.55%), and patchy (4.16%). Females showed similar patterns, with solid being predominant (43.87%), followed by dull (19.6%), patchy (12.25%), mottled (10.29%), barred (6.86%), striped (5.87%), and spotted (1.22%). These results align with those of Rajakumar (2013), with similar findings reported in the Mysore division by Gopinath (2013).

Feathers were also examined for secondary plumage patterns, categorized into

seven groups. The most predominant pattern in males was self-red (43.05%), followed by self-black (24.99%), mottled (16.66%), barred (5.55%), self-white (4.16%), self-blue (2.77%), and lasing (2.77%). In females, self-red was also predominant (40.92%), followed by mottled (26.22%), self-black (21.07%), lasing (5.14%), barred (2.69%), self-white (2.44%), and self-blue (1.46%). These findings were consistent with Rajakumar (2013) and Gopinath (2013) in the Mysore division, who reported similar secondary plumage patterns.

Skin color

In the overall population consisting of 72 males and 408 females, 91.66 per cent of males had yellow skin, while 8.33 per cent had white skin. Among females, 96.07 per cent had yellow skin, and 3.91 per cent had white skin. These findings were consistent with those reported by Rajakumar (2013). However, Gopinath (2013) reported contradictory values in the Mysore division, where the combined sex showed 83.11 per cent yellow skin and 16.87 per cent white skin. According to NBAGR (2011), the Ghagus breed is known for having white skin, while other indigenous chicken populations have been documented to have white and/or yellow skin colors (Nthimo, 2004; Vijn *et al*, 2005a; Vij *et al*, 2006a; Kumar and Kumar, 2007). The pigmentation of non-feathered tissues such as skin and shank involves carotenoids and melanins, responsible for yellow and black colours respectively.

Shank color

In the indigenous chicken population of the Belgaum division, yellow was the predominant shank color, with 83.33 per cent in males and 91.42 per cent in females, followed by white at 4.16 per cent in males and 1.46 per cent in females, black at 9.72 per cent in males and 5.63 per cent in females, and green at 2.77 per cent in males and 1.46 per cent in females. These findings were consistent with those reported by Rajakumar (2013) and

Gopinath (2013).

Ear lobe color

In the current study, all male and female birds in the Belgaum division exhibited red ear lobes. These results were consistent with findings by Gopinath (2013) and Rajakumar (2013), and they align with the breed descriptor provided by NBAGR (2011), where the Aseel and Ghagus breeds are noted for having red ear lobes.

Comb color

All indigenous chickens in the Belgaum division were observed to have red-colored combs in this study, consistent with observations by Gopinath (2013) and Rajkumar (2013). Other comb colors have been documented by Ravikumar (2011) and Faruque *et al* (2010).

Eye color

In male birds, eye color was observed in three variants: grey (41.66%), brown (55.55%), and black (2.77%). Among females, it was grey (28.67%), brown (59.55%), and black (11.76%). These findings were consistent with those reported by Rajakumar (2013) and Gopinath (2013). The breed descriptor by NBAGR (2011) notes red-colored eyes in the Ghagus breed.

Comb type

In the study, comb types were categorized into three varieties: single (80.55%), pea comb (16.66%), and rose comb (2.77%) in males, and single comb (86.02%), pea comb (11.76%), and rose comb (2.20%) in females. These results were consistent with those reported by Gopinath (2013) and Rajakumar (2013). The breed descriptor by NBAGR (2011) indicates that the Ghagus breed typically has a single comb.

Presence/absence of wattles

Wattles were present in 59.72 per cent of male birds and absent in 40.27 per cent, while in females, they were present in 41.41 per cent and absent in 58.57 per cent of birds in the Belgaum division. These findings were consistent with those reported by Rajakumar (2013), but not with

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Gopinath (2013). The breed descriptor provided by NBAGR (2011) notes that the Ghagus breed typically has smaller, red-colored wattles. Wattle color is inherited as a polygenic trait involving variations in pigmentation of carotenoid and melanin pigments.

CONCLUSION

The observations on skin, shank, and ear lobe color in this study align with the typical characteristics of the Asiatic class. The slight variations in morphological traits across different genotypes within various districts suggest natural adaptations to local conditions. Particularly, the performance of indigenous chickens in terms of body weight was notably better in Bijapur and Belgaum districts. The significant variations observed among the indigenous chickens across the studied districts indicate genetic diversity within the local population. This diversity can be further explored and utilized through improved management practices and breeding strategies. By conserving these birds and selectively breeding them, new varieties and strains can be developed to better meet the needs of rural poultry farming, including organic production.

Further investigation, particularly molecular characterization and assessment of genetic similarity/divergence with other Indian breeds, is warranted for the indigenous chickens from all three districts evaluated in this study. Efforts should be made to officially recognize these birds as distinct breeds and conserve their genetic diversity.

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