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Phenotypic characterization of indigenous chicken under field conditions in Bengaluru division of Karnataka

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Abstract

The present study was carried out to document the phenotypic characteristics *viz.*, plumage colour, pattern, skin colour, ear lobe colour and eye colour in indigenous chicken under field condition in Bengaluru division (Tumkur, Chitradurga, Davanagere and Shimogga) of Karnataka. A total of 349 Cocks and 385 Hens were considered for recording the phenotypic characters. The highest overall plumage color recorded was red (31.30%) followed by multi-colour (29.70) in cocks and in hens it was brown (36.03%), followed by black (22.09%) and multi-colour (17.99%). The highest primary plumage pattern in cocks and hens was solid (45.22 and 44.79%) followed by dull (29.14 and 31.10%) and the least pattern observed was striped (0.88 and 1.13%). The most commonly observed secondary plumage pattern in cocks and hens were self-red (29.98 and 29.69%) followed by self-black (20.34%) and barred (18.72%). The predominant skin colour was yellow in both cocks and hens (74.60 – 78.40%) followed by white skin colour (22.10 – 25.41%). Yellow shanks was the predominant shank colour (77.48%) followed by black (14.17%) and least was white (1.09%). The colour of the ear lobes in indigenous chicken from Bengaluru division of Karnataka irrespective of the sex was predominantly red (99.45%) and few birds carried white ear lobes (0.55%). The results of the present study provided evidences of varying phenotypic characteristics of indigenous birds in Bengaluru division of Karnataka indicating adaptability of the birds under field conditions for better productivity and survivability.

Keywords: Indigenous chicken, plumage, phenotypic, characterization, field condition, Bengaluru division

Introduction

India has rich poultry genetic resources with more than 19 morphologically defined indigenous chicken breeds along with various nondescript varieties (Ghosh *et al.*, 2013) [7]. These indigenous breeds are a valuable genetic resource for present and future generations since they hold several genetic advantages such as disease resistance, acclimatized to extreme environment, lower inputs and higher genetic diversity as compared to exotic and commercial broilers (Okeno *et al.*, 2011) [19]. In addition, to the recognized breeds/ strains of indigenous birds, there are several unrecognized strains of birds often referred to as non-descript chicken that are been grown under rural parts of India, which is playing a vital role in improving the livelihood and socio-economic status of the rural/ tribal community. Indigenous non-descript birds have varied morphological characteristics which mainly depends on geographical location, climatic conditions and social practices of the community in which they are being maintained. Under field conditions, the native bird's exhibit varying plumage colours and patterns which is one of the major mechanisms by the birds improves its survivability by escaping from the predators (Harikrishnan *et al.*, 2019) [10]. Hence, detailed scientific investigations are required to establish baseline data about various for phenotypic characteristics of indigenous non-descript chicken at field level. In view of the above, the present investigation has been carried out to document various phenotypic characteristics of indigenous non-descript chicken four districts of Bengaluru division of Karnataka at field level.

Materials and Methods

The present study was carried out in four districts *viz.*, Tumkur, Chitradurga, Davanagere and Shivamogga districts of Bengaluru division of Karnataka. A total of 734 indigenous chickens (349 Cocks and 385 Hens)

were assessed for various phenotypic characteristics as per the standard format (NBAGR). The plumage colour was recorded and it included black, white, red, blue, gold and brown. Birds with mixed colours were grouped under multi-coloured category. The colour distribution in the plumage on different body parts was examined and grouped them into categories like solid, dull, stripped, patchy, spotted, barred and mottled. The feathers on the anterior part of the back region of each bird were carefully examined to record the secondary plumage patterns. According to the variation in colour distribution within each feather, the patterns were recorded viz; self-white, self-black, self-blue, self-red, barred, mottled and lacing. The non-feathered part of skin underneath the wings was examined to record the skin colour. Based on the skin colour the birds were grouped into white skinned, yellow skinned and black skinned. The shank colour was recorded on each bird and grouped into white, yellow, black, green, and blue shank. The birds were grouped based on ear lobe colour as white or red. The eyes of the birds were examined for colour and classified as brown, grey and yellow. The data obtained were converted to per cent based on the number of birds assessed.

Results and Discussion

The results of various plumage colours, pattern and other morphological features observed in indigenous chicken from four districts of Bengaluru division of Karnataka are presented in Table 1 and 2.

Plumage color and pattern

The highest per cent of overall plumage color recorded in Cocks among four Districts were red (31.30) followed by multicolour (29.70), gold (22.06), black (8.60), brown (5.18), white (2.22) and blue (0.92). The highest per cent of overall plumage color recorded in indigenous Hens among four Districts were brown (36.03), followed by black (22.09), multicolour (17.99), red (14.54), blue (3.51), gold (3.13) and white (2.70). Plumage colour is a feature used in modern poultry breeding to distinguish between breeds, strains and pure lines and is therefore an important morphological characteristic which is attributed to sex-linked genes. Variation in plumage colour is attributable to differences in the primary and secondary colour patterns exhibited by individual birds. The findings of our study indicated that multicolor was the predominant plumage and are in concurrence with Gopinath (2013)^[9] in indigenous chicken in Mysore division of Karnataka, Tabassum *et al.* (2014)^[24] in indigenous chicken of Bangladesh, Alem (2014)^[2] in indigenous birds of central zone of Tigray, Agarwal *et al.* (2020)^[1] in indigenous birds of Jharkhand, Bibi *et al.* (2020)^[4] in indigenous chicken in different localities in Pakistan and Sudhir *et al.* (2021)^[23] in indigenous birds of Gulbarga division. However, contrary to the findings of this study, several researchers have documented varying plumage colour in indigenous chicken. Blackish brown gold plumage color in local hill fowl of central Himalayan region (Kaur *et al.*, 2010)^[12], black plumage colour in Indigenous dwarf chicken of Bangladesh (Ferdaus *et al.*, 2016)^[6], black and white in indigenous birds of Ethiopia (Melaku, 2018)^[16], Red plumage in native chicken of Kerala (Harikrishnan *et al.* 2019)^[10] and brown/black in indigenous chicken of Belagauam division of Karnataka (Veeranna Gowda *et al.*, 2020)^[27]. The higher variation of plumage colour between different studies may be attributed to diverse agro-climatic regions, tribal groups,

socio-economic and cultural differences. In the present study, it was evident that the highest primary plumage pattern in cocks and hens from all the four division of Bengaluru was solid (45.22 and 44.79%) followed by dull (29.14 and 31.10%) and the least pattern observed was stripped (0.88 and 1.13%). The most commonly observed secondary plumage pattern in cocks were self-red (29.98%) followed by mottled (24.93%) and barred (12.88%), whereas in hens it was self-red (29.69%) followed by self-black (20.34%) and barred (18.72%). The findings are in concurrence with the results of Gopinath (2013)^[9], Rajkumar (2013)^[20], Veeranna Gowda *et al.* (2020)^[27] and Sudhir *et al.* (2021)^[23], who have reported similar plumage patterns among indigenous chicken from different divisions of Karnataka. However, literature search revealed scanty information on plumage pattern in other indigenous chicken from other regions of India as well as other countries and hence no corroboration could be made.

Skin colour

In the present survey it was observed that the predominant skin colour was yellow in both cocks and hens in all the four districts of Bengaluru division (74.60 – 78.40%) followed by white skin colour (22.10 – 25.41%). The findings are in agreement with Msoffe *et al.* (2001)^[17], Vij *et al.* (2005)^[28], Iqbal and Pampori (2008)^[11], Kumar and Kumar (2007)^[14], Nigussie *et al.* (2010)^[18], Gopinath (2013)^[9], Rajkumar (2013)^[20], Veeranna Gowda *et al.* (2020)^[27] and Sudhir *et al.* (2021)^[23] who observed yellowish or white skin colour in indigenous chicken. However, different skin colour in different breeds of indigenous chicken from different part of India have been reported by Tantia *et al.* (2006)^[26] as Yellow or pinkish, Vij *et al.* (2006)^[29] as pinkish white, Vij *et al.* (2007)^[30] as Greyish and Ravi Kumar (2011)^[22] as black skin and Vij *et al.* (2016)^[31] as white or pinkish white.

Shank Colour

In all the four districts of Bengaluru division in both cocks and hens the predominant shank colour observed was yellow (79.19 and 75.16%) followed by black (11.83, 16.50%) and the least colour observed was white (1.70, 0.47%) in the present study. The predominant yellow color corresponds to that reported by Rajkumar *et al.* (2017)^[21] in Aseel birds in India, Assefa and Melesse (2018)^[3] in native chicken of Shekha Zone of Ethiopia, Tadele *et al.* (2018)^[25] in South-Western Ethiopia, Agarwal *et al.* (2020)^[1] in indigenous birds of Jharkhand, Gombarume *et al.* (2020)^[8] in indigenous birds of Zimbabwe, Lalhimpuia *et al.* (2021)^[15] in indigenous birds of Mizoram and Sudhir *et al.* (2021)^[23] in indigenous chicken of Gulbarga division of Karnataka. The yellow color of shank may be due to feeding of naturally available food materials, kitchen and household wastes responsible for the formation of carotenoid pigments.

Ear lobe colour

The colour of the ear lobes in indigenous chicken from Bengaluru division of Karnataka irrespective of the sex was predominantly red (99.45%) and few birds carried white ear lobes (0.55%). In line with the findings of our study red ear lobes have been recorded to be predominant in indigenous chicken by Agarwal *et al.* (2020)^[1], Lalhimpuia *et al.* (2021)^[15], Veeranna Gowda *et al.* (2020)^[27] and Sudhir *et al.* (2021)^[23] across different parts of India. Several researchers have observed different ear lobe colors ranging from red and white (Msoffe *et al.* 2001, Rajakumar, 2013)^[17, 20], white (Tantia *et*

al. 2006) [26], brown or white or grey (Vij *et al.* 2006) [29], white and brown (Vij *et al.* 2007) [30], white and red (Iqbal and Pampori 2008) [11], white, yellowish white, red and yellow (Kumar, 2009) [15].

Eye color: In the present study it was observed that the predominant eye colour in both cocks and hens in Bengaluru

division was brown (60.99, 63.80%) followed by grey (28.48, 28.01%) and black (7.74, 8.18%). It was evident that hens predominantly had brown eyes as compared to males. Similar observations have been documented by Gopinath (2013) [9] and Sudhir *et al.* (2021) [23] who observed that majority of the indigenous birds in Mysore and Gulbarga division of Karnataka had brown eyes.

Table 1: Per cent plumage colour and patterns of indigenous chicken under field conditions in Bengaluru division of Karnataka

Sl. No	Parameters	Categories	Male (349)	Female (385)	Overall pooled sex (734)
1.	Plumage colour	White	2.22	2.70	2.46
		Blue	0.92	3.51	2.22
		Black	8.60	22.09	15.35
		Red	31.30	14.54	22.92
		Brown	5.18	36.03	20.61
		Gold	22.06	3.13	12.60
2.	Primary Plumage pattern	Multicolor	29.70	17.99	23.85
		Solid	45.22	44.79	45.01
		Dull	29.14	31.10	30.12
		Stripped	0.88	1.13	1.01
		Patchy	8.77	4.98	6.87
		Spotted	1.46	1.01	1.23
		Barred	6.10	7.05	6.53
3.	Secondary plumage pattern	Mottled	8.45	10.01	9.28
		Self-white	2.98	1.31	2.15
		Self-Blue	3.17	2.29	2.73
		Self-Black	12.48	28.20	20.34
		Self-Red	29.98	29.40	29.69
		Barred	12.88	24.57	18.72
		Mottled	24.93	5.86	15.40
		Laced	13.58	8.36	10.97

Table 2: Other morphological features (skin colour, shank colour, eye colour and ear lobe colour) of indigenous chicken under field conditions in Bengaluru division of Karnataka (%)

Sl. No	Parameters	Categories	Male (349)	Female (385)	Overall pooled sex (734)
1.	Skin color	Yellow	78.40	74.60	76.5
		White	22.10	25.41	23.76
2.	Shank Colour	Yellow	79.19	75.76	77.48
		White	1.70	0.47	1.085
		Black	11.83	16.50	14.17
3.	Ear lobe colour	Green	7.30	7.28	7.29
		Red	98.90	100	99.45
		White	1.10	0	0.55
4.	Eye color	Brown	60.99	63.80	62.40
		Black	7.74	8.18	7.96
		Grey	28.48	28.01	28.25

Conclusion

The results of the present study provided clear evidences of varying plumage colour and pattern existing among the indigenous chicken reared by farmers in Bengaluru division of Karnataka under field conditions. These phenotypic characters of the birds are an important identification of the breed character as well as a defense mechanism of these indigenous birds to escape from the predators by camouflaging with the natural environment in which these birds are reared.

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