

Phenotypic Characterization of Indigenous Chicken Population in South West and South Part of Ethiopia

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Abstract: The Phenotypic characteristics of four indigenous chicken populations in Ethiopia were studied. A total of 240 individual chickens, (six months older in age) 120 chickens from each study zone i.e. South west Showa zone and Gurage zone were characterized under traditional management system for qualitative and quantitative traits. The results indicated that the predominant plumage color of four types of indigenous chickens was brown (32.8 %) followed by gray mixture (14.4 %) and red brownish with black (14.4 %). Values indicate that 33.73% of indigenous chickens had whitish shank color followed by yellowish 32.48%; brown 11.40% and black 7.75 %. Almost all chickens (81.5%) in the study area had ear lob and the dominant ear lob colour were both red (30.6%) and red&white (30.6%) followed by white (26.7%). Regarding the head shape 72.8 % of the chicken in the study area had plain head shape and the remaining 27.2 % had crest head shape. Variations were also found on quantitative morphological traits such as wattle length, shank length and body length and body weight. The four indigenous chickens showed distinct physical variations for both qualitative and quantitative traits under traditional management system.

Key words: Indigenous Chicken • Qualitative Traits • Quantitative Traits • Traditional Management

INTRODUCTION

Indigenous breed is a general terminology to describe those birds that are kept in the extensive system, scavenging in the free-range, have no identified description, multi-purpose and unimproved [1, 2]. Indigenous chickens have several valuable characters that are not found in “exotic” chicken and are appropriate for traditional low input/low output farming system. These indigenous chicken types have a good adaptability for climate and resistance against diseases. In Ethiopia chickens are the most widespread where almost every rural family owns chickens, which contribute greatly to supply of eggs and meat [3-5]. The total chicken population in the country is estimated to be about 44.96 million, most of the chicken types being local ones, which show a large variation in body conformation, plumage color, comb type and productivity [6-9]. The improvement of domestic animals including chickens to meet human needs is dependent on variations (variations within and between breeds). Such variation among individuals or

groups of chickens gives room and opportunity for breeding and selection. Limited work pertaining to the phenotypic and genotypic constitution of the indigenous chicken of Ethiopia has been carried out [4,10,8].

Thus, there is little information available on the diversity of different chicken ecotypes. Moreover, no real efforts have been made to conserve these chicken genetic resources. The present and future improvement and sustainable utilization of indigenous chickens are dependent upon the availability of these genetic variations [11]. Genetic characterization based on molecular assessment is reported to be most common and used method to evaluate genetic diversity among and within livestock breeds, but it needs high technology and cost [12-14]. Researchers have used a characterization method based on morphological traits that are easy to measure, low cost and provide valuable information [10, 8]. Thus the present study was under taken to phenotypically characterize some indigenous chicken in Ethiopia by taking qualitative and quantitative morphological traits.

MATERIALS AND METHODS

The study was conducted in South West part and South part of Ethiopia. Four districts, two districts namely Dawo and Seden Sodo from South West Showa Zone of South west and two districts namely Mehale Ameba and Mehurena Aklile from Gurage Zone of South part of Ethiopia were selected based on purposive multi Stage sampling method. A rapid field survey was done before the main survey, to map out the distribution and concentration of local chicken.

A total of 240 indigenous chickens: 120 chickens from each study zone, managed through traditional scavenging system, were selected randomly. The chicken used were approximately six months older in age as per information provided by the owners and also verified by the researchers using wing plumage. Qualitative morphological traits (*i.e.*, plumage color, comb pattern, head shape, ear lob colour) and quantitative morphological traits (*i.e.*, shank feather, shank color, wattle length, shank length, body length and body weight) were recorded following the recommended descriptors for chicken genetic resources [15]. Measuring tapes (calibrated in centimeter) and a spring balance (a 5-kg measuring scale) were used to measure the respective quantitative traits and body weight of sampled chickens.

Data Analysis: The qualitative parameters were analyzed using descriptive statistics and compared as percentages using statistical package for social science [16]. Similarly, the data collected from the quantitative variables were analyzed to obtain descriptive statistics, using General Linear Model (GLM) multivariate analyses of the same software package.

RESULTS AND DISCUSSION

Variation in Qualitative Traits: Qualitative traits such as plumage colour, earlobe colour, shank colour, comb type and earlobe type were evaluated among indigenous chicken population studied in South west Showa zone and Gurage zone of Ethiopia (Table 1). The predominant plumage colour of the local chicken populations in the study area of South west Showa zone and Gurage zone of Ethiopia is brown (32.8 %) followed by gray mixture (14.4 %) and red brownish with black (14.4 %). However, considerable numbers of chickens showed

heterogeneity and have diverse plumage colour like black, black with white tips, brown with white and black strips, red and white which accounted for 9.2, 2.1, 11.8, 5.1 and 10.3 % respectively that aid for camouflage against predators. This is in agreement with Daikwo, *et al.*, in Nigeria [17] and Halima [8] in North West Ethiopia. Duguma [15] also found similar results for the Horro, Tepi and Jarso indigenous chickens with regard to plumage colour. The various plumage colouration which was observed among the indigenous chicken of south west showa zone and Gurage zone of Ethiopia attributed the lack of selection of breeding programme directed towards choice of plumage colour [18]. According to Ensminger [19], plumage colors such as white or light colored feathers have become an important factor in breeding particularly in broilers because they are easier to pick clean and preferred for appearance of carcass and cut-up parts, thus, have market implication.

Variations were also observed in comb type and head shape (Table 2). Of the Dawo indigenous chicken, 59.2% had single comb pattern followed by rose comb pattern (31.8%) and double comb pattern (9.9%). Indigenous chicken from Seden Sodo had single comb pattern (46.8%), rose comb pattern (43.5%) and double comb pattern (9.7%).

The Mehale Ameba indigenous chicken was dominated by rose comb pattern (46.7%) followed by single comb pattern (33.3%) then Strawberry comb pattern (16.7%) and double comb pattern (3.3%).

Indigenous chicken from Mehurena Aklile had relatively equal Strawberry (12.5%) and single (12.5%) comb pattern and rose (56.3%) was the dominant comb pattern followed by double (18.8%) comb pattern. Regarding the head shape, 72.8 % of the chicken in the study area had plain head shape and the remaining 27.2 % had crest head shape and this is similar with a report by Addis [20]. Almost all chickens (81.5%) in the study area had ear lob and the dominant ear lob colour were both red (30.6%) and red&white (30.6%) followed by white (26.7%) and these results are in agreement with others [4,8,10].

The study also showed that there is a variation in shank colour and the overall mean indicated that about 32.48, 33.73, 11.4 and 7.75 % of the chickens had Yellow, White, Brown and Black shank colour, respectively (Table 3). Almost all chicken in the study area (98.48%) had no shank feather. Similar shank colour variations were reported in North West Ethiopia [8] and also by Duguma [10].

Table 1: Plumage colour characteristics of indigenous chicken population of the study areas

Plumage colour (%)	Study districts				Over all mean
	Dawo	Seden Sodo	Mehale Ameba	Mehurena Aklile	
Sample size	60	60	60	60	
black	7.0	11.3	13.3	6.3	9.2
Black with white tips	4.2	0.0	3.3	0.0	2.1
brown	32.4	48.4	13.3	21.9	32.8
brown with white and black strips	11.3	12.9	10.0	12.5	11.8
grey mixture (nech gebesems)	4.2	9.7	40.0	21.9	14.4
red	8.5	4.8	3.3	0.0	5.1
red brownish with black (key gebesema)	19.7	6.5	6.7	25.0	14.4
white	12.7	6.5	10.0	12.5	10.3

Table 2: Morphological characteristics of the head region of indigenous chicken population in the study area

Morphologies (%)	Traits	Study districts				Over all mean
		Dawo	Seden Sodo	Mehale Ameba	Mehurena Aklile	
Comb pattern	Rose	31.0	43.5	46.7	56.3	41.5
	Strawberry	0.0	0.0	16.7	12.5	4.6
	Single	59.2	46.8	33.3	12.5	43.6
	double	9.9	9.7	3.3	18.8	10.3
Head shape	Plain	54.9	79.0	96.7	78.1	72.8
	Crest (guteya)	45.1	21.0	3.3	21.9	27.2
Ear lob	Yes	69.0	87.1	100.0	81.3	81.5
	no	31.0	12.9	0.0	18.8	15.7
Ear lob colour	Red	45.8	37.5	6.7	38.5	30.6
	White	29.2	23.2	43.3	30.8	26.7
	White & red	22.9	39.3	46.7	30.8	30.6
	Yellow	0.0	0.0	3.3	0.0	0.6
	black	2.1	0.0	0.0	0.0	0.6

Table 3: Morphological characteristics of the leg region of indigenous chicken population of the study area

Morphologies	Traits	Study districts				Over all mean
		Dawo	Seden Sodo	Mehale Ameba	Mehurena Aklile	
Shank feather	Yes	2.8	0.0	3.3	0.0	3.05
	no	97.2	100.0	96.7	100.0	98.48
Shank colour	Yellow	38.0	40.3	11.0	40.6	32.48
	White	47.9	29.0	8.0	50.0	33.73
	Brown	8.5	19.4	0.0	6.30	11.40
	Black	5.6	11.3	11.0	3.10	7.75

Table 4: Wattle length, shank length, body length and body weight of indigenous chicken in the study area

parameter	Dawo	Seden sodo	Mehale Ameba	Mehurena Aklile	F- value and level of significance
Wattle length	2.05 ^a	1.37 ^b	1.22 ^b	1.52 ^b	4.64*
Shank length	9.8 ^a	10.5 ^a	12.2 ^b	10.0 ^a	7.75*
Body length	28.00 ^a	30.85 ^b	33.55 ^c	28.83 ^a	12.05*
Body weight	1297.18 ^a	1380.33 ^a	1955.00 ^c	1013.46 ^b	10.53*

*The mean difference is significant at 0.05 level;

Means within rows with different superscripts differ significantly

Table 5: Correlation between shank length, body length and body weight of indigenous chicken in the study area

Correlations	Correlation coefficients (r)
Correlation coefficient between shank length with body weight	0.789 ^{ns}
Correlation coefficient between shank length with body length	0.973*
Correlation coefficient between body length with body weight	0.634 ^{ns}

r= correlation coefficient; ns = none significant; * = significant

Quantitative Morphological Traits: Body weight, body length, shank length and wattle length are shown in Table 4. Data presented in Table 4 showed that the live performance parameters as affected by the different indigenous chicken in four different study districts. The Mehale Ameba indigenous chicken had shank length of 12.2 cm, which was significantly longer compared to the other chicken in this study. Significantly ($P < 0.05$) the highest wattle length was observed in Dawo.

The present result (Table 5) indicated that there is significantly positive relationship between shank length with body length in all indigenous chicken in the study area ($r = 0.973$) while non-significant positive relationship between shank length with body weight ($r = 0.789$) and between body length and body weight ($r = 0.634$) was observed. Similarly there is a study in North Gondar Zone, Ethiopia which shows positive correlations of body weight and other linear body measurements [20]. Alabi *et al.* [21] also observed a positive relationship between body weight and other linear body measurements.

CONCLUSION

From this study it may be concluded that the indigenous chickens in the study area had distinct physical variations for both qualitative and quantitative traits in traditional management system. There is a scope to improve native chicken and further research is needed to explore full potentiality of indigenous chicken by conservation and molecular characterization.

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