

Phenotypic Characterization of Indigenous Chickens' Ecotypes in Host Communities of Njala University, Sierra Leone

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Abstract:- Phenotypic characterization of indigenous chicken ecotypes on extensive management system in five communities hosting Njala university was done using multivariate analyses of qualitative morphological/phenotypic traits from July to October 2018.

Six distinct ecotypes with their respective proportions were identified (frizzle(11.1%), normal feathered(71.2%), naked neck (7.5%), rumples (4.6%), dwarf (2.9%) and straw feathered plumage (2.7%) with significant differences ($P < 0.05$) among the five villages in terms of morphological appearance. Diverse plumage coloration among indigenous chickens with variegated plumage forming the majority 39.5%, while 26.2% were black; 22.9% white, 5.9% brown and 5.5% red with variations attributed to lack of selection for this qualitative trait and uncontrolled mating. With regards comb type, single comb accounted for 88.4 %, while the remaining 4.2%, 3.8%, and 3.6% have, pea, walnut and rose comb types respectively. 93.6% of the birds have normal shank type, while the remaining 6.4% have feathered shank. Three distinct shank colours were identified with black comprising (46.5%), white (41.4%) and yellow (12.2%).

The research findings conclude that diverse phenotypic variations exist between ecotypes of indigenous chickens in Sierra Leone for all parameters investigated as a result of no selection for these traits due to uncontrolled and indiscriminate mating that prevails within the extensive system. Gene erosion and dwindling population of important ecotypes was also observed in all the communities.

The research however recommends their conservation, through setting up and breeding of nucleus herds of different ecotypes for the purpose of multiplication.

Keywords:- Indigenous chicken, morphological/phenotypic traits.

I. INTRODUCTION

Indigenous chicken breeds are birds kept under extensive free-range system, scavenging for their survival resources (feed and water), generally unimproved, multipurpose and small body conformation and weight with distinct morphological parameters between ecotypes (Horst P. 1989); (Pedersen C.V. 2002). With similar situation in Sierra Leone. According to (Horst P. 1989), indigenous chickens are reported to have variable morphological identity carrying genes that have adaptive values to their environment and diseases and considered them to be repository for a wide genetic pool especially for genes that have adaptive features for tropical conditions. Indigenous chickens are widespread in resourced poor rural Sierra Leone with each household involved in the rearing of these birds and that they greatly contribute to household protein nutrition security (meat and eggs) and income (Alemu Y. and Tadelle D. 1997); (Aklilu H.M. 2007); (Tadelle D. 2003). Unpublished reports put indigenous chicken production to account for over 90% of total chicken production in Sierra Leone with high variation in eco type, plumage colour and type, comb types, and shank types and colour and are used for socio-cultural and traditional rites other than food. The remaining 10% being exotic commercial layers farms. Similar findings in Ethiopia (CSA) 2011/12); (Halima H.M. 2007); (Tadelle D. 1996); (Teketel F. 1986). Although performance characteristics of individual ecotypes is yet to be done in Sierra Leone, a number of studies had been done on the performance characteristics of various ecotypes of Ethiopian chickens (Alemu Y. and Tadelle D. 1997); (Tadelle D. 2003); (Duguma R. 2010); (Halima H.M. 2010); (Aberra M. and Tegene N. 2011); (Mengesha M. and Tsega W. 2011). There is however little information available on the diversity of different indigenous chicken ecotypes. Moreover, no real efforts have been made to conserve these indigenous chicken genetic resources in pure stands. The present and future improvement and sustainable utilization of indigenous chickens are dependent upon the availability of these genetic variations (Benitez F. 2002). Presently, studies on characterization (some phenotypic and very few genetic characterization) in Ethiopia are being taken up to generate useful information towards conservation of animal genetic resources, but these works are mostly on small ruminants and cattle rather than on chickens. 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 (Wimmers K., Ponsuksili S, Hardge T, *et. al.*, 2000); (Hillel J.M.A. Groenen, M. Tixier-Boichard, A.B. Korol, *et. al.*, 2003); (Hillel J.M.A. Groenen, M. Tixier-Boichard, A.B. Korol, *et. al.*, 2003). Researchers have used a characterization method based on morphological traits that are easy to measure, low cost and provide valuable information (Duguma R. 2010); (Halima H.M. 2007). Hence, this study was undertaken to phenotypically characterize indigenous chicken populations in the five communities hosting Njala University in Moyamba district, southern Sierra Leone qualitative morphological traits.

II. MATERIALS AND METHODS

A. Description of the study Area

This research was conducted in five villages hosting Njala University (Bonganema, Foya, Mokonde, Mosongo and Taiama) in the Kori Chiefdom, Moyamba District in the Southern Province of Sierra Leone. Like in any other part of the country, Moyamba district is subjected to two distinct seasons; rainy and dry seasons. The rainy season is often experience in May to October and the dry season is prevalent in November to April which is usually accompanying by a short lived harmattan period which occurs around December to February months. The study area was stratified into five villages (Bonganema, Foya, Mokonde, Mosongo and Taiama) all in the Kori Chiefdom, Southern Sierra Leone.

Taiama, the chiefdom headquarter town of Kori Chiefdom is one of the five study locations and is approximately 118 miles east of Freetown and like Mokonde lying on the banks of River Taia. Kori Chiefdom is host to Njala University, Sierra Leone Agricultural Research Institute (SLARI), a radio station (Njala Radio MHz 95.2), Taiama Health Center and Njala hospital which serve surrounding villages and few banking institutions.

The climate of Kori Chiefdom is mainly tropical with high temperature ranges from 24°C to 27°C for the greater

part of the dry season. The vegetation consists of farm bush, grassland and inland valley swamps.

Kori chiefdom has been an iconic place for agricultural development in the country and to international researchers as Njala University is the largest agriculture based educational and research institute in the country. This may be the reason why the main industry in the chiefdom is agriculture which is believed to employ majority of its inhabitants.

B. Sampling and data collection methods

a) Data collection methods

This study uses primary data collection methods using purposeful structured open and close ended questionnaires in a bid to generate more information, focus group discussion and key informants' interviews of indigenous poultry keepers. The respondents were randomly interviewed until the targeted number was reached before moving to the next village.

b) Sample size

A total of 250 sample farmers, 50 from each village, targeting local chickens' caretakers, owners and household heads irrespective of gender were selected randomly using lottery method from those households reared at least one chicken in the year.

c) Scope of the research

Research scope was hinged on phenotypic characterization of indigenous chickens' population in host communities of Njala University, Njala campus

d) Statistical analysis

Descriptive statistics such as mean, range, frequency and percentage were calculated and the surveyed data were analyzed using Statistical Package for Social Sciences (SPSS) version 16 (SPSS Inc., Chicago, Illinois, USA, 2007). The descriptive statistics (mean, SD) for numerical survey data were subjected to procedures of SPSS to conduct student sample T-Test.

III. RESULTS AND DISCUSSIONS

- Plumage type and colour and comb types of indigenous chickens in the study areas

Variable	Bonganema		Foya		Mokonde		Mosongo		Taiama		Overall (3,389)	Overall Mean	P Value	
	n	%	n	%	n	%	n	%	n	%				
Plumage type														
Frizzle	122	17.3	22	4.4	43	6.3	130	13.0	58	11.5	375(11.1%)	133.26	0.00	
Normal	399	56.7	426	85.2	570	83.8	642	64.2	375	74.3	2412(71.2%)			
Naked neck	70	9.9	22	4.4	35	5.1	95	9.5	32	6.3	254(7.5%)			
Rumpless	70	9.9	12	2.4	15	2.2	50	5.0	10	1.9	157(4.6%)			
Dwarf	19	2.7	10	2.0	9	1.3	47	4.7	16	3.2	101(2.9%)			
Straw	24	3.4	8	1.6	8	1.2	36	3.6	14	2.8	90(2.7%)			
Plumage colour														
Black	161	22.9	119	23.8	179	26.3	327	32.7	101	20.0	887(26.2%)	134.76	0.00	
White	167	23.7	98	19.6	170	25.0	233	23.3	108	21.4	776(22.9%)			
Red	45	6.4	10	2.0	32	4.7	75	7.5	25	4.9	187(5.5%)			

Brown	35	5.0	7	1.4	52	7.6	85	8.5	21	4.2	200(5.9%)		
Variegated	296	42.0	266	53.2	247	36.3	280	28.0	250	49.5	1339(39.5%)		
Comb type													
Single	601	85.4	437	87.4	614	90.3	902	90.2	441	87.3	2995(88.4%)	131.48	0.00
Pea	32	4.5	25	5.0	27	3.9	44	4.4	16	3.2	144(4.2%)		
Rose	35	5.0	14	2.8	31	4.6	26	2.6	15	3.0	121(3.6%)		
Walnut	36	5.1	24	4.8	8	1.2	28	2.8	33	6.5	129(3.8%)		

Table 1: Multivariant table showing morphological indices (qualitative traits-plumage type and colour and comb types) of indigenous chickens in five different villages of the study area

Note: n = the total number of respondents

Qualitative traits such as plumage type and color, shank type and color, comb type, and head appearance were evaluated in study area as indicated above in (Table 1). Six ecotypes were identified (frizzle type feathered, normal feathered, naked neck, rumpless, dwarf and straw feathered). The results indicated that there are significant differences among the five villages in terms of morphological appearances with (P<0.05). Majority of the indigenous chickens, 71.2% were mostly normal feathered or have normal plumage type, while 11.1% being frizzled, with few necked necks (7.5%). Other phenotypes like rumpless, dwarf, and straw feather types accounts for 4.6%, 2.9% and 2.7% respectively.

Result from the study area also indicated diverse plumage coloration observed among indigenous chickens as presented above in Table 1. with indigenous chickens having variegated plumage forming the majority 39.5%, while

26.2% were black; 22.9% white, 5.9% brown and 5.5% red, being the dominant colours observed. This result is in close line with Halima, (2007) who reports that, the plumage colour in North West Ethiopia were 25.49% white, 7.79% black, 16.44% red, 22.23% gebisama and 13.64% black with white strips. The large variation in plumage colour might be attributed to a lack of selection of breeders for this trait, as reported by (Daikwoet *et al.*, 2011) in Ethiopia; Abdelqader *et al.*, 2007 in Jordan and Badubi *et al.*, 2006 in Botswana; and the indiscriminate and uncontrolled mating arising from the extensive free-range system of management.

The results from the study also revealed diverse comb types in the study areas with single comb accounting for 88.4 %, while the remaining 4.2%, 3.8%, and 3.6% have, pea, walnut and rose comb types respectively which is in line with (Daikwoet *et al.*, 2011); (Halima, 2007) findings in North West Ethiopia.

Variable	Bonganema		Foya		Mokonde		Mosongo		Taiama		Overall (3,389)	Overall Mean	P Value
	n	%	n	%	n	%	n	%	n	%			
Shank type													
Normal	618	87.8	471	94.2	661	97.2	969	96.9	453	89.7	3172(93.6%)	338.9	0.00
Feathery	86	12.2	29	5.8	19	2.8	31	3.1	52	10.3	217(6.4%)		
Shank colour													
White	271	38.5	232	46.4	256	37.6	407	40.7	236	46.7	1402(41.4%)	225.93	0.00
Black	366	52.0	226	45.2	303	44.6	473	47.3	207	41.0	1575(46.5%)		
Yellow	67	9.5	42	8.4	121	17.8	120	12.0	62	12.3	412(12.2%)		
Head appearance													
Normal head	612	86.9	474	94.8	657	96.6	900	90.0	482	95.4	3125(92.2%)	357.3	0.00
Cap/crested head	92	13.1	26	5.2	23	3.4	100	10.0	23	4.6	264(7.8%)		

Table 2: Multivariant table showing morphological indices (qualitative traits-shank types, colour and head appearance) of indigenous chickens in five different villages of the study area

Note: n = the total number of respondents

Table 2 presents shank types and appearance, 93.6% of the birds have normal shank type, while the remaining 6.4% have feathered shanks. These results are consistent with the observations of (Bogale, 2008); (Halima, 2007); (Faruque *et al.* 2010), who reported that most of the indigenous chickens have no shank feathers.

The shank colour was also evaluated with black accounting for 46.5%, white 41.4% and yellow 12.2% Table 2 This finding was also slightly similar with findings of

(Halima, 2007) reported that, chickens in North Western Ethiopia have yellow 64.42%, black 9.61%, white 13.99%, green 11.98% shank color.

Majority of the birds within the study population have 92.2% normal head, while 7.8% have crested/cap head appearance. This phenotypic head appearance has not been reported in literature by any researcher.

IV. CONCLUSIONS

From the results, it can be concluded that diverse phenotypic variations exist between ecotypes of indigenous chickens in Sierra Leone for all parameters investigated as a result of no selection for these traits due to uncontrolled the indiscriminate mating that prevails within the extensive system. Gene erosion and dwindling population of important ecotypes was also observed in all the communities.

RECOMMENDATIONS

Based on the research findings, the following are being proffer Identification and conservation through setting up and breeding of nucleus herds of different ecotypes for the purpose of multiplication.

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