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Full Length Research Paper

Phenotypic characterization of indigenous chicken ecotypes in the eastern Amahara, region Ethiopia

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Abstract

A reconsunsus field survey was conducted in Eastern Amahara region, Ethiopia to identify and characterize the local genetic resources of chicken ecotypes. Qualitative and quantitative traits from 450 adult chickens were considered. From the total districts in three zones chicken ecotypes such as Hemete, Kuakuate and Yeberha Tsehaye from Ziqualla, Teneta and Jamma districts were identified, respectively. Measurable traits indicated that body weight and body length of Yeberha Tsehaye and Kuakuate was (p < 0.01) higher than Hemete ecotypes. Sex and ecotype interaction were significant (p < 0.01) sources of variation for both body weights and linear body measurements. Key informants are very good individuals to recognize the non identified genetic resources of animals. Future AGR identification and characterization should be conducted routinely to validate and investigate the resources in the country.

Key words: Hemete, yeberha tsehaye, kuakuate, Eastern Amahara Ethiopia.

INTRODUCTION

Ethiopia is known in livestock populations and gets way of domestic animals migration from Asia to Africa and has huge population size in the country (CSA, 2011). As of a few African countries, about 60% chicken populations are found in Ethiopian (Mekonnen *et al.,* 1991). Poultry include all domestic birds (*Gallus domestics)* and in Ethiopia except chickens other poultry species are found in their natural habitat whereas geese and turkeys are exceptionally not common (Tadelle *et al.,* 2003). Such poultry species contributed important socio-economic roles for food securities by generating additional cash incomes and religious/cultural reasons (Salam, 2005).

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In Ethiopia, chicken populations are estimated about 49.3 millions of which 97.3%, 2.32 % and 0.38% were indigenous, exotics and hybrid breeds, respectively (CSA, 2011).

Still these large population indigenous chickens are found in traditional production systems. There is no proper provision of additional feeds, they are rearing by consuming table left over from the household, requiring small house at night and free ranging at day time, but they are well adapted to the tropics, resistant to poor management, feed shortages, tolerate to diseases and provide better test of meat and eggs than exotic chickens (Tadelle and Ogle, 2001). Despite, indigenous chickens are poor in both reproductive and productive performance (Pedersen, 2002; Gondwe, 2004). Therefore, they are under-estimated, neglected and little attention has been given from researchers, development workers and policy

makers to put them in the research and development agendas (Tadelle, 2003).

There is no well-developed breeding practice in chicken production in Ethiopia. However, farmers in the view to increase meat and egg production follow their own breeding practice through selection (Halima, 2007; Bogale, 2008; Fisseha *et al.,* 2010a). However, Nigussie (2011) reported that the breeding practices of farmers were allowing cocks and hens to mate indiscriminately without systematic mating. The other practice was the use of improved exotic breeds to be used a sire line crossing with local ecotypes. According to the report of Tadelle (1996) in central high lands of Ethiopia, introduction of exotic breeds at various times and different forms through cockerels, pullets and fertile eggs were practiced. Nevertheless, their effects on upgrading of the village chicken performances have been minimal. This is because the programs were usually planned without participation of farmers, with no parallel improvement of feeding, housing and health care and typically lasts for short time (Tadelle, 1996; Bogale, 2008). Such random distribution of exotic breed before appropriate identification, characterization and conservation of indigenous chicken is believed to be the main cause of indigenous chicken genetic erosion (Halima, 2007; Besbes, 2009). In addition to those, there has been number of reports on the constraints which played significant role in loss of poultry population. Among these are disease (Serkalem *et al.,* 2005), predation (Halima, 2007), market system (Bogale, 2008), management and production system (Fisseha *et al.,* 2010b).

To improve the performance of indigenous chicken, identification and characterization of available genetic resource is important (FAO, 2011). Some researchers (Tadelle, 2003; Halima, 2007; Nigussie *et al.,* 2009) have made phenotypic and genetic characterization of indigenous chicken in some parts of Ethiopia. Poultry production and marketing system in three districts of southern Ethiopia was conducted by Mekonnen (2007), phenotypic and genetic characterization of indigenous chickens in Northwest Ethiopia by Halima (2007), genetic parameters on Horro chickens for weights and egg production trait by Nigussie *et al*. (2010) and breeding objective and trait preference of village poultry producers in same selected parts of Ethiopia by Nigussie (2011). The above researchers are area specific and not include chickens in north Wollo zone Ethiopia. Therefore this study was conducted to identification and characterization the available local chicken ecotypes in the north eastern part of Ethiopia.

MATERIALS AND METHODS

Description of the Study Area

The study was conducted in three districts of eastern Amahara (Ziqualla from Sekota zone, Teneta and Jamma from Debub Wollo Zone) of Ethiopia. The altitude of North Sekota zone ranges from 500 to 3500 meter above sea label (MSL) with annual rainfall of 150 to 700 mm and temperature ranging from 15 to 40^{o}C. Ziqualla district is located in western part of Sekota Zone between 11^{0}47' and12^{0}21N latitude and between 11^{0}18' and 12^{0}15'E longitude. It is 721km far from Addis Ababa and 48 km from Sekota town. The annual temperature ranges from 25 to 39^{0}c with annual rainfall range of 600 mm (ZADO, 2013). Teneta district located in southwest of Desse town with the average temperature of 27^{0}c and annual rainfall of 1400 mm. Jamma district is located 536 km northeast of Addis Ababa and 136km south west of Desse at an altitude of 1500 metres above MSL with the temperature of 25 and annual rainfall of 1700 mm (TADO, 2013).

Data Collection Methods

Reconsunsus field survey, semi-structured questionnaires, participatory rural appraisal (PRA) and focus group discussion, field observation and body measurements were employed to develop required information. For the morphological and biometrical measurements, all matured chicken ecotypes n = 450, 150 males and 300 females were deliberated. Qualitative traits such as plumage size, body shape, comb type, shank colour, skin color, head shape and eye colour was documented through direct visualization. Whereas measurable trait like body weight (kg), body length, wing span, shank length and circumference, wattle length and width, keel length, spur length, beak length, comb length and width) were measured using spring balance and measuring tape in cm measuring tape in cm in the nearest two digits (FAO, 2011).

Statistical Technique

Information from personal observation and focus grouped discussions were simply reviewed and synthesized by researchers. Quantitative and qualitative data were analyzed using SAS software version 9, 2002. General linear model was used to examine quantitative traits (SAS, 2002). Duncan multiple range tests were used to compare factor that brought significant difference. The model was used for body weight and linear body measurement of ecotypes by considering the fixed effects of sex and ecotype.

Model1. $Y_{ijk} = \mu + A_i + D_j + AD_{ij} + e_{ijk}$ Where: Y_{ijk}= the observed body weight and linear body measurement of chickens

μ = overall mean

A_i = fixed effect of i^{th} eco type (I =1, 2 and 3)

D_j = the effect of k^{th} sex (j= male and, I= female)

AD_{ji} = the fixed effect interaction of i^{th} eco type with j^{th} sex

Eij_k = random residual error

RESULTS

Hemete Chicken

Hemete chickens are found in a very hot ecological zone of Ziqualla district (Figure 1). This chicken ecotype is completely red in body plumage colors. About 45 % of

Table 1: Description of dominant qualitative traits of newly reported indigenous chickens

Character	Attributes	Ecotypes by proportions and their associations					P–value
		Hemete=150	Kuakuate N=150	Yeberha Tsehaye N=150Overall (%)	Overall N=450	Cramer's V	
Pc							
	Black with white tips	-	-	-	33.3^{a}	0.56	0.001
	(TikurTeterma)	-	100^{a}	-	-		
	Grayish-mixture	-	-	80^{a}	26.7^{b}	0.85	0.001
	(*Gebsema*)	-	-	-	-		
	Red-braunish(*Kokima*)	-	-	10^{a}	3.3^{a}	0.25	0.06
	Multicolor *(Ambesa*)	-	-	-	-		
	Black (*Tikur*)	10^{a}	10^{a}	-	6.7^{a}	0.22	0.07
	White (*Nech*)	3^{a}	-	-	-		
	Red *(Kiy*)	87^{a}	-	-	29^{b}	0.55	0.05
Hs	Plain (*Ebaberas*)	100^{a}	47^{c}	63^{b}	36.7^{c}	0.71	0.01
	Crest (*Gutya*)	-	53^{a}	37^{ab}	30^{b}	0.36	0.02
Ct	Single	30^{a}	20^{ab}	20^{ab}	23.3b	0.34	0.05
	Rose	30^{b}	37^{a}	23^{c}	30^{b}	0.28	0.06
	Pea	33^{a}	23^{b}	23^{b}	26.3^{b}	0.41	0.02
	Watunet	7^{c}	20^{b}	34^{a}	20.3^{b}	0.18	0.05
Ec	Orange	-	13^{a}	-	4.3^{a}	0.11	0.09
	Black	-	-	-	-	0.00	0.5
	Purl	-	-	-	-	0.00	0.6
	Red	100^{a}	87^{bc}	100^{a}	95.7^{b}	0.89	0.001
BS	Triangular	60^{a}	33^{d}	37^{bcd}	43.3^{b}	0.65	0.001
	Blocky	20^{a}	3.3^{b}	20^{a}	14.4^{a}	0.22	0.04
	wedge	20^{c}	63.7^{a}	43^{b}	42.2^{b}	0.35	0.03

NA = not available, a, b, c, with different superscript within a row are significantly different

Figure 1: Typical Hemete male (left), female and male (right) chicken ecotype

the birds have white skin color, 30% single combs, 30% rose combs while 100% had plain headed facial appearance (Table1 and Figure 1). The other peculiar features of this ecotype are good productive and reproductive performance, tolerance to common diseases and have better in egg production.

Kuakuate Chicken Ecotype

Kuakuate chicken ecotype is distributed in Teneta district and (Figure 2) most households keep this chicken sheltered in the family house during the night, while they spend the day scavenging in the backyards supplemented with grains and food leftovers. The chicken is predominantly white with thin black (100%) body plumage color. About 37% of the ecotypes are rose combed (Figure 2 and Table1). Passive and easily exposed to predators, poor productive and reproductive performances are the unique feature of the ecotype.

Figure 2: Typical Kuakuate male (left) and female (right) chicken type

Figure 3: Typical Yeberha Tsehaye male left and female right chicken type

Yeberha Tsehaye Chicken Ecotype

Yeberha Tsehaye chickens (Figure 3) are distributed specifically Jamma district. Most of the households keeping these chickens provided separate hanging shelters during night time to protect them from suffocation, high performance and good ability to resist endemic disease, flight like birds are the unique characters of the newly identified ecotype. This chicken is dominated by brown (100%) body plumage color. The investigated chicken ecotype is showed additional heterogeneity in quantitative traits (Table1 and Table 2). The results indicated that the dominant average plumage color of newly identified average three local chicken ecotypes were 33.3% Black with white tips followed by 29% red and 26.7% Grayish mixture. About 30 % are rose comb type, 43.3% triangular body shape and 36.7% plain headed are the most dominant observable traits of chickens' ecotypes (Table 2). About 30%, 37% and 23% of chicken from Hemete, Kuakuate and Yeberha Tsehaye ecotype were characterized by rose comb type respectively. The proportion of plain head shape in chicken populations of Hemete, Kuakuate and Yeberha Tsehaye were comparable with 100%, 47% and 63%, respectively (Table 1 and figure 3). This variation could be adaptation fitness to their environment.

Quantitative traits of (Hemete, Yeberha Tsehaye and Kuakuate) chickens

A total of 450 adult hens and cocks with twelve measurable parameters such as wingspan (WS), shank length (SL), body length (BL), comb length (CL), comb width (CW), wattle length (WL), wattle width (WW), beak

Table 2: Comparison (Lsm ± SE) of body weight (kg) and linear body measurements (cm) and extraction effect of independent variables of the three indigenous chickens

Parameters	sex	Hemete	Yeberha Tsehaye	Kuakuate	C V%	Overall mean	Grand Mean
Sample size	M	50	50	50		150	450
	F	100	100	100		300	
Effects &levels		LSM±SE	LSM±SE	LSM±SE		LSM±SE	LSM±SE
WS	M	35±0.6[b]	38.2±0.6[a]	38.6±0.3[a]	11.3	37.3±0.81[a]	36.96±0.45
	F	36.5±0.3b	37.9±0.7a	36±0.2b	10	36.8±0.5[a]	
SL	M	7.7±0.2b	8.8±0.2a	8.5±0.4a	16	8.3±0.2[a]	8.1±0.33
	F	7.6±0.6b	8.0±0.1a	8.2±0.2a	13	7.9±0.1[a]	
BL	M	33.6±0.9b	34.9±0.2b	37.3±0.8a	12	35.2± 0.7[a]	35.2± 0.43
	F	33.9±0.2b	35.4±0.5b	36.3±0.6a	8	35.2±0.5[a]	
CL	M	3.1±0.3a	3.1±0.1a	3.0±0.2a	30	3.1±0.1[a]	2.8±0.03
	F	2.7±0.1a	2.4±0.2b	2.9±0.2a	25	2.7±0.1[b]	
CW	M	2.3±0.2a	2.3±0.1a	2.2±0.1a	38	2.3±0.2[a]	2.1±0.14
	F	1.7±0.1b	1.7±0.2b	2.4±0.1a	33	1.9±0.1[a]	
WL	M	3.4±0.9b	2.3±0.3b	2.7±0.2a	28	2.8±0.1[a]	2.7±0.10
	F	2.9±0.2a	2.3±0.2b	2.8±0.3a	30	2.7±0.1[a]	
WW	M	3.5±0.1a	2.4±0.2b	2.3±0.2b	41	2.7±0.2[a]	2.6±0.09
	F	3.1±0.1a	2.1±0.2b	2.4±0.3b	42	2.5±0.1[a]	
bl	M	2.4±0.2b	2.4±0.2b	2.7±0.1a	28	2.5±0.2[a]	2.5±0.09
	F	2.2±0.2b	2.4±0.1b	2.7±0.2a	20	2.4±0.1[a]	
KL	M	8.2±0.1b	10.3±0.2a	8.8±0.4b	13	9.1±0.3[a]	8.9±0.13
	F	7.9±0.2b	9.2±0.3a	9.2±0.4a	12	8.7±0.1[a]	
Wt	M	1.1±0.1a	1.3±0.1a	1.2±0.1a	26	1.2±0.05[a]	1.1±0.08
	F	1.0±0.1a	1.1±0.02a	1.0±0.3a	23	1.0±0.04[b]	

Ws= wingspan, SL= shank length, BL= body length CL= comb length, CW=comb, width, WW=wattle, width, WL= wattle, length, KL= keel length, sl= spur length, bl= beak length, SC= shank circumference, in the measurement of cm Wt = weight (kg), and NA = not available LSM = least square mean and SE= standard error, a, b, c means different superscripts are significantly different (P<0.05)

length (bl), spur length, keel length (KL) (cm) and body weight (Wt) (kg) for different sexes were considered. The least squares mean of body weight and body measurements of newly investigated chickens ecotypes were tested with HSD (Honestead significant difference) comparison tests in Table 2. The overall least squares mean of wingspan, shank length, body length, comb length, comb width, wattle length, wattle width, beak length, keel length and body weight were (36.96±0.45, 8.1±0.33, 35.2±0.43, 2.8±0.03, 2.1±0.14, 2.7±0.10, 2.6±0.09, 2.5±0.09, 8.9±0.13 (cm) and 1.1±0.08 (kg), respectively. Overall sex effect body weight mean squares of male and female chickens were 1.2 and 1 (kg), respectively. Yeberha Tsehaye chicken male body weight 1.3 (kg) is significantly *($p < 0.01$)* heavier than and Hemete male chicken 1.1 (kg) but not body weight of Kuakuate (1.2kg). Furtherly, Yeberha Tsehaye cocks and hens were found to be significantly taller shank length of 8.8 and 8.2 (cm), respectively than the others. However, Kuakuate cocks and hens are inversely superior in body length than Hemete and Yeberha Tsehaye male and female chickens (Table 2). A non significance comb length variation between sexes of all ecotypes was obtained. While Yeberha Tsehaye and Kuakuate cocks had the longest keel length of 10.3 and 8.8 (cm), respectively than Hemete cocks 8.2 (cm). Beak length variation is recorded among ecotypes but not with in ecotype in respected sexes (Table 2).

DISCUSSIONS

Analyzing research result evidenced that more than 90% of the population of chicken ecotypes in the study areas which has unique characteristics. The results on plumage colors of the identified chicken ecotypes are different from the report result from northwest Ethiopian (Halima, 2007)**.** Variations of rose comb types, white skin color, blocky body shape and plain head types are the dominant visible traits of chicken ecotypes. This result was not in lined with the reported result done at Bure and Fogera districts in the Amhara region and Dale district in Southern Ethiopia (Fisseha *et al*.,2010).This variation could be a breed's-specific traits, nutritional status, genotype and reflected adaptation fitness to their environment (Aberra and Tegene, 2011; Dana, 2011). Complete flitting capacity for Yeberha Tsehaye and early weaning of Kuakuate chicken ecotype is the unique characters from the previous studies in Ethiopia and elsewhere in the tropics by (Halima, 2007 and Dana, 2011). Overall body weight of male and female chickens are varied from Ethiopian chickens reported by (Dana, 2011) which is 1.63 (kg) for males and 1.27 (kg) for females. Body weight of the identified chicken ecotypes were almost similar to chicken in central (Dana, 2011) and northwest Ethiopia (Halima, 2007) in the body weight of 1.26 kg and 0.87 kg for adult male and female, respectively.

CONCLUSIONS AND RECOMMENDATIONS

Hemete, Kuakuate and Yeberha Tsehaye chickens are newly identified ecotypes from Ziqualla, Teneta and Jamma districts of north eastern parts of Ethiopia, respectively. The identified chicken ecotypes had diversified variations in both qualitative and quantitative characters. As an example, phenotypic characterization like quantitative and qualitative traits was considered among the three chicken ecotypes. Heaver adult body weight and longer shank length were measured from Yeberha Tsehaye chicken ecotypes. Qualitatively all chicken eco-type had normal feather morphology and others like red in Hemete, shiny in Yeberha Tsehaye and mixed color for Kuakuate chicken ecotype is easily distinguishable characteristics. Whereas, *Yeberha Tsehaye* chicken ecotype is characterized by have a capacity to flying like other poultry species. All these findings indicated that the investigated chicken ecotypes are showed heterogeneity in most traits considered. Thus, In-depth further molecular characterization should be considered to verify the level of genetic variations and relationships among newly identified and other indigenous chicken ecotypes.

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REFERENCES

Besbes B (2009). Genotype evaluation and breeding of poultry for performance under suboptimal village conditions. Food and Agriculture Organization of the United Nations, World's Poultry Science. **65**: 260-271.

Bogale K (2008). In situ characterization of local chicken eco-type for functional traits and production system in Fogera district, Amahara regional state. M.Sc. Thesis Submitted to the department of Animal Science School of Graduate Studies, Haramaya University.

CSA (central statistical authority) (2011). Agricultural sample survey 2010/11. volume.**2**: statistical bulletin 505. Report on livestock and livestock characteristics (prevent peasant holdings), Addis Ababa, February 2011.21.

Nigussie Dana, Tadelle Dessie, Liesbeth HV and Johan AM (2009). Morphological features of indigenous chicken populations of Ethiopia. Animal Breeding and Genomics Center, Wageningen University .Animal Genetic Resources, 2010. 46:11–23.

Nigussie Dana (2011). Breeding programs for indigenous chicken in Ethiopia Analysis of diversity in production systems and chicken populations; PhD .Thesis submitted in fulfillment of the requirements for the degree of doctor at Wageningen University Netherlands.

Nigussie D, vander WE and A, M Johan (2010). Genetic and phenotypic parameter estimates for body weights and egg production in Horro chicken of Ethiopia. Submitted to Trop Anim. Health Prod, Animal Breeding and Genomics Centre, Wageningen University Netherlands 14 July 2010.

FAO (Food and Agriculture Organization of United Nations) (2011). Draft guidelines on phenotypic characterization of Animal genetic Resource. Commission on Genetic Resources for Food and Agriculture Rome. 18-22 July, 2011. 6p.

Fisseha Moges, Abera Mellesse, and Tadelle Dessie (2010a). Assessment of village chicken production system and evaluation of the productive and reproductive performance local chicken ecotype in Bure district, North West Ethiopia. Afri. J.Agric. Res.Vol. **5**(13): 1739-1748, 4 July, 2010.

Fisseha Moges, Azage Tegegne and Tadelle Dessie, 2010b. Indigenous chicken production and marketing systems in Ethiopia: Characteristics and opportunities for market-oriented development. Working paper No.24; Improving Productivity and Market Success (IPMS) of Ethiopian Farmers Project, International Livestock Research Institute (ILRI). Addis Ababa, Ethiopia.66p.

Gondwe TNP (2004). Characterization of local chicken in low input-low output production systems: is there scope for appropriate production and breeding strategies in Malawi? PhD thesis, Georg-August-niversität Göttingen, Germany.

Halima Hasten (2007). Phonotypic and genetic characterization of indigenous chicken populations in Northwest Ethiopia. PhD. Thesis submitted to the faculty of National and agricultural sciences department of animal Wild life and Grass land Sciences University of the Free State, Bloemfontein, and South Africa.

Mekonnen G/r (2007). Characterization of smallholder poultry production and marketing system of dale, Wonsho and Loka Abaya Weredas of southern Ethiopia. M.Sc Thesis, Awassa College of Agriculture, Hawassa University.

Mekonnen G/r, Teketel F, Alemu G, Dagnatchew Z and Anteneh A (1991). The Ethiopian livestock industry: retrospect and prospects. Proc.3rd National Livest. Improvement Conference, Institute of Agricultural Research, Addis Ababa, Ethiopia.

Pedersen CV (2002). Production of semi-scavenging chicken in Zimbabwe. PhD. Thesis, Royal Veterinary and Agricultural University, Copenhagen.

Salam K (2005). Improvement of village chicken production in a mixed (chicken ram) farming system in Burkina Faso. Ph.D.Thesis.Wageningen Institute of Animal Sciences, Animal Nutrition Group, Wageningen University, the Netherlands.

Serkalem Tadesse, Hagos Ashenafi and Zeleke Aschalew (2005). Sero-prevalence study of Newcastle disease in local chickens in central Ethiopia. International Journal of Applied Research. Vet. Med. Vol. **3**, No. 1/19.

Tadelle Dessie (1996). Studies on village poultry production systems in the central highlands

Tadelle D (2001). The role of scavenging poultry in integrated farming systems in Ethiopia. Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. Livestock feed resources within integrated farming systems. Pp.377–399.

Tadelle Dessie, and Ogle B (2001). Village poultry production system in the Central Highlands of Ethiopia. Trop Anim Health Prod. **33**. 521–537.

Tadelle D (2003). Phenotypic and genetic characterization of chicken ecotypes in Ethiopia. Ph.D. Thesis submitted to Humboldt University, Germany.

Tadelle D, Alemu Y and Peters K (2003). Village chicken production systems in Ethiopia: Use patterns and performance valuation and chicken products and socio-economic functions of chicken. Livestock Research for Rural Development (15)1. (Available from http://www.lrrd.org/ lrrd15/1/tadeb151.htm) (Accessed on 1 September 2010).

TADO (2013). Teneta agricultural Development office annual data reporting 2013.

ZADO (2013). Ziqualla agricultural Development office annual data reporting 2013.