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Phenotypic Characterization of Indigenous Chicken Ecotypes in North Gondar Zone, Ethiopia

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Abstract: An exploratory field survey was conducted in north Gondar zone, Ethiopia to identify and characterize the local chicken ecotypes. Seven qualitative and twelve quantitative traits from 450 chickens were considered. Chicken ecotypes such as necked neck, Gasgie and Gugut from Quara, Alefa and Tache Armacheho districts were identified, respectively. Morphometric measurements indicated that the body weight and body length of necked neck and Gasgie ecotypes were significantly ($p < 0.01$) higher than Gugut ecotypes except in shank circumstances. Sex and ecotype were the significant ($p < 0.01$) sources of variation for both body weights and linear body measurements. The relationship of body weight with other body measurements for all ecotypes in both sexes were highly significant ($r = 0.67$, $p < 0.01$). Some traits like wingspan, body length and super length ($r = 0.64$, $P < 0.01$) for males and for females ($r = 0.59$, $P < 0.01$) of necked neck chickens are significantly correlated with body weight. Therefore, highly correlated traits are the basic indicators for estimation of the continuous prediction of body weight of chicken. Identification and characterization of new genetic resources should be employed routinely to validate and investigate the resources in the country.

Key words: Chicken · Ecotypes · Necked Neck · Gasgie · Gugut · Ethiopia

INTRODUCTION

Ethiopia takes the lead in livestock population and gateways of domestic animals migration from Asia to Africa, thus rolled for widespread distribution and huge population size in the country [1]. Poultry contribute socio-economic roles for food securities, generation of additional and cash incomes [2, 3]. Therefore, almost all rural and many peri-urban families keep small flock scavenging chickens [4]. In Ethiopia the population of chickens estimated about 49.3 million of which 97.3, 0.38 and 2.32 % indigenous, hybrid and exotic breeds respectively [5]. Indigenous chickens have good potential to adapt in different agro ecology through habitual management system [6]. Local chickens are non descriptive type and show a large variation which might be attributed to their widespread distribution [1, 7, 8].

Indigenous chickens are underestimated because of their poor performance. To this effect they have been neglected and little attention has been given from researchers, development workers and policy makers to put them in the research and development agendas [9]. Some researchers have done on phenotypic and genetic characterization of indigenous chicken in some parts of Ethiopia. Poultry production and market system was studied in southern Ethiopia by (Mekonnen); [9] characterization of poultry productivity and market system by (Bogale), [10] and genetic parameters on horro chickens for weights and egg production trait was conducted by Danna *et al.* [11]. However, comprehensive genetic resources identification in the remote districts northern Godar zone in general and identification and characterization of new local chicken ecotypes in particular were not studied in the area.

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Therefore, the objective of this study was to identify and characterize the new local chicken ecotypes in North Gondar zone, Ethiopia.

MATERIALS AND METHODS

Description of the Study Area: The study was conducted in three districts of north Gondar zone (Quara, Alefa and Tache Armacheho) of Ethiopia. The altitude of the zone is ranged from 528-4620 meter above sea label (m.a.s.l) and rainfall of 880-1772 mm with the temperature of 44.5°C to-10°C. Quara district is located western part of north Gondar Zone between 11°47' and12°21 and latitude and 35°16' and 35°47'E longitude. It is 1123 km far from Addis Ababa and 324 km from Gondar town and elevation ranging 528-654 meter above sea label. The annual temperature ranges 25-44°c with mean annual rainfall of 600-1000 mm [5]. The same source indicated that Alefa district is located at 162km in southwest of Gondar town and 909 km from Addis Ababa with the temperature of 25-30°C and annual rainfall of 900-1400mm. Armacheho district is also found 814 km northwest of Addis Ababa and 65km North West of Gonder town with the altitude of 600-2000 m.a.s.l with the temperature of 25-42°C and with annual rainfall of 800-1800 mm [5].

Data Collection Methods: In addition to exploratory field survey, semi-structured questionnaires and participatory rural appraisal (PRA), focus group discussion, field observation, trait characterization and body measurements were employed to dig up the required information. For the morphological and biometrical measurements, all matured chicken ecotypes n = 450, 150 males and 300 females were measured. 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, super length, beak length, comp length and width) were measured using spring balance and centimeter (cm) in the nearest two digits [12].

Data Management and Statistical Technique: Information from the focused group discussion and personal observation were briefly summarized and synthesized. More over, quantitative data was used by General Linear Model (GLM) and imported to SAS [13] version 9. Tuky comparison test was used to compare sub factor brought significant difference. The model was used for body weight and linear body measurement of chickens' ecotypes by considering the fixed effects of sex and ecotype.

Model 1:

$$Y_{ijk} = \mu + A_i + + D_j + AD_{ij} + e_{ijk}$$

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 i^{th} of eco type with j^{th} of sex
Eij_k = random residual error

The second used model was multiple liner regression coefficients for continuous predicting body weight of matured cocks and hens using eleven linear body measurements (independent variables) in each ecotype.

Model 2:

$$Yj = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11} + e_{ijk}$$

Where

Yj = dependant variable or predicted mean body weight of chickens; β_0 = the intercept; X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10} and X_{11} are the independent variables for wing span, body length, shank length, shank circumstance, keel length, super length, beak length, wattle length, wattle width, comb length and comb width, respectively.

β_1, β_2, β_3, β_4, β_5, β_6, β_7, β_8, β_9, β_{10} and β_{11} are the regression coefficient of the variable X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8 X_9, X_{10} and X_{11} and e_{ijk} = the residual error

RESULTS

Necked Neck Chickens: Necked neck chickens are found in a very hot ecological zone of Quara district which is located at altitudes ranging from 528-654 meter above sea level with the maximum temperatures of 44°C. They are maintained under scavenging system with small supplementation and sheltered outside the family

Table 1: Morphological Characteristics of Newly Founded Indigenous Chicken Ecotypes

Character	Attributes	Ecotypes by proportions and their associations: Necked neck=150	Gasgie N=150	Gugut N=150	Overall N=450	Cramer's V	P-value
Pc	White black and red [ns]						
	trips(*Kiy Tikur Teterma*)	(0.67)1.320.22	(1.34)	(2.67)	1.56	0.13	0.323
	Black with white tips						
	(TikurTeterma)[ns]	(10.70)	(8.67)	(6.00)0.22	8.44	0.13	0.286
	White with red tips						
	(*Kiy Teterma*)[ns]	(5.33)	(8.67)	(8.00)	7.33	0.11	0.465
	Grayish-mixture						
	(*Gebsema*) ***	(10.70)[b]	(22.00)[a]	(10.00)[b]	14.20	0.33	0.005
	Red-braunish(*Kokima*)**	(13.30)[a]	(8.67)[a]	(2.00)[b]	8.00	0.34	0.003
	Multicolor *(Ambesa)**	(5.33)[ab]	(4.00)[b]	(10.00)[a]	6.44	0.22	0.037
	Black (*Tikur*) ***	(7.33)[b]	(5.33)[b]	(22.00)[a]	11.50	0.52	0.001
	White (*Nech*) ***	(28.00)[a]	(9.33)[b]	(9.33)[b]	15.60	0.66	0.001
	Red *(Kiy)* ***	(18.70)[b]	(32.00)[a]	(30.00)[a]	26.90	0.60	0.001
Hs	Plain (*Ebaberas*) [ns]	(70.00)[a]	(65.33)[a]	(76.00)[a]	70.40	0.10	0.19
	Crest (*Gutya*) [ns]	(30.00)	(34.67)	(24.00)	29.60	0.08	0.23
Ct	Doublex (V-shape)*	NA	(9.33)[b]	(24.00)[a]	32.70	0.21	0.024
	Single***	(66.00)[a]	(27.33)[b]	(30.00)[b]	38.90	0.42	0.001
	Rose***	(34.00)[b]	(60.70)[a]	(38.70)[b]	44.40	0.33	0.001
	Pea[ns]	NA	(2.67)[a]	(7.33)[a]	3.33	0.03	0.045
Skc	Yellow ***	(66.00)[a]	(24.70)[b]	(67.30)[a]	53.10	0.55	0.001
	White***	(23.30)[b]	(66.00)[a]	(20.70)[b]	42.90	0.75	0.001
	Black*	(4.00)[ab]	(0.67)[a]	(8.00)[b]	4.22	0.20	0.001
	Green*	(6.00)[a]	NA	(1.33)[b]	1.56	0.18	0.004
	Red*	(0.67)[a]	(8.67)[b]	(3.33)[a]	4. 22	0.09	0. 05
Ec	Orange [ns]	(0.67)[a]	(4.67)[a]	(4.67)[a]	3.33	0.10	0.088
	Black[ns]	(6.00)[a]	NA	(3.33)[a]	3.11	0.16	0.058
	Purl***	(1.33)[b]	NA	(3.33)[a]	1.56	0.13	0.021
	Red***	(92)[b]	(95.30)[a]	(88.70)[b]	92	0.42	0.001
BS	Triangular***	(40.7)[a]	(15.30)[b]	(30.70)[a]	29.00	0.32	0.001
	Blocky***	(58.00)[a]	(31.30)[b]	(49.30)[a]	46.20	0.36	0.001
	wedge***	(1.30)[b]	(5.33)[b]	(20.00)[a]	24.90	0.32	0.001
Snc	Yellow***	(68.00)[b]	(66.00)[ab]	(51.30)[a]	62.00	0.19	0.002
	White***	(16.70)[ab]	(14.00)[b]	(26.00)[a]	19.10	0.20	0.001
	Black[ns]	(7. 33)[a]	(9.30)[a]	(8.00)[a]	8.00	0.07	0.285
	Green[ns]	(7. 33)	(10.00)	(8.00)	8.22	0.03	0.814
	Red*	(0.67)[b]	(0.67)[b]	(5.33)[a]	2.67	0.17	0.012

NA = not available, a, b, c, with different superscript within a raw are significantly different (P < 0.05)

house (perch). The chickens have predominantly white 28 % and red 20 % body plumage colors. However, they had heterogeneity and diverse additional plumage color like; red-braunish (0.7%), white with red tips (5.3%), black with white tips (10.7%), black (7.3%), multicolor (5.3%) and white black red trips (13.3%). About 53 % of the birds have white skin colour, 66 % single combed followed by 34 % rose combs and 70 % plain head are facial appearance (Table 1 and Figure 1) of the ecotypes. The other peculiar features were aggressive, high feed requirements, good productive and reproductive performance and tolerance to common diseases and had large carcass (cleaned meat) body weight.

Gasgie Chicken Ecotypes: Their dominant geographical distribution and origin is limited to the mid and plain topography of Alefa district at average altitude of 1400 mere above sea level (Fig 2). Most of the households keeping these chickens sheltered in the family house during the night, while they spend the day scavenging in the backyards supplemented with grains and food leftovers. The chickens have predominantly red 32 % body plumage colour with other diverse plumage colour such as white (9.3%) red-braunish (9%), white with red tips (9%), black with white tips (9%), black (5.3%), multicolor (4%) and white black red trips (1.3%). About 60.7 % of the ecotypes are rose combed. Long necked (especially males), short weaning

Fig. 1: Typical necked neck male (right) and female (left) chicken ecotypes

Fig 2: Typical Gasgie male (left) and female (right) chicken type

Fig 3: Typical Gugute male and female chicken type

time, docile and good productive and reproductive performances are the main unique feature of the ecotype.

Gugut Chickens Ecotypes: Gugut chickens are well dominated in Debresina area of Tache Armacheho district and inherited from early lived parents and transmitted from generation to generation. Most of the households keeping these chickens provided separate shelters for housing during the night in case of suffocation and predators (snack) like that of Quara district. Dense feathers from the neck, absent of wattle in female, low performance, short beak length, ability to resist endemic disease, small body size, passive and easily exposed to predators are the unique behaviors of the ecotype. The chickens have predominantly white (22%) body plumage colour with other diverse plumage colour such as multicolor (10%), red (9.3%), black (9.3%), white with red tips (8%), red-braunish (2%), black with white tips (2%) and white black red trips (2%). In later case they also showed different other qualitative and quantitative variations described from.

The results indicated that the predominant average plumage color of newly identified local chicken ecotypes were 26.90% red followed by 15.60% white and 14.20% grayish mixture. About 44.4 % are rose comb type, 42.90% white sicken color and 46.20% blocky body shape and 70.40% plain headed are the most dominant observable traits of Gugut chickens ecotypes (Table 1). About 34, 60.7 and 38.7 % of chicken from necked neck, Gasga and Gugut ecotype were characterized by rose comp type respectively. The proportion of plain head shape in chicken populations of necked neck, Gasgie and Gugut were comparable from 70%, 65.3% and 76 %, respectively. This variation could be feed availability reflecting, adaptation fitness to their environment [14].

Quantitative Traits of Chickens: A total of 450 adult hens and cocks with twelve measurable parameters such as wingspan (WS), shank length (SL), shank circumference (SC), body length(BL), comp length (CL), comp width (CW), wattle length (WL), wattle width (WW), beak length (bl), super length (sl), 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 Necked neck, Gasgie and Gugut chickens with tuky comparison tests are presented in (Table 2). The overall least squares mean of wingspan, shank length, shank circumference, body length, comp length, comp width, wattle length, wattle width, beak length, super length, keel length and body weight were (37.04±0.13), (7.79±0.15), (3.78±0.07), (35.79±0.09), (2.76±0.09), (1.68±0.04), (1.76 ±0.06), (1.51±0.06), (2.03 ±0.02), (0.18 ±0.02), (8.24 ±0.09) (cm) and (1.46 ±0.01) (kg), respectively.

Whereas, overall mean square for body weight obtained for male and female was (1.63±0.03) and 1.37±0.02 (kg), respectively. Despite body weight of male in Necked neck 1.78±0.31 (kg) was significantly *(P < 0. 01)* heavier than Gugut 1.40±0.04 (kg) but from Gasgie 1.71±0.05(kg) cocks. Furthermore, the Necked neck cocks and hens were found to significantly taller shank length of 9.61±1.03 and 9.043±1.10 (cm) respectively. However, shank circumference of Gugut cocks and hens inversely had superior shank circumferences of 3.85±0.03 and 3.38±0.07 (cm) than 3.58±0.50 and 3.1±0.59 (cm) from Necked neck and 3.25±0.07 and 3.11±0.03(cm) from Gasgie for male and female chickens, respectively. Comp lengths

Table 2: The Interaction Effect of Sex and Ecotypes on Linear Body Measurements (Cm) and Body Weight (Kg)

	Sex	Necked	Gasgie	Gugute			Overall mean	Grand Mean
Parameters	M	50	50	50			150	
Sample size	F	100	100	100	CV %	P-value	300	450
Effects & levels	LSM±SE		LSM±SE	LSM±SE			LSM±SE	LSM±SE
WS	M	38.70±2.6[a]	39.61±0.42[a]	35.97±0.23[b]	6.51	.0001[**]	38.09±0.24[a]	37.04±.13
	F	37.17±2.36[a]	37.36±0.26[a]	35.03±0.18b	6.19	.0001[(**]	36.52 ±.14b	
SL	M	9.61±1.03[a]	7.25±0.10[b]	7.37±0.73[b]	10.05	.0001[(**]	8.08± 0.11a	7.79±0.15
	F	9.043±1.10[a]	6.80±0.06[c]	7.08±0.05[b]	9.10	.0001[(**]	7.64 ±0.07 b	
BL	M	38.12±2.14[a]	36.10±0.34[a]	35.2±0.09[b]	9.49	.0002[**]	36.77 ± 03 a	35.79±0.09
	F	36.90±2.61[a]	34.60±0.26[b]	34.37±0.21[b]	6.93	.0001[(**]	35.29±0.16[b]	
CL	M	3.25±0.87[a]	3.16±0.12[a]	3.08±0.09[a]	26.24	0.594[ns]	3.16 ± 0.07[a]	2.76±0.09
	F	2.99±3.68[a]	2.28±0.07[b]	2.40±0.06[ab]	35.61	0.0482[*]	2.55 ±0.13b	
CW	M	2.11±0.82[a]	1.93±0.13[a]	2.19±0.05[a]	38.36	0.255[ns]	2.08± 0.07a	1.68±0.04
	F	1.78±0.85[a]	1.07±0.06[b]	1.59±0.06[a]	45.55	.0001[**)]	1.48 ±0.04b	
WL	M	2.76±0.69[a]	2.70±0.14[a]	1.83±0.23[b]	32.19	.0001[(**]	2.43± 0.07a	1.76 ±0.06
	F	2.44±0.80[a]	1.84±0.04[b]	NA	37.23	.0001[(**]	1.42 ±0.07b	
WW	M	2.76±1.01[a]	2.32±0.16[b]	1.45±0.09[c]	44.53	.0001[(**]	2.17± 0.09a	1.51±0 .06
	F	2.34±1.03[a]	1.19±0.05[b]	NA	56.29	.0001[(**]	1.18 ±0.07b	
bl	M	2.42±0.45[a]	2.00±0.02b	1.85±0.10c	14.12	.0001[(**]	2.09 ± 0.03a	2.03 ±0.02
	F	2.28±0.60[a]	1.93±0.0[b]	1.78±0.02[c]	18.67	.0001[(**]	1.99 ±0.02b	
sl	M	0.66±0.8[a]	0.49±0.10[a]	0.17±0.09[b]	46.35	.0009[**]	0.44 ± 0.05a	0.18 ±0.02
	F	0.09±0.32[a]	0.08±0.02[a]	NA	48.83	0.0172[*]	. 011± 0.18a	
SC	M	3.58±0.50[b]	3.25±0.07[b]	3.85±0.03[a]	20.78	.0001[**]	4.81± 0.18a	3.78± .07
	F	3.31±0.59[a]	3.11±0.03[b]	3.38± 0.07[a]	17.23	.0027[**]	3.27± .03b	
KL	M	9.11±1.02[a]	9.55±0.15[a]	7.62±0.23[b]	16.81	.0001[**]	7.51±0.24b	8.24 ±0.09
	F	8.56±0.87[b]	9.27±0.08[a]	7.98±0.07[c]	9.08	.0001[**]	8.60 ±0.05a	
Wt	M	1.78±0.31[a]	1.71±0.05[a]	1.40±0.04[b]	18.15	.0001[**]	1.63 ±0.03 [a]	1.46 ±0.01
	F	1.52±0.26[a]	1.36±0.03[b]	1.23±0.02[c]	17.50	.0001[**]	1.37 ±0.02[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= sure length, bl= beak length, SC= shank circumstance, 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)

Table 3: Correlation Coefficients on Body Weight and Linear body Measurements.

		Sex and ecotype					
		Necked neck		Gasgie		Gugute type	
Traits	variables	M	F	M	F	M	F
WS	N	50	100	50	100	50	100
	r	0.64[**]	0.56[**]	0.35*	0.41[**]	0.50[**]	0.39**
SL	N	50	100	50	100	50	100
	r	0.18[ns]	0.20*	0.26*	0.29**	0.54**	0.08[ns]
BL	N	50	100	50	100	50	100
	r	0.59**	0.54**	0.49**	0.59**	0.33*	0.50**
CL	N	50	100	50	100	50	100
	r	0.31*	0.05[ns]	0.54**	0.41**	0.40**	0.35**
CW	N	50	100	50	100	50	100
	r	0.15[ns]	-0.07[ns]	0.64**	0.39**	0.37**	0.21[ns]
WL	N	50	100	50	100	50	100
	r	0.05[ns]	-0.01[ns]	0.67**	0.39**	0.39**	NA
WW	N	50	100	50	100	50	100
	r	0.05[ns]	-0.13[ns]	0.52**	0.47**	0.49**	NA

Table 3: Continue

		Sex and ecotype					
		Necked neck		Gasgie		Gugute type	
Traits	variables	M	F	M	F	M	F
bl	N	50	100	50	100	50	100
	r	-0.22^{ns}	-0.01^{ns}	0.20ns	0.30**	0.24*	0.22*
sl	N	50	100	50	100	50	100
	r	0.48**	0.27**	0.52**	0.28**	0.21ns	0
SC	N	50	100	50	100	50	100
	r	0.31*	0.13^{ns}	0.35**	0.18ns	0.04ns	-0.02^{ns}
KL	N	50	100	50	100	50	100
	r	0.37**	0.28**	0.62**	0.33**	0.23*	0.21*

N= number of sample size, r = correlation coefficients

Table 4: Prediction Equations in Multiple Regression Analysis of Body Weight

Ecotype	Male	R2	Female	R2
Necked neck	Y= -1.34+0.08WS	0.40	Y= -0.78 +0.06WS	0.31
	Y= -1.12+0.07WS+0.17sl	0.60	Y= -1.48 +0.04WS+ 0.04BL	0.41
	Y= -2.12 + 0.06 WS+0.04 BL+0.14 sl	0.65	Y= -1.60+0.05WS+0.04BL+-0.10bl	0.47
Gasgie	Y= Y=1.11+0.22WS	0.45	Y= -0.89+0.06BL	0.35
	Y=0.49+0.21 WS +0.2SC	0.53	Y= -0.77+0.05BL+0.19WW	0.46
Gugut	Y=1.1+0.21WW	0.30	Y= -0.04+0.04BL	0.25
	Y=-0.97+0.16WW+0.06WS	0.44	Y= -0.47+0.04BL+0.22bl	0.31
	Y=-1.05+0.05WS+0.09CL+0.13WW	0.50	Y= -0.47+0.03BL+0.07CL+0.24bl	0.37
	Y=-0.22+0.05WS+0.12CL+0.14WW+0.03KL	0.55	Y= -0.8+0.03BL+0.06CL+0.23bl+0.04KL	0.40
			Y=-1.15+0.03BL+0.06CL+0.2bl+0.05SC+0.07KL	0.42

were not significantly different from Necked neck chicken ecotypes for males 3.25±0.87 and for female 2.99±3.68(cm). As to beak length, the Necked neck and Gasgie cocks had the longest beak length of, 2.42±0.45 and 2.00±0.02 (cm), respectively; while the smallest beak length was recorded for Gugut cocks 1.85±0.10 (cm). Both the male and female chickens had a non significant *(p > 0.05)* variation beak length with in ecotypes (Table 2).

Correlations of Body Weight and Other Linear Body Measurements: Live weight was positively correlated ($r = 55.5$, $P < 0.01$) with wingspan. Body length and super length in Necked neck were positively correlated, males ($r = 0.62$, $P < 0.01$) and females ($r = 0.55$, $P < 0.01$). Whereas WL is highest correlated trait ($r = 0.67$, $P < 0.01$) with body weight of Gasgie male chickens. The high correlation coefficients between body weight and other body measurements ($P < 0.01$) helped to predicting body weight of chickens.

Prediction Equation Models: Stepwise multiple regression analysis was first carried out linear regression and conducted to multiple regressions by adding WS, BL and WW at a time in three chicken ecotypes. The regression result of Necked neck cocks and females and, Gasgie cocks were found to the value of 0.40, 0.31 and 0.45 with body weight, respectively. The essence was to determine effects of other body measurements on body weight prediction and applied additional variables to improve the regression coefficient as discussed in (Table 4). To increase meat and egg production requires genetic improvement of body weight of chickens. But, proper measurement of this variable is often hard in villages due to lack of weighing scales. Hence, easily measurable linear body measurements are more relevant for chickens' body weight prediction at farmers' level rather subjectively judging by hand. In addition the present farmers are active at early morning by providing supplementary feed to their chicken before brought to the market.

DISCUSSIONS

More than 70% of the population of chicken ecotypes in the study area carrying the Naked neck gene that we studied was new and significantly ($p < 0.001$) higher than those reported in other parts of Ethiopia (7.9%) [15] <2%; [16], Nigeria (6%) [17] and Botswana

(3.6%) [18]. The chicken ecotypes in this study have plumage color differed from report of northwest Ethiopian local chicken ecotypes [1]. Furthermore, the overall variations of dominant rose comb types, white skin colored, blocky body shaped and plain head types were the most dominant observable traits of chickens different from the studies done at Bure and Fogera districts in the Amhara region and Dale district in Southern Ethiopia [19]. This variation could be a breed-specific trait, nutritional status of the breeds, genotype and reflecting adaptation fitness to their environment [15, 14]. In this study complete absence of wattle gene from Gugut female and long necked morphology and early weaning of Gasgie chicken ecotypes makes unique from reports of previous studies in Ethiopia and elsewhere in the tropics reported by Halima, Aberra and Tegene, and Badubi, *et al*. [1, 14] and [15] respectively.

The overall list mean square for body weight obtained for male and for female which were varied from Ethiopian chickens reported by Danna [14] which were 1.6 (kg) for males and 1.27(kg) for females. Despite the list mean square for body weight obtained in Necked neck and Gasgie chickens were heavier than chicken in central [15] and Northwest Ethiopia [1] of 1.26 and 0.87 kg for adult male and female, respectively. The frequency of chicken ecotypes carrying the Naked neck gene that we studied was significantly ($p < 0.001$) higher than those reported in other parts of Ethiopia (<2%) [15] Nigeria (6%) [18] and Botswana (3.6%) [19].

CONCLUSIONS

A key informant was found to be a useful individual to identify distinct animal genetic resource. Necked neck, Gasgie and Gugut chicken ecotypes were newly identified and dominantly found in Quara, Alefa and Tache Armacheho district northern Ethiopia, respectively. Furthermore phenomic characterization was helped to describing the general uniqueness of the populations. The highest adult body weight was obtained from Naked-neck, followed by Gasgie chicken ecotypes. Necked neck, Gasgie and Gugut chicken ecotypes were dominantly found in Quara, Alefa and Tache Armacheho district, respectively. In addition qualitatively as Necked neck chickens ecotype was easily identified by their complete absence of feather at neck and chest. Whereas, Gasgie chicken ecotype was also characterized by their normal feather (not bold or muffed) and long necked. Generally, complete absence of wattle in hens, smallest of all and dunce feather at neck (muffed) in both sexes were the most famous characteristics of Gugut chicken ecotype. Similarly, Naked-neck chickens had the longest shank than those of other current findings. The population of the newly found chicken ecotypes showed heterogeneity in most morphological traits considered. Thus, In-depth molecular characterization using genetic markers should be undertaken to confirm the level of genetic variations and relationships among newly identified and other indigenous chicken ecotypes.

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