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Full length Research paper

The Nutritive Value of meat and egg of indigenous chicken strains in Ethiopia

***Getachew BF[1], Wondmeneh E[4], Gebeyehu G[2], Aberra M[3] and Tadelle D[4]**

[1]Gambella University, College of Agriculture and Natural resource, Department of Animal production and Technology, P O Box 126,Gambella, Ethiopia.
[2]Addis Ababa University, College of Veterinary Medicine and Agriculture, Department of Animal Production, P O Box 34, Bishoftu, Ethiopia.
[3]Hawassa University, School of Animal and Range Sciences, P O Box 5, Hawassa, Ethiopia.
[4]International Livestock Research Institute (**ILRI)**,African Chicken Genetic Gains **(ACGG)**, Addis Ababa, Ethiopia.

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The present study was conducted to investigate the nutritive value of meat and egg of indigenous chicken strains. At otal of 32 mixed sex matured chickens from Abobo (Ab), Gambella ketema Zuria (Gkz), Itang (It),Lare (La), and 30 eggs were used from each ecotype to determine nutritive value. Complete randomized design arrangements were used. The nutritive value of meat and eggs were determined according to the Association of Official Analytical Chemists (AOAC, 2010) methods. Mean comparisons were made by using Tukey`s studentized range test method at $p<0.05$. The breast meat had higher protein contents in all chicken strains than the thigh and drumstick meat. The overall mean of crude protein contents (19.85±0.57) in all strains of chicken's breast meat had higher than the thigh (18.84±0.74) and drum stick meat (18.76±0.52). The crude protein contents (20.51±0.11) of Gkz strain egg were higher than the Ab, It and La strains egg 19.45± 0.23, 19.42± 0.32 and 19.43±0.41 respectively.

Key words: egg, chickens, meat, Nutritive, Strains

INTRODUCTION

Among meat sources, chicken meat contains higher protein as well as lower fat contents than red meat, and consequently is considered superior for human health (Choe *et al.,* 2010). In addition, it is cheaper than pork and beef and has fewer religious restrictions. Meat quality is a function of the genotype, nutrition and rearing practices. Previous studies have reported the differences in carcass and meat quality traits between slow-growing and fast-growing chicken lines (Chodova *et al.,* 2021).Recently, increasing consumer interest in eating healthier meat has resulted in an increasing interest in indigenous chicken breeds, because the meat of indigenous chicken breeds has higher protein and lower fat contents as well as unique flavors compared with broiler breeds (Choe *et al.,* 2010; Jung *et al.,* 2011; Jayasena *et al.,* 2013).

Moreover to its relatively cheaper price, several other factors make chicken meat superior to red meat. Such factors include its health benefits, because it contains less fat; easy to handle portions; and less religious barriers. Therefore, indigenous chicken breeds are regarded as good sources to produce meat that has high nutritional value (Jung *et al.,* 2013).Eggs constitute an important part of human diet because of its high quality protein (Forson *et al.,*2011). Keeping chickens for egg production has become one of the fastest ways of meeting the protein demands in a nation's population in that, no taboo or religion forbids its consumption. Also, egg could be consumed absolutely when fresh without any need for refrigeration and storing the left-over (Farell, 2013; Ogunwole *et al.,* 2015a). Reports have shown that proximate composition of egg is

*Corresponding author: e-mail: gechourji@gmail.com, Tel: +251911550351/ +251915607211

affected by various factors such as breed, management and nutrition (Fakai *et al.,* 2015).
Chickens egg is a cheap source of good quality animal protein fulfilling the requirements of the rapidly growing human population. Consumers prefer egg with better egg quality which is determined by their physical structure and chemical composition. Even though these advantageous characteristics present in chickens have been mostly studied, the nutritive value (meat and egg) of indigenous chicken strains remain totally unstudied and no data is available on chickens' strains meat and egg in the study area. Therefore, our study, objected to investigate the nutritive value, (meat and egg) of indigenous chicken strains under intensive management in Ethiopia.

MATERIALS AND METHODS

Ethical clearances/permission

Permission of experimental conduction was obtained from the Addis Ababa University College of Veterinary Medicine and Agriculture of Animal Research ethics review committee to allow sample collection from the indigenous chicken strains of Gambella region, Ethiopia under the ref. No: VM/ERC/06/01/12/2020.

Experimental design

We have used a complete randomized design arrangement. 32 (thirty-two) matured live chicken (4 male and 4 females from each chicken strains) and 30 eggs per indigenous chicken strains were taken at random for nutritive value investigation. The live chicken and egg samples of indigenous chicken strains were collected from Abobo, Gambella Ketema Zuria, Itang and Lare indigenous chicken strains, respectively from on-station evaluation at Gambella Agricultural research institute.

Sample preparation and Slaughtering process

We have used a complete randomized design arrangement. 32 (thirty-two) matured live chickens (4 male and 4 females from each chicken strains) and 30eggs per indigenous chicken strains were taken at random for nutritive value investigation.At the age of 24 weeks, the selected indigenous chicken strains were separated from the flock and fasted overnight but drinking water was provided adlibitum. The selected chicken strains were weighed and bled after 16 hours of deprived of water and feed.
The chicken strains were bled by section of the jugular vein manually and were allowed to bleed for a period of three minutes by holding the bird's head down. During, they were eviscerated; the heart, kidney, crop and intestines were taken off. The samples of breast, thigh and drumstick were collected to determine the nutritive value of the meat. 30(thirty)eggs were taken from each chicken strains (Abobo, Gambella ketema Zuria, Itang, and Lare). The meat and egg samples were transported from Gambella regional state to Addis Ababa and Bishoftu for preparation and the analysis at the laboratory of (Bless food- agri. laboratory service PLC and National Veterinary Institute).

Nutritive value of indigenous chicken strains meat and egg

Nutritive value (moisture, crude protein, crude fat, ash, and fiber) of the samples (meat and egg) were determined. The nutritive values of meat and egg samples were determined according to the AOAC (2010) methods. Moisture content was determined by drying the samples at 105°C to constant weight. The crude protein content was determined by the Kjeldahl method and the crude fat content was determined by the Soxhlet method. The ash content was determined by charring followed by ashing the samples at 550°C to a white ash. The carbohydrate content was calculated by difference (total mass of moisture, crude fat, ash, crude fiber and crude protein subtracted from the mass of the food).

Data collection

The frozen samples of the breast, thigh and drumstick were dissected into small pieces and homogenized separately in a blender at -10°C. The eggs were randomly collected from each chicken strains evaluated under on-station to investigate the moisture, crude protein, crude fat, crude fiber and ash contents were determined following the standard procedures (AOAC, 2010).
Moisture content was determined gravimetrically (Corthinas, 2004; Oluwatosin et al., 2007) by drying 6 g of meat and egg at 105°C accordingly to the NF V 04-401 French standards method. Each value was an average of 2 measurements. Crude protein was determined by Kjeldahl method according to the NF V 04-407 norm and using a Kjeltec Auto Sampler System 1035 Analyzer (Foss, Benelux). Each analysis was repeated twice. The total ash content was determined according to the NF V 04-404 French standard method. About 6 g of samples were a shed in an oven maintained at 550°C with twice repeated to determine ash content.
The fat content was determined by Soxhlet method according to the NF V 04-402 standard ISO 1443: 1973. Each analysis was repeated twice using petroleum ether at 40-60°C.

Table1. Nutritivevalue of indigenous chicken'smeat studied

Chicken strains	Meat part	Moisture %	Crude-protein %	Crude-fat %	Ash %	Crude-fiber %
Ab	Breast	75.35 ± 0.52	19.84 ± 0.56	4.36 ± 1.05	0.28 ± 0.06	0.31 ± 0.05
	Thigh	75.48 ± 0.86	18.97 ± 0.94	4.60 ± 0.67	0.43 ± 0.09	0.48 ± 0.06
	Drumstick	75.69 ± 0.99	18.65 ± 0.88	4.72 ± 0.71	0.47 ± 0.07	0.51 ± 0.06
Mean ± SE		**75.51 ±0.79**	**19.15 ± 0.79**	**4.56 ± 0.81**	**0.39 ± 0.07**	**0.41± 0.05**
GKz	Breast	75.24 ± 0.54	20.04 ± 0.05	4.34 ± 0.36	0.20 ± 0.04	0.36 ± 0.07
	Thigh	75.26 ± 0.55	18.98 ± 0.73	4.78 ± 0.43	0.41 ± 0.05	0.50 ± 0.06
	Drumstick	75.31 ± 0.06	18.97 ± 0.17	4.62 ± 0.20	0.46 ± 0.07	0.43 ± 0.05
Mean ± SE		**75.27 ± 0.38**	**19.33 ± 0.32**	**4.58 ± 0.33**	**0.36 ± 0.05**	**0.43 ± 0.06**
It	Breast	75.25 ± 0.94	19.76 ± 0.49	4.31 ± 0.14	0.38 ± 0.04	0.31 ± 0.06
	Thigh	75.27 ±1.02	18.71 ± 0.77	4.92 ± 0.13	0.47 ± 0.01	0.53 ± 0.04
	Drumstick	75.50 ± 0.78	18.69 ± 0.62	4.63 ± 0.12	0.61 ± 0.08	0.46 ± 0.03
Mean ± SE		**75.34 ± 0.91**	**19.05 ± 0.63**	**4.62 ± 0.13**	**0.48 ± 0.04**	**0.42 ±0.04**
La	Breast	75.22 ± 0.86	19.78 ± 0.69	4.42 ± 0.17	0.40 ± 0.03	0.52 ± 0.08
	Thigh	75.39 ± 0.99	18.74 ± 0.54	4.87 ± 0.15	0.52 ± 0.06	0.67 ± 0.04
	Drumstick	75.36 ± 0.80	18.72 ± 0.39	4.75 ± 0.18	0.63 ±0.07	0.69 ± 0.07
Mean ± SE		**75.32 ± 0.88**	**19.08 ± 0.54**	**4.68 ± 0.16**	**0.52 ± 0.05**	**0.63 ± 0.06**
Overall mean ± SE		**75.36 ± 0.74**	**19.15 ± 0.57**	**4.61 ± 0.36**	**0.44 ± 0.05**	**0.47 ± 0.05**

Ab *(Abobo),* ***Gkz*** *(Gambella ketema Zuria),* ***It*** *(Itang) and* ***La*** *(Lare),* ***SE****(standard errors), different superscripts in the same column indicate significant difference in nutritive value among chicken's meat at p<0.05*

Data analysis

All data were coded and recorded in Microsoft excel sheet. Data collected was subjected to Analysis of Variance (ANOVA) using the General Linear Model (GLM) procedure of SAS version 9.4, 2017. For the analysis of variance, a fixed effects linear model was adjusted to the data and includes the fixed effects of chicken strains, meat parts, and egg. The interaction between chicken strains, meat, and egg were taken into account in the model of variance analysis. Mean comparisons were made by using Tukey`s studentized range test method at p<0.05. The statistical model used was:

$Y_{ijkms} = \mu + E_i + ME_l + S_g + E_{ijk}$, Where,

Y_{ijkms} = an observation for a given variables.

μ = overall mean.

E_i = effect of the i^{th} ecotypes (i: 1, 2, 3 and 4).

M_l= fixed effect of meat ME (breast, thigh, drumstick and egg).

S_g= fixed effect of sex (male, female).

E_{ijk} = residual random error.

RESULTS AND DISCUSSION

Nutritive value of indigenous chicken's strains meat

The result of the nutritive value ofon-station evaluated of Abobo, Gambella ketema Zuria, Lare and Itang chicken strains meat were presented in Table 1. In the current study, there were non-significant differences at (P>0.05) in moisture contents in all of the chicken strains namely (Abobo, Gambella Ketema Zuria, Itang, and Lare) with the overall means were 75.47± 0.79, 75.27 ± 0.38, 75.33 ± 0.91, and 75.32 ± 0.88 respectively. The present study was in agreement with the findings reported by (Salma *et.al.,* 2016) non-significant difference in moisture content of breast and thigh meat in Fayoumi and White Leghorn breeds was recorded from Pakistan.

From the current findings, the crude protein contents of the chicken between strains were non-significant differences at (p >0.05). In all of the studied chicken strains, the crude protein contents of breast meat were significantly higher than those of the thigh and drumstick meat part at (p<0.05), whereas the contents in moisture, crude fat, Ash, and crude fiber of the thigh and drumstick meat were significantly higher (p<0.05) than those of the breast meat (table1). Additionally the overall means of the crude protein contents in all the studied strains of (Abobo, Gambella Ketema Zuria, Itang, and Lare) were 19.15 ± 0.79, 19.33 ± 0.32, 19.05 ± 0.63, and 19.08 ± 0.54, respectively. The findings of this study showing non-significant difference in crude protein contents in all chicken strains were in agreement with those of Fayoumi and White Leghorn breeds (Salma *et.al.* 2016) who reported non-significant difference between protein content of WLH and other poultry breeds.

From the current findings the overall means of the ash contents in all the studied strains of (Abobo, Gambella Ketema Zuria, Itang, and Lare) were 0.39 ± 0.07, 0.35 ± 0.05, 0.49 ± 0.06, and 0.52 ± 0.05, respectively. From the nutritive value of chicken's meat, since the protein content is very crucial for human diet it is better to eat the meat which was produced from the breast meat part of chickens.

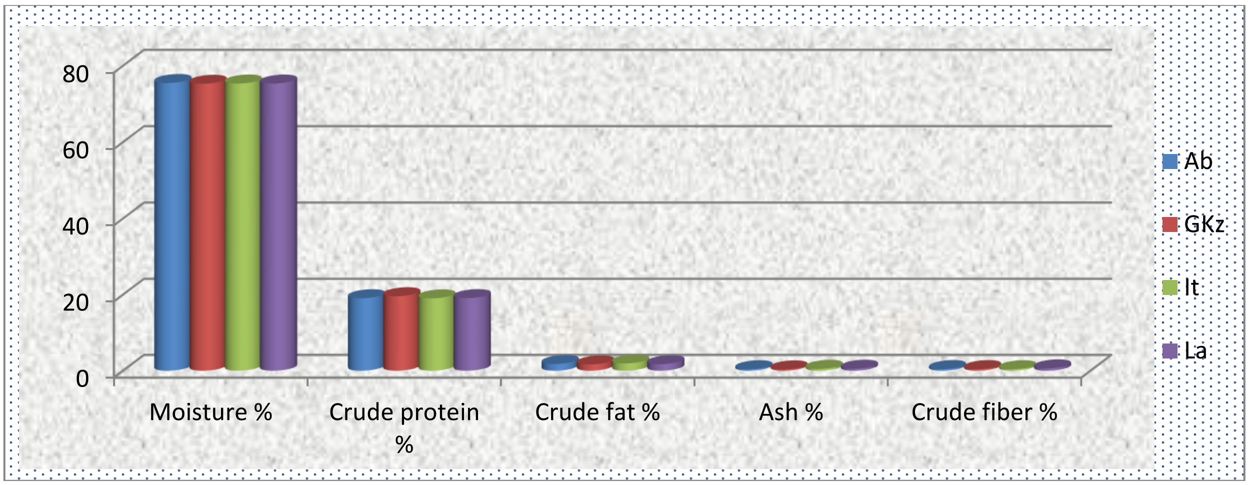
Figure 1 shown that the nutritive value of the different chicken strains meat in the study area. As shown in the

Table 2. The mean value of the chicken strains of all meat part (breast, thigh and drumstick)(mean ± SE)

Nutritive value (%)	**Ab**	**GKz**	**It**	**La**
Moisture	75.51 ± 0.79	75.27 ± 0.38	75.34 ± 0.91	75.32 ± 0.88
Crude protein	19.15 ± 0.79^{b}	19.33 ± 0.32^{a}	19.05 ± 0.63^{b}	19.08 ± 0.54^{b}
Crude fat	4.56 ± 0.81	4.58 ± 0.33	4.62 ± 0.13	4.68 ± 0.16
Ash	0.39 ± 0.07	0.36 ± 0.05	0.48 ± 0.04	0.52 ± 0.05
Crude fiber	0.41 ± 0.05	0.43 ± 0.06	0.42 ± 0.04	0.63 ± 0.06

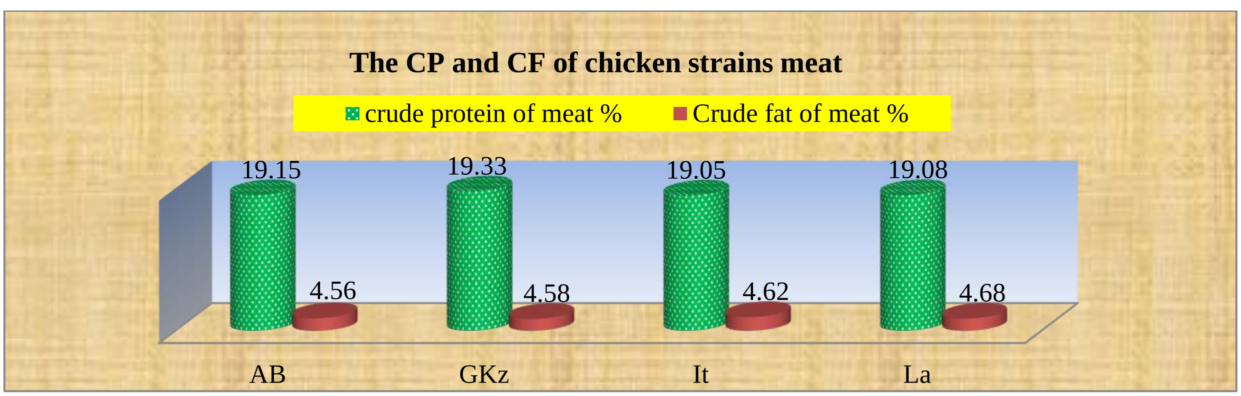
***Ab** (Abobo), **Gkz** (Gambella ketema Zuria), **It** (Itang) and **La** (Lare),* SE *(standard errors), different superscripts in the same column indicate significant difference in nutritive value among chicken's meat at p<0.05*

Figure 1. Representing the mean value of the nutritive value of the meat cut-parts



Ab (Abobo), GKz (Gambella Ketema Zuria), It (Itang) and La (Lare).

Figure 2. Nutritive value of cp & cf of raw chicken meat



Ab (Abobo), GKz (Gambella Ketema Zuria), It (Itang) and La (Lare), cp (crude protein), and cf(crude fat)

figure 1 the higher, moderate, lower and the lowest percentages mean values were projected in moisture, crude protein, crude fat, ash and crude fiber respectively. The mean values of nutritive value for all chicken strains (GKz, Ab, It, and La) of raw chicken meat were given in Figure 1.

As shown in figure 2, the crud protein and crude fat of the indigenous chicken strains meat studied has non-significant differences in (Abobo, studied has non -significant differences in (Abobo, Gambella Ketema Zuria, Itang and Lare chicken strains).

Investigation of nutritive value of indigenous chicken strains' egg

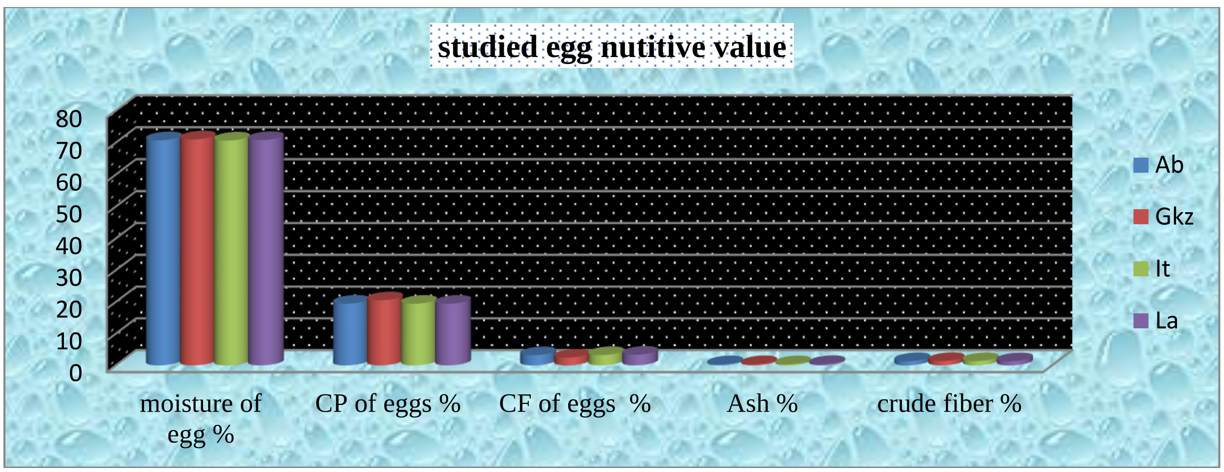
The nutritive value of egg obtained from indigenous chicken strains was shown in Table 3. The mean value of the moisture contents of investigated egg from all

Table 3. Nutritive value of indigenous chickens' eggs (M±SE)

Egg of strains	Moisture (%)	C P (%)	CF (%)	Ash (%)	Crude fiber (%)
Ab	70.74± 1.05	19.45± 0.33[b]	3.22± 0.27	0.41±0.07	1.37± 0.14
Gkz	71.02±0.85	20.51±0.61[a]	2.36±0.73	0.35 ±0.02	1.34±0.23
It	70.66±0.91	19.42±0.52[b]	3.26±0.68	0.43±0.05	1.39±0.42
La	70.81±1.03	19.43±0.71[b]	3.35±0.45	0.39 ±0.03	1.36±0.28
Over all mean	70.80±0.73	19.44±0.54	3.34±0.53	0.39±0.04	1.37±0.27

Ab (Abobo), Gkz (Gambella ketema Zuria), It (Itang) and La (Lare), CP (crude protein), CF (crude fat),SE (standard errors), different superscripts in the same column indicate significant difference in proximate composition among chicken's eggs at p≤0.05

Figure 3 shown that the nutritive value of the different chicken strains eggs studied



Ab (Abobo), Gkz (Gambella ketema Zuria), It (Itang), La (Lare), cp (crude protein) and cf (crude fat).

chicken strains of Ab, GKz, It, and La (70.74± 1.05,71.02±0.85,70.66±0.91, and 70.81±1.03), respectively. The current result revealed that, non-significant differences () in moisture contents of egg between Ab, GKz, It, and La of indigenous chicken strains. The present study was similar with the findings reported by (Isah Musa *et.al,* 2015) non-significant difference (P>0.05) in moisture content of egg in Columbia livia, Corturnix ypsilophora, and Gallus domesticus egg was recorded from Nigeria. The protein contents of Gambella ketema Zuria chicken strain egg was slightly higher (20.51±0.61) than the three indigenous chicken strains (Ab, It, and La). The variation of the protein contents of the same strain may be due to the different egg size of the strains.

Thus, the current findings were similar with the value reported by (Isah Musa *et.al,* 2015) significant difference (P<0.05) in protein contents of egg shows in all other egg species. The results of crude fat, Ash, and crude fiber contents were non- significant differences (P>0.05) in Ab, GKz, It, and La indigenous chicken strains egg. From the present findings the overall mean of the crude fat, ash, and crude fiber of the Ab, GKz, It, and La were 3.34±0.53,0.39±0.04, and 1.37±0.27, respectively. The current result was similar with the findings of (Isah Musa *et.al,* 2015), who reported in crude lipid and ash shows non-significant differences (P>0.05) between some of the egg species.

As presented in figure 4 the nutritive value of crude protein & crude fat contents of chicken strains egg studied were illustrated. The Gkz chicken strain was higher significant difference (p<0.05) than the three chicken strains (Ab, It and La), the differences may be due to the variation of the egg size occurred.

CONCLUSION

The breast meat had higher protein contents in all chicken strains than the thigh and drumstick meat. The protein contents of Gambella ketema Zuria chicken strain egg were higher than the Abobo, Itang and Lare egg chicken strains. The variation of the protein contents of the same breed may be due to the egg size of the chicken strains. With these findings, there is need for consumer and farmer awareness on the sustainable use of indigenous chicken strains' meat and egg produced, because of their high protein and low fat contents.

Competing interests

The authors declare that they have no competing interest.

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REFERENCES

AOAC (2005). Official methods of analysis (18th Edition). Association of Official Analytical Chemists, Washington, DC

Chodová D, Tůmová E, Ketta M; Skřivanová V (2021) Breast meat quality in males and females of fast-, medium- and slow-growing chickens fed diets of 2 protein levels. Poult. Sci. 2021, 100, 100997.

Choe JH, KC Nam, Jung S, Kim BN, Yun HJ, Jo CR(2010). Differences in the quality characteristics between commercial Korean native chickens and broilers. Korean J. Food Sci. An. 30:13-19.

Fakai IA, Sani I, Olalekan OS (2015). Proximate composition and cholesterol content of egg obtained from various bird species. *Journal of Harmonized Research inMedical and Health Science.* 2(2), 18-25 ISSN 2395-6046

Farrell D (2013). How important is cholesterol in eggs, the role of poultry in human nutrition. Poultry Development Review. Retrieved from http://www.fao.org/docrep /019/i3531e/i3531e02.pdf

Forson A, Axivor JE, Banini GK, Nuviadenu C, Debrah SK (2011). Evaluation of some elemental variation in raw egg yolk and egg white of domestic chicken, guinea, fowl and duck eggs. *Annals of BiologicalResearch, 2: 676-680.*

Jung S, Bae YS, Kim HJ, Jayasena DD, Lee JH, Park HB, Heo KN, Jo C(2013). Carnosine, anserine, creatine, and inosine 5′-monophosphatecontents in breast and thigh meats from 5 lines of Korean native chicken. Poult. Sci. 92:3275-3282.

Salma A, Shamim A, Sohail H, Muhammad A(2016). Comparative study on quality, proximate composition and cholesterol content of eggs and meat in Fayoumi and commercial White Leghorn chickens. *Cogent Food &Agriculture*, 2: 1195539.

SAS (2017). SAS User's Guide. Version 9.4 for windows. SAS Institute Inc., SAS Campus Drive, Cary, North Carolina, USA.