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BODY MEASUREMENTS AND PROXIMATE COMPOSITION OF SOME DOMESTIC BIRDS SOLD AT ADUWAWA LIVESTOCK MARKET

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ABSTRACT

A total of 60 matured birds 10 each of quail, pigeon, guinea fowl, indigenous fowl, hubbard old layer and broiler were sampled from Aduwawa Livestock market in Benin-City. Morphological features measured include body weight, neck length, head length, wings length, body girth, length of drum stick, length of shank and height; and proximate composition determined were crude protein, lipid and ash. The crude protein content of quail, pigeon, indigenous fowl, broiler, old layer and guinea fowl were 31.10%, 23.5%, 17.86%, 18.20%, 17.6% and 16.6% respectively. Ash content measured 0.7% 1.4%, 0.65%, 0.71% 0.69% and 0.84% respectively. Body fat content values were 15.46%, 10.3%, 26.62%, 27.2%, 26.32 and 30.46% for quail, pigeon, indigenous fowl, broiler, old layer and guinea fowl respectively. The contribution of birds to national protein supply is emphasized.

Keywords: Poultry birds, Body measurement, Chemical composition, Food value.

INTRODUCTION

The Nigerian poultry population was estimated at 160 million comprising of 72.4 million chicken, 11.8 million ducks, 4.7 million guinea fowl 15.2 million pigeon and 0.2 million turkeys (Ajala *et al*, 2007). The rural poultry accounts for 84% of the total chicken population. Chickens are of great importance to African rural households. They constitute more than 80% of the total poultry population in Africa (Sonaiya, *et al*, 2004). In general, village producers keep small flocks of between 5 and 20 chickens per household. Rural poultry plays a significant role in the cultural life of rural communities. It serves as gift item, for sacrificial and ceremonial activities as well as starting capital for youths, and the newly married (Ajala *et al*, 2007). Indigenous chickens are widely distributed in the rural areas of tropical and sub-tropical countries where they are kept by the majority of the rural poor. Indigenous chickens in Africa are in general hardy, adaptive to rural environments, survive on little or no inputs and adjust to fluctuations in feed availability. Chickens largely dominate flock composition and make up about 98% of the total poultry numbers (chickens, ducks and turkeys) kept in Africa. Developing countries are faced with the food crises characterized by inadequate meat protein which is very important to their overall wellbeing (Gueye, 2003). According to the FAO, daily animal protein consumption of about 55g per head per day is needed for an individual for optimum growth. Interestingly too, Nigeria a third world country is faced with the problem of inadequate protein consumption. The daily animal protein consumption is put at l0g per head, per day which is a far cry from the FAO daily recommendation. The question that easily comes to mind is whether the Nigeria people do not want to consume animal meat or whether there are no enough resources to

acquire the available animal protein (meat). The objectives of the study were to take measurement of the body indices of the domestic birds that arrive Aduwawa cattle market in Benin City, Edo state; to determine variation in the body measurement between the different birds available as food animals in Benin City, Edo state.

The need for animal protein in human diet cannot be over emphasized. Recurrent chemical analysis of animal protein sources is hence very necessary as a first step in evaluating the protein status of the human populace, given the agro-ecological dynamics associated with current changes in the global environment.

MATERIALS AND METHODS

Sample Collection and Management

Sixty (60) matured adult birds, ten (10) each of indigenous fowl, quail, old layers, pigeon, guinea fowl and broiler species were sampled and examined. The six species were chosen because they are most commonly sold and found in Aduwawa market. Quails, indigenous fowls, guinea fowls, and pigeons were purchased from Aduwawa market while layers and broiler species were obtained from the farm project University of Benin in Edo State, Nigeria. The birds were selected based on active appearance and no injury on the foot. The birds were housed in cages according to their breeds and were rested for 1-2weeks to neutralize the treatment they have been exposed to during which period they were fed layer mash, finisher while quail were fed with paw-paw leaves and finisher (this is because this avian instinctively shows preference for this feed) and water was given *ad-libitum.* Remnant feed left in each treatment feeder were cleared and the feeder cleaned before another set was introduced

Measurement of body parts

Body measurements were taken using a centimeter tape; while live weight of the birds were weighed with electronic balance for quails and pigeons, and the physical balance / weighing scale used for indigenous fowl, guinea fowl, old layer and broiler. Thus the following measurements were taken and recorded: weight of birds, length of the body, body girth, neck length, wing length and height of wither.

Sample preparation

A day prior to slaughter, all foods except water were withdrawn from the chickens overnight. Five (5) birds were selected from each class of poultry species. The birds were individually weighed and slaughtered by bleeding from a neck cut, which severed the carotid arteries and jugular veins. After bleeding, birds were processed by use of hot water to defeater and thereafter dissected. The heads and necks were removed by cutting through the last cervical and the first thoracic vertebrae; and the shank at the tibio-tarso, tarsal, metatarsal joints, following the method described by (Vidyadaran *et al*, 1988). The carcass dressing percentage was calculated as weight of carcass (without blood, feather, head neck, shank and giblet) divided by live weight multiplied by 100 (Vidyadaran *et al*, 1988).

The skin and the under-lying sub-cutaneous fat were removed and weighed. The abdominal fat was also removed and weighed according to the procedures of Kubena et al. (1974). Fat surrounding the gizzard and intestines extending within the ischium and surrounding the bursa of fabricius, hearts, livers, gizzards, spleens, and lungs were removed and weighed. The carcasses were then sectioned into breast, thigh and drumstick portions and weighed. The breast muscle *(Pectoralis major)* was carefully dissected. Essentially, this involved the removal of the *pars thoracicus, pars propairagialis* and the *pars abdominal* (Vidyadaran et al., 1988). The muscles were wrapped in polyethylene bags and stored at -22°C until required for further analysis. Thereafter, the muscles (meat) were *oven* dried at 70°c for 46 hours to constant weight, cooled

in desiccators and weighed for moisture and dry matter determination.

Chemical analysis

Meat samples were homogenized to fine powder using a blender; and then proximate analyses were performed for crude protein, crude fiber, ash, fat and nitrogen-free-extract using standard analytical methods recommended and described by AOAC (2010).

Statistical Analysis

Analysis of variance was performed on the data; means were separated by species and compared by Duncan's Multiple Range Test.

RESULTS

Body Index values of Birds sold at Aduwawa market, Benin City

A summary of the average body measurements of various poultry species sold at Aduwawa is presented in Table1. Significant variations were observed for some measurements. Live weight values were not significantly ($p>0.05$) different between the quail and pigeon and between the guinea fowl and the indigenous domestic fowl. The broilers and the old layers recorded significantly higher ($p<0.05$) body weights than other species. Guinea fowls and old layers measured lengths of head which were non-significantly different ($p>0.05$) between them but were significantly ($p<0.05$) higher than the measurement for other poultry species. The indigenous fowls and the broiler recorded non-significant values in head length, while the head of the quail birds measured the least value of head length. All bird species showed a similar trend of statistical significance in the length of neck, and length of the wings; with an exception in the wing length of the broiler which measured significantly higher than other species. The statistical significance of measured values of body girth and length of drumstick showed similar trend between the birds; while for each bird species the two index value seemed to correlate. The least shank length was measured in the quail which was significantly lower ($p<0.05$) than the values for other birds. Differences in shank length were not significant between the pigeon and guinea fowl, and between the broiler and old layer.

Table 1 Average Body measurements of Aduwawa market Birds, Benin City

Parameters	QL	PG	GF	IF	BB	OL	MS
Body weight (kg/g)	0.16^{a}	0.25 ^{a}	1.33^{b}	1.32^{b}	2.62^{9}	1.85^{c}	1.25±0.11
Lenght of Head (cm)	3.96^{a}	4.58^{b}	8.75^{d}	7.95c	7.60^{c}	8.95 ^{d}	6.97±0.21
Length of neck(cm)	4.86^{a}	8.39b	9.59^{cd}	9.00^{C}	9.30^{c}	10.00^{d}	8.50±0.21
Length of wings(cm)	9.35^{a}	25.64^{c}	21.80 ^{b}	21.10^{b}	28.61^{d}	21.90^{b}	21.40±0.67
Body girth (cm)	I0.76^{a}	13.93°	12.75 ^{a}	11.45^{a}	14.40^{d}	12.45^{b}	12.51±0.45
Length of drum Stick (cm)	10.23*	12.21^{c}	8.60 ^{a}	7.60 ^{a}	13.70^{d}	8.55 ^{a}	10.17±0.38
Length of shank(cm)	3.14^{a}	5.53b	5.15^{b}	7.0^{c}	8.51^{d}	8.25 ^{d}	6.86±0.22
Height (cm)	10.6c	8.63	28.55	24.20^{c}	27.05^{c}	27.40^{de}	21.07±0.49

^{abc}Means on same row with different superscripts are statistically significant ($P<0.05$)

Key: QL= Quail, PG= Pigeon, GF= Guinea Fowl, IF= Indigenous Fowl, BB= Broiler, OL= Old layer

Chemical composition of Birds sold at Aduwawa livestock market, Benin City

In this study broiler CP values were 16.20 - 21.22% with mean of 18.20%. The CP content of the meat of old layers sold at Aduwawa market ranged from 16.30 to 19.20% with mean of 17.86% whereas the smallest size birds – the quail, measured crude protein content of between 28.94% and 34.20% with average of 31.10%. The guinea fowls measured between 16.55-20.46% CP, with mean value of 16.65%; indigenous domestic fowls recorded 16.30-19.20% with mean of 17.86; while the CP for pigeon valued between 21.20-24.32% with of 23.5 (Table 2).

The body fat content measured for quails ranged in values between 14.0 and 17.02% with average of 15.46%; while the guinea fowls recorded 26.7 - 39.5% with mean of 30.46%. Indigenous domestic fowls measured 25.4-28.5% with mean of 26.62%; pigeons measured between 11.30-12.20% with mean of 10.30; broilers 26.4-29.5% with mean of 27.62%, while old layers recorded 25.4 - 28.5% with mean of 26.32%.

The Ash content values measured in quails ranged between 0.88 and 0.94% with average of 0.944%, guinea fowl 0.80 - 0.92% with mean of 0.87%. and indigenous fowl is between 0.60-0.70% with mean of 0.65%, Recorded ash values for pigeons were 0.90 – 1.5% with mean of 1.4; broilers 0.66 - 0.75% with mean of 0.71%, whereas the old layers measured 0.62- 0.70% ash content with mean 0.69%.

Table 2 Proximate composition of poultry species sold at Aduwawa market, Benin-City

Nutrient(g/100gd)	QL	PG	GF	IF	BB	OL	MS	Cv
Crude Protein (CP)	31.1^{a}	23.5^{b}	16.65^{c}	17.0^{c}	18.20^{d}	17.6^{c}	20.8±0.41	8.3
Crude fat (EE)	15.46^{c}	10.3^{a}	30.46^{e}	26.6^{c}	27.2^{d}	26.32^{c}	22.72±0.49	8.5
Ash	0.91^{b}	1.4^{a}	0.84°	0.65^{b}	0.71^{c}	0.69^{b}	0.667±0.11	11

^{abc}Means on same row with different superscripts are statistically significant($P<0.05$)

Key: QL: Quail PG :Pigeon GF: Guinea Fowl IF: Indigenous Fowl BB:Broiler OL:Old layer

DISCUSSION

Classes and characteristics of Aduwawa birds

This study undertook to measure body physical characteristics and chemical composition of some domestic birds available for sale at Aduwawa Market in Benin-City over a period of two years. It is pertinent that all classes of poultry species in Nigeria are available and are sold at that market. The indigenous fowl is still very much relevant and cherished among poultry species; it comprises various ecotypes which are found and distributed in the different agro-ecological zones in the country (Momoh, *et al*, 2007; Ajaiayi and Agaviezor, 2009). The various ecotypes are classified and characterized according to genetic lines such as normal or frizzled feather, body structure, body size such as dwarf or tall types, body features such as naked or covered neck, and the color of plumage such as black, white, brown, or mottled. Based on location there were reports that in Bayelsa State, the frequency distribution of normal feathered chicken was about 91.8% while that of frizzled and naked neck were 5.2 and 3.0% respectively (Ajaiayi and Agaviezor, 2009); whereas in the dry savannah regions in the north the heavy Fulani ecotypes are prevalent; these weigh about 0.9-2.5 kg at maturity, compared to the classes of light ecotypes mostly found in the rain forest and derived savannah regions. The body weight range

measured for the indigenous domestic fowl in this study was 1.0-1.7kg which is similar to the range of 0.68-1.5 kg reported by Momoh, *et al* (2007). These observations and reports suggest that some ecotypes are more prominent or prevalent in some locations than others. It is essential that increased production of the less prominent ones be encouraged and their gene pool be conserved to prevent the gradual extinction of such ecotypes in Nigeria. The guinea fowl species are many and varied in their physical characteristics (Nahashon and Wright 2006). Old layers are sold and slaughtered for meat at the end of egg production period (LeBihan-Duval, 2008; Ajayi, 2010). Broilers measured the biggest in size among the different species of birds examined; while quails proved to be the smallest bird, recording an average body weight of 0.163kg in this study. The pigeons are characteristically stout-bodied birds with short neck, slender bills with fleshy cares. However, in this study we observed variations that tend to confirm the assertion that pigeons and doves exhibit considerable variations in size which ranged between the New World ground-dove *Columbina* weighing as little as 22g, and the crowned pigeon of New Guinea, which is nearly turkey-sized, weighing about 4kg (Baptista,1997). There were regular supplies and sales of all the poultry species in that market.

Chemical composition of Aduwawa birds

The levels of crude protein, and of ash, offered by the Aduwawa birds were not significantly different from the values reported previously for the birds elsewhere (USDA, 1995, 1999; Olomu, 2011). The values obtained for ether extract determinations (Table 3) corroborate previous reports that the quail has the least fat content among poultry species. Of interest also is the level of ash in the quail, which is higher than the level in other birds examined; evidently, in comparison to other poultry species, this small size bird offers a superior nutrient profile (31.1%CP, 15.5%FAT, 0.91%ASH) with prospects for nutritional and dietetic recommendations (Olomu, 2011).

Notwithstanding the aforementioned, the variations and differences in measurements and proximate composition values reported in literature, and the differences obtained for poultry species, in this study, are generally attributed to factors such as species specificity, biochemical individuality, nutrition and age of birds, and the location of study. Of significance also are the laboratory and analytical conditions (Ikeme 1990; Olomu, 2011). Nevertheless, published data resulting from such evaluations could be helpful in comparing the vital statistics of various poultry species, whilst this could also be useful in researches on poultry development as high potential food animals.

Food value of Poultry species

The results of this study corroborate previous evidences that poultry species, offer high nutritive values which measure favorably with meat from livestock and other food animals. It has long been specified that about 25% of Nigerians are seriously afflicted by protein malnutrition, while a further 25% suffer from mild to moderate forms of diseases related to inadequate food supply and under-nutrition (Ikheola and Iredia, 2005; Atinmo and Akinyele, 2006). Poultry meat is widely accepted as good source of high quality protein, mineral and vitamins; and various poultry species can be exploited favorably to combat the protein inadequacy problem in Nigeria (Olomu, 2011). The different birds examined in this study are being produced and marketed for this purpose. Therefore, efforts aimed at increasing the production and supply of the various poultry species are worth encouraging.

The Nigerian human population is on the increase, with corresponding increase in demand for meat. In order to meet this demand poultry species are essentially the placebo, particularly because each has seemingly

unique or peculiar qualities of economic interest. For example, reports indicate that the indigenous fowl is a hardy, versatile and very useful bird. Many authors have described it as having better genetic materials due to the ability to survive in a little input environment, in terms of capital, feeding and labor requirements. Also, it has high resistance against certain poultry diseases including the New Castle disease, fowl pox and coccidiosis (Gunaratne, *et al*, 1993; Gueye, 1998; Minh, 2005; Olomu, 2011; Psifidi, *et al*, 2014). Pigeons can be raised on roof tops; they are scavengers and so can be raised on a minimum of feed. Adult pigeons produce their young (squabs) frequently, two squabs every four weeks during a breeding season that can last several months. Also of advantage, squabs grow rapidly and require a minimum of attention (Batista, *et al*, 2007). Quail meat is highly valued for its textural, nutritional and sensory properties, which attract high consumer preference value; the meat is sweet smelling, slightly dark in color, and firm in texture (Shanaway, 1994). Guinea fowls are many and varied in their physical characteristics; whilst the helmeted species has high potential food value in Africa (Nahashon, *et al*, 2006; Nahashon and Wright 2006). The texture and firmness of the meat of old layer tend to have a wide appeal for consumer preference and choice of meat for traditional food preparations; and the broiler has remarkable production features and meat quality; hence it is the most conventional of birds in commercial poultry for meat (LeBihan-Duval, 2008; Ajayi, 2010; Olomu, 2011).

The Nigeria food balance sheet indicates that only 4.82% of the required amount of animal protein is consumed by an individual daily, representing only about 10% of the recommended total protein intake (Ikheola and Iredia, 2005). Thus the availability of various poultry species in the country offers the potential to address such problems; and efforts made through research, policies and programs to develop meat yield and meat quality of the different species are the means of finding solutions to them (Sonaiya and Swan 2004)

CONCLUSION AND RECOMMENDATION

The levels of crude protein offered by the various Aduwawa birds were not significantly different from the values reported in literature for chicken, guinea fowl, turkey as well as the rodent, rabbit. Similarly the values of ash measured in the birds were comparatively, not at significant variance from the values reported for beef and turkey. Protein inadequacy is a major nutritional problem in Nigeria. The body size and morphological indices of the poultry birds as well as their chemical compositions are a means of evaluating their food value. The interest to domesticate and increase the production, supply and consumption of various poultry species along with conventional food animals is highly recommended. Advancing research efforts on the development of meat yield and meat quality of the different species is therefore also recommended.

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