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COMPREHENSIVE DESCRIPTION OF BODY SHAPES, SIZES AND PLUMAGE COLORATIONS OF DOMESTIC PIGEONS IN BENUE STATE, NIGERIA

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ABSTRACT

The domestic Pigeons (Columbia livia domestica) are hardy birds that can be raised with little effort. They are able to survive in hostile climates and fend for themselves, often ranging over many kilometers in attempt to locate seeds and edible scraps. In Nigeria pigeons are well distributed in the different agro-ecological zones of the country. In Benue State and indeed Nigeria, the available domestic pigeon population is largely genetically and phenotypically uncharacterized. Considering this fact, the present study was conducted on Comprehensive Description of Body Shapes, Sizes And Plumage Colorations of Domestic Pigeons in Benue State, Nigeria. Field data collection phase of the study was carried out through combined use of questionnaire and fortnightly visits for a period of six months. A total of sixty pigeon farmers and three hundred domestic pigeons were covered during the survey. Mature body weights were measured to the nearest grammes on all the adult birds covered during the field data phase using a 5kg capacity weighing scale. Plumage, beak and shank colourations/colour patterns were measured via visual observations during the two phases of the experiment. Body, shank, beak, thigh and wing lengths and breast girth were measured at maturity using a graduated linear scale (rule) and tailor's tape. Bird height (from leg on the ground up to the level of the back of the bird) was also measured. Qualitative data collected were subjected to descriptive statistics such as percentages and averages, while the data quantitative (economics) traits were analyzed through the use of Analysis of Variance (ANOVA) technique and correlation analysis based on the SPSS II programme. Ash plumage predominated other colours, constituting 16.94% of all the observed plumage colours. This was closely followed by brown (12.78%), black (12.22%) and white (12.22%) with black and grey colour being the rarely observed (1.39%). About 56% of the pigeons surveyed had muffed feet (feathered feet). The overall mean weight of 326.63±1.69 for male and 312.25±1.83 for female pigeons kept on semi-intensive system is slightly lower. In terms of morphological traits, the pigeons demonstrated a great deal of variations and complexities in plumage, shank and beak colourations. The variations observed in other quantitative traits such as linear body measurements (body, shank and beak lengths breast girth and bird height) revealed no significant difference ((P>0.05).

Keywords: *pigeons, body shapes, sizes, plumage*

INTRODUCTION

Nigeria is endowed with many poultry species, which are local to the country. These have lived, adapted and produced for several years in the Nigerian environment, although their productivity is poor, probably due to stressful environmental factors of disease, pests and parasites, heat stress, poor housing and inadequate feeds and feeding (Momoh, 2005).

It is estimated that the daily protein requirement of an adult Nigerian and most third world countries varies between 65-75 grams per caput per day (FAO, 1996) of which animal protein constituted a small fraction. Two decades ago, it was reported that the consumption of animal protein in Nigeria was 5.5g per head per day (Basher *et al*., 2002) which is less than the FAO (1988) recommended level of 35g per caput per day. This condition by now may have been worsened by the ban on the importation of live poultry and frozen poultry product into the country. In view of high cost, animals and their products are no longer within the reach of many Nigerians. This has led to serious shortfalls in protein intake of Nigerians. To correct this shortfall, enormous increase in animal protein supply could be pursued through the production of animals that are highly prolific and of short generation intervals. This would mean mainstreaming rabbits and poultry species. Developing

countries including Nigeria have indigenous poultry types with diverse uses and benefits. The origin of each type or strain/ecotype is the product of mutation and genetic drift as well as separate adaptation and evolution with differing selection pressure imposed by climate, endemic parasites and diseases, available nutrition and selection criteria set by man (Barker, 1994). Gueye (1998) reported that indigenous poultry represent an important reservoir of genetic variation that should be conserved. They are also subjected to challenging selection pressure due to the poor management condition under which they are kept. Thus they are a potential source of hardness genes that should be conserved for future use. McAinsh *et al* (2004) cited by Badubi (2006) reported that indigenous chickens are not classified into specific breeds; rather, they are heterogeneous in phenotype and probably also in genotype. Besides chickens, there are other poultry species in Nigeria that if properly and fully harnessed could raise the national animal protein supply profile. Among these poultry species are the indigenous ducks, geese, guinea fowl and domestic pigeons. Of these, the domestic pigeon is the most under exploited for poultry meat and egg production. Pigeons show promising potentials because of their small sizes and fast growth and can be adopted for small holder production, thereby tapping into their genetic potentials to ameliorate the problem of animal protein shortfall.

The domestic Pigeons (*Columbia livia domestica*) are hardy birds that can be raised with little effort. They are able to survive in hostile climates and fend for themselves, often ranging over many kilometers in attempt to locate seeds and edible scraps (Holderread, 2008). They have been raised for centuries, especially in North Africa and the Middle East. In parts of North America and Europe, they are produced and prepared as delicacies for the gourmet market (i.e. meat of special taste and often expensive). At the moment, raising pigeons for food is not as widespread as it should be in Nigeria. In fact, in modern times, its potential has hardly been touched. Farmed Pigeons are particularly promising as urban micro livestock because they require little space and thrive in cities (Holderread, 2008).

In Nigeria pigeons are well distributed in the different agro-ecological zones of the country. Their widespread distribution in the urban and rural areas demonstrates the socio-economic and cultural importance of these small and easily managed birds.

Pigeon production may never rise enough to compete with commercial poultry as a major source of food, but for the poor farmers and some urban dwellers, these birds could become a significant addition to their diet (as per animal protein intake) as well as a source of substantial supplemental income.

In Benue State and indeed Nigeria, the available domestic pigeon population is largely genetically and phenotypically uncharacterized, although recently, Adediran (2009) provided some baseline data on the plumage colourations, body measurements and breeding characteristics of the domestic pigeon in Benue State. Nevertheless, Comprehensive characterization of the pigeons, pigeon farmers and the productions systems are still lacking.

OBJECTIVE

To provide a comprehensive description of body shapes, sizes and plumage colorations of the domestic pigeons in Benue State

METHODOLOGY

Location of study area

This study was conducted in Benue State of Nigeria. Benue State is located between latitude 6^0 20' N - 8^0 60' N and longitude 7^0 40` E – $9^0$ 45` E (Andrew, 2007). The attitude is 97m above sea level and shares common boundaries with five states namely: Nassarawa to the north, Taraba to the east, Cross River to the south, Enugu to the south east and Kogi to the west (Andrew, 2007) The state has a population of over 4.2 million people (Census, 2006) and occupies a land area of 30, 955 sq km.

Climate

The state experiences a sub-humid tropical climate with two distinct seasons namely rainy and dry seasons. The rainy season is characterized by 6-7 months of rainfall with an annual rainfall of 1250 -2000 mm. Ambient temperature ranges from 32.0^0C (July) to 37.0^0C (February/March). Relative humidity ranges from 30.6% to 78.5% (Okoh, 2007).

Occupation

The main occupation of the people is farming, which includes the cultivation of crops such as yam, soybean, rice, cowpea, cassava, millet, cocoyam, sorghum, pepper,

tomatoes and sesame.

Livestock and poultry are kept as part-time farming activities. The classes of livestock and poultry kept by the people include local chickens, ducks, geese, pigeons, turkey, guinea fowl, sheep and goats, and pigs.

Sampling procedure

Field data collection

Three Local Government Areas namely Okpokwu (Ugbokolo), Katsina-Ala, and Vandeikya were chosen for the study. Four (4) locations in each local government area were randomly selected and five (5) local pigeon farmers in each location were visited and administered questionnaires by the defacto method. In other words, field data collection phase of the study was carried out through combined use of questionnaire and fortnightly visits for a period of six months. A total of sixty (60) pigeon farmers and three hundred (300) domestic pigeons were covered during the survey.

Experimental procedure

The experiment was conducted in two phases Viz:

(1) The field data collection phase, where the birds used were those pigeons kept by local farmers in the study area.

(2) The on-station experimental phase: Foundation stock consisting 150 pairs (i.e. 150 males and 150 females) of domestic pigeon were randomly sampled from the three local government areas in the study location as described in section 3.2.1, with each local government area contributing 50 pairs

On-station trial

The total of 150 pairs (i.e. 150 males and 150 females) of domestic pigeons were managed intensively on a private Poultry Farm (Anebi Farms, Otada Otukpo) in an open sided poultry house screened with poultry wire mesh for protection. Each mating pair was provided with a pigeon hole made of wood and measuring 30cm x 30cm x 30cm. These cages were raised to about 50cm above the concrete floor of the poultry house with enough room for free flight within the house. They were maintained as single unselected and unimproved pair-mating population. They were provided with formulated diet (as shown in Table 1 below) and clean water, *ad-libitum*. Nesting materials of soft sticks, broom sticks and grasses were provided for the birds.

The birds were allowed to mate, produce eggs and hatch their eggs naturally, on hatching, squabs were fed and nursed by their parents for about four weeks. After this period, feeds were formulated and provided for the birds. The composition and nutrient analysis of the diet is similar to the Table 1. Measurements were taken on all the first-generation progeny produced during the experiment. A total of about 300 progenies were measured.

Traits measured

During the field and on-station experiments the following traits were measured.

Body weight

Mature body weights were measured to the nearest grammes on all the adult birds covered during the field data phase using a 5kg capacity weighing scale. In the on-station phase, body weights were taken at hatch and subsequently at weekly interval until maturity (age at first egg) using a sensitive electronic (digital) scale.

Body colourations

Plumage, beak and shank colourations/colour patterns were measured via visual observations during the two phases of the experiment. Shank types were also evaluated.

Linear body measurement

Body, shank, beak, thigh and wing lengths and breast girth were measured at maturity using a graduated linear scale (rule) and tailor's tape. Bird height (from leg on the ground up to the level of the back of the bird) was also measured.

Statistical analysis

Qualitative data collected were subjected to descriptive statistics such as percentages and averages, while the data quantitative (economics) traits were analyzed through the use of Analysis of Variance (ANOVA) technique and correlation analysis based on the SPSS II programme (Hedderson, 1991).

RESULTS AND DISCUSSION

Morphological characteristics

Table 1: Percentage of some qualitative characteristics of pigeons: on-farm (n=300)

Traits		Okpokwu		Katsina-Ala		vandeikya		Cumulative	
		Number of observation	% proportion	Number of observation	% proportion	Number of observation	% proportion	Number of observation	% proportion
Plumage	**colour**								
	Ash	20.00	16.67	22.00	18.33	20.00	16.67	62.00	17.22
	Ash/brown	02.00	01.67	02.00	01.67	02.00	01.67	06.00	01.67
	Ash/black	03.00	02.50	04.00	03.33	02.00	01.67	09.00	02.50
	Ash/purple	06.00	05.00	05.00	04.17	07.00	05.83	18.00	05.00
	Ash/white	02.00	01.67	02.00	01.67	02.00	01.67	06.00	01.67
	Black	14.00	11.67	14.00	11.67	16.00	13.33	44.00	12.22
	Black/white	04.00	03.33	06.00	05.00	02.00	01.67	12.00	O3.33
	Black/brown	05.00	04.17	02.00	01.67	02.00	01.67	09.00	02.50
	Black/grey	03.00	02.50	02.00	01.67	02.00	01.67	07.00	01.94
	Brown	14.00	11.67	17.00	14.17	15.00	12.50	46.00	12.78
	Brown/white	03.00	02.50	04.00	03.33	04.00	03.33	11.00	03.06
	Brown/black	03.00	02.50	02.00	01.67	02.00	01.67	07.00	01.94
	Grey	04.00	03.33	06.00	05.00	06.00	05.00	16.00	04.44
	Grizzle	02.00	01.67	02.00	01.67	02.00	01.67	06.00	01.67
	Pied	05.00	04.17	04.00	03.33	06.00	05.00	15.00	04.17
	Recessive red	05.00	04.17	02.00	01.67	04.00	03.33	11.00	03.06
	Splash	02.00	01.67	02.00	01.67	02.00	01.67	06.00	01.67
	White	15.00	12.50	15.00	12.50	14.00	11.67	44.00	12.22
	White/brown	04.00	03.33	02.00	01.67	03.00	02.50	`09.00	02.50
	White/black	04.00	03.33	05.00	04.17	07.00	05.83	16.00	04.44
	Sub total	120	100	120	100	120	100	360	100
Shank	**Colour**								
	Pink	114.00	95.00	110.00	91.67	114.00	95.00	338	93.89
	Black	06.00	05.00	10.00	08.33	06.00	05.00	22	06.11
	Sub total	120	100	120	100	120	100	360	100
Beak	**Colour**								
	Grey	104.00	86.67	103.00	85.83	106.00	88.33	313	86.94
	White	16.00	13.33	17.00	14.17	14.00	11.67	47	13.06
	Sub total	120	100	120	100	120	100	360	100
Shank	**Type**								
	Feathered	63.00	52.50	70.00	58.33	67.00	55.83	200	55.56
	Bared (clean)	57.00	47.50	50.00	41.67	53.00	44.17	160	44.44
	Sub total	120	100	120	100	120	100	360	100

Quantitative traits

Body weight

The mature body weight of domestic pigeon in Benue state obtained from On-farm survey is presented in Table 2. The mature body weight for the male ranged from 324.58g to 327.86g with an overall mean of 326.30±1.69g. The female mature body weight ranged from 310.44g to 313.94g with an overall mean of 312.25±1.83g which was significantly lower (P<0.05) than the male body weight.

Table 2: Body weight of mature domestic pigeons of benue state (N=300)

L.G.A	Parameters	
	Male	Female
Okpokwu	326.46±1.77[a]	313.94±1.88[a]
Katsina-Ala	324.58±1.75[b]	310.44±1.83[b]
Vandeikya	327.86±1.55[a]	312.36±1.79[a]
Overall mean	**326.30±1.06[a]**	**312.25±1.15[b]**

ab= mean within column and row with different superscripts are statistically (P<0.05) different

On-farm plumage and other body colourations

Plumage colour and pattern, skin colour, shank colour, feet feathering, naked neck and comb type are inherited by single pairs of genes (Nesheim *et al*., 1979 and Ensminger, 1992).

In this study, diverse plumage colourations have been observed within and between Local Government Areas. The varied plumage colourations of the domestic pigeons of Benue state makes it difficult to conform to a particular colour pattern that can reproduce true to type. The multiplicity of plumage colouration of domestic pigeon ranged from those that are completely ash, brown, black, white, gray, grizzle to pied, which are the commonly seen colours. The rarer tan laced and many more that are difficult to describe were observed to be restricted to particular body parts especially the neck region with varying number of iridescent feathers. Similar observations were reported by Wilmer (1997), Link (2008) and Mosca (2003). The domestic pigeons of Benue State have Ash (16.94%) as the dominant plumage colour followed by brown, (12.78%), black (12.22%) and white (12.22%) in that order. Other works by Mosca (2003) and Adediran (2008) reported Ash colours as the most common plumage colour. Wilmer (1997), Mosca (2003) and Link (2008) however, reported brown, black and white as common colours. The wide range of colours indicate that deliberate selection had not been carried out for a particular colour pattern (Nwosu *et al*., 1985).

The pink colouration of the shank dominates over grayish black in the domestic pigeons surveyed. Similar observation (Fig 1 – Fig 7) has been reported earlier (Levi, 1977; Jahan, 2008; Rock pigeon, 2008). Adediran (2009) reported red colour as the dominant shank colour in the Benue pigeon population. The variation in shank colours may be probably due to a particular gene prevailing in the population of domestic pigeons in Benue state and may not have been influenced by the scavenging feed resources or feed supplements. Adediran (2008) have indicated that the domestic pigeons of Benue state have black beak colour predominantly. In the current study, grayish colour was greater in proportion than white colours, this variation is due to the age of the birds.

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

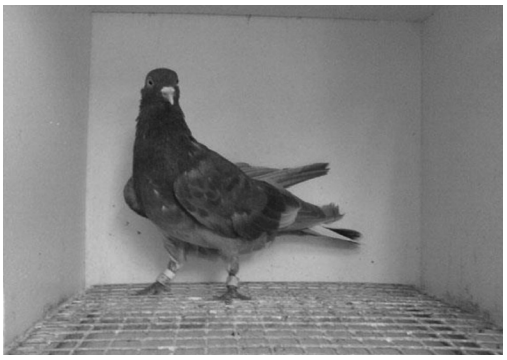

Fig. 6

Fig. 7

This observation is in agreement with the report by Levi (1977), Jahan (2008) and Gibbs (2008) which showed grayish beak colour in young pigeon and white in adults.

About 56% of the pigeons surveyed had muffed feet (feathered feet). This is in consonnance with Adediran (2009) which gave higher proportion to muffed feet (feathered-feeted) in the pigeon population of Benue State. Other reports (Mosca, 2003 and Rock pigeon, 2008) also showed that some pigeons have "stocking" that is, are heavily muffed. The shank type which showed considerable variation may be used as identification character for strains of pigeons.

On-farm quantitative traits of domestic pigeons in benue state

Body weight and linear body parameters

The overall mean weight of 326.63±1.69 for male and 312.25±1.83 for female pigeons kept on semi-intensive system is slightly lower than the overall mean adult weight of 345.62±1.19g reported by Khargharia *et al* .(2001), the 346.22±4.35g for males and 301.91±4.35g for females reported by Adediran (2009). Other authors reported 556.7g to 647.6g (Mignon *et al.*, 2000), 450g- 500g (Jahan, 2008 and Holderread, 2008) for medium breeds and 1000g (CACC 1984; NRC, 1991 and Mosca, 1997) for heavy breed of pigeons. In general, the domestic pigeons of Benue state appear to be smaller in sizes than those in the southern state of Nigeria as reported by Adenowo *et al*. (1999). The most probable explanation for the differences in average mature body weight in this study and previously reported values could be differences in environmental conditions and management systems. Environment plays a crucial role in the phenotypic expression of an individual (Gueye *et al.,* 1998 and Msoffe *et al*., 2001). However, the present values are higher than the range of 250g-300g adult weight reported by Jahan (2008) for light breeds and lower than the value for heavy breeds, 1000g (CACC 1984), hence, the domestic pigeon of Benue state could be classified on the basis of body weight as medium breeds.

The mean body length of 23.38±0.04cm reported in the present study is agreement with the mean body length reported by Adediran (2009) for pigeons in Benue State of Nigeria but higher than the value of 14.70±1.09cm reported by Adenowo *et al*. (1999) for pigeons in the south-west region of Nigeria. Butler (2008) gave a range of 15cm to 120cm for body length in domestic pigeons. The shank length of 3.50±0.03cm as reported in this study is similar to 3.83±0.04cm reported by Adenowo *et al*. (1999) and 3.33±0.10cm reported by Adediran (2009).

Adenowo *et al*. (1999) reported a value of 1.57±0.08cm beak length in pigeons in the south-west region of Nigeria which is lower than the value of 2.13±0.01cm reported in this study. The present observation is however, in agreement with the report of Adediran (2009), which gave a value of 2.06±0.03cm as beak length for domestic pigeons in Benue state. The similarities in body measurements of the domestic pigeons in the present studty with the reported

values of Adediran (2009) which are slightly different from the reports of Adenowo *et al*.(1999) may indicate that Benue pigeons while being similar are different from those from the south-west region. This difference could be due either to environmental differences (management, nutrition etc) or strain/variety differences.

CONCLUSION

In terms of morphological traits the pigeons demonstrated a great deal of variations and complexities in plumage, shank and beak colourations. The variations observed in other quantitative traits such as linear body measurements (body, shank and beak lengths breast girth and bird height) revealed no significant difference ((P>0.05) between pigeons in different parts of Benue State thus demonstrating the similarities of pigeons in Benue State.

RECOMMONDATIONS

From the findings of this research work, it could be recommended that:

(i) Farmers should be encouraged to improve on their management techniques by deliberate and sustainable improvement programmes adopted for pigeon farmers in Benue State. Given such attention the gains could be great.

(ii) Proper housing for domestic pigeons should be adopted by pigeon's farmers.

CONFLICT OF INTEREST

No conflict of interest among researchers.

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