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Characteristics of Indigenous Ducks and Their Production System in Nigeria: A Review

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ABSTRACT

Indigenous ducks are important biodiversity resources and genetic reservoirs needed for mitigating future challenges of food insecurity even though they are highly prejudiced in some parts of Nigeria. They can compare favourably with chickens to produce meat and egg, can adapt to different climatic conditions since raising them does not require elaborate houses. These ducks are known for their high hatching rate that is higher than any other local poultry species and also have the potential to perform better under improved management systems. Average body weight of 2.7 and 1.6 kg have been reported for drakes and females respectively, egg weight of about 50-60 g have equally been reported. Each duck can lay between 60-80 eggs annually under scavenging conditions, while meat from duck is rich in unsaturated fatty acids which are advantageous for human health. Wide variations in phenotypic traits and also high genetic diversity exist among ducks. Thus the findings of this paper suggest that the genetic makeup of these ducks have not been altered through selective breeding therefore, their genetic improvement and conservation is highly essential towards achieving food security.

Key words: Blood markers, Conservation, Genetic improvement, Poultry, Productive outcomes.

Indigenous poultry breeds are vital genetic sources for protecting genetic diversity and introducing key economic traits (Seo *et al*. 2016). Rapid industrialization during the last years have led to boom in exotic poultry breeds as compared with local breeds and this has led to a decrease in the performance and productivity of local breeds, decline in its population size and extinction of a few breeds with a resultant decline in genetic diversity (Seo *et al.* 2016). The global population of duck has been put at 1.24 trillion with Asia being the highest producer (Ismoyowati and Sumarmono, 2019). Similarly in Nigeria, duck population has been estimated to be about 9,553,911(NBS, 2012) and they have been found in all agro-ecological zones of Nigeria (Oguntunji and Ayorinde, 2015b). Despite these numbers, duck production in Nigeria has been very poor and these ducks are on the verge of going extinct because they are prejudiced poultry species in regions where they are found (Oluyemi and Ologhobo, 1997). They are reared traditionally in an unrestrained mating system thereby resulting in the genetic dilution of indigenous ducks (Muzani *et al*. 2005). Improvements in duck rearing methods are necessary and this entails a good understanding of its prevailing production environment, morpho-physiological and genetic characteristics, with a view to identify intervention needs (Yakubu 2011). To surmount such situations, FAO (2010) recommended the establishment of conservation programmes for the preservation of animal genetic resources in different regions of the world through the identification, characterization and conservation of local livestock to guarantee food security and meet future animal production needs in Nigeria and Africa at large (Yunusa *et al*. 2013). Characterization of Farm Animal Genetic Resources (FAnGR) includes the identification, description and documentation of any breed under natural habitats and production systems to which they are adapted or not adapted to (Gizaw *et al*. 2011). This equally entails a definition of the genetic potentials of an animal species or breed, which has a one-of-a-kind genetic distinctiveness (Rege and Lipner, 1992), its population size, morphological description, uses, breeding and production systems, population tendencies, depiction of the environment were they are prevalent, pointers of performance levels such as meat, growth, egg and the genetic uniqueness of the animal (Weigend and Romanov, 2002). Hence this paper focuses on the characteristics of indigenous ducks and their production system in Nigeria.

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Breeds of duck reared in Nigeria

The Muscovy duck (*Cairina moschata*) is the most dominant breed of duck reared in Nigeria (Kadurumba *et al*. 2019) (Table 1). Muscovy ducks are surely identified by means of the fleshy reddish outgrowths around the eyes and bill (Manuel 2008). The ducks could be multi-coloured, white, black and black and white in colour (Raji *et al*. 2009) and are predominantly found in southern Nigeria (Ikani 2003). Muscovy ducks are specifically equipped for scavenging systems because of their top notch foraging and incubation behaviour as well as high tolerance to warm environments (Raji *et al*. 2009). These local ducks have a fast growth rate, high dressed weight of drakes; they are tougher and hardier to diseases and environmental perils than chickens (Duru *et al*. 2006). The eggs of these Muscovy ducks are rarely consumed or sold by farmers rather the eggs are primarily used for breeding purposes. They are good mothers and under scavenging, conditions can lay an average of 60-80 eggs yearly (Ikani 2003). Their existence is threatened due to wrong cultural beliefs, which depicts ducks as mystique birds that do not require serious management attention. Similarly, the Khaki Campbell breed found mostly in research farms is the second most popular breed of duck in Nigeria and though they are not valued for their meat, they still lay up to 300 eggs per annum if properly housed (Ikani 2003).

Duck housing

Rearing ducks does not require complicated houses rather as an alternative, petite spaces are needed and these ducks can be raised in small sheds at night time and released at day time. Ducks are super fliers and usually, their wings are clipped to control their movement. In south-eastern Nigeria, they are basically kept on free-range and backyard premises and local myths have it that indigenous ducks will perform poorly or maybe die if restricted or reared in an intensive system, thus there is often a low level of survivability to maturity among ducks. They adapt and perform better in hot environments than chickens (Raji *et al*. 2009), thus they can be raised in low, high, wet and/or dry land (Ogundele 1991). However, the dangers of the scavenging system are that mortality is high and productivity is low (Oguntunji and Ayorinde, 2015b).

Duck feeding system

The scavenging system of duck production is the predominant form of duck farming in developing countries and it accounts for the majority of ducks raised particularly in Nigeria (Ogah and Momoh, 2013). Under this system, flocks comprise 5-20 ducks which are allowed to scavenge at daytime and then return home to the village yards in the evenings on their own. Ducks when raised intensively and fed balanced rations, have high feed wastage, due to the nature of their bill which results to less efficient use of feed by ducks and thus their meat and eggs becomes more expensive than chicken meat and egg (Etuk *et al*., 2006). Again, while management systems and wallowing did not affect growth performance parameters of Muscovy ducks raised till 20 weeks of age, intensive system with *ad libitum* feeding produced better egg qualities than a semi-intensive system with a restricted feeding regime (Etuk *et al*., 2012).

Health management of duck

The use of ethnoveterinary drugs (EVD) in treating duck ailments is very popular and a common practice amongst rural farmers prior to the introduction of orthodox medicine (Oguntunji and Ayorinde, 2015b). Plant parts typically used in the preparation of EVD are obtained locally and are reported to be very powerful in preventing and healing sick ducks. The use of traditional medicines in the treatment of livestock is very common amongst rural farmers owing to its low price, nearby availability, ease of use as it does not require modern technologies such as refrigeration (Mapiye *et al*. 2008). Although EVD is very widespread amongst duck farmers, there is need to conduct on-farm tests to authenticate their effectiveness as claimed by duck farmers so as to improve documentation, conservation, commercialization and wide use of EVDs with proven efficacy (Oguntunji *et al*., 2015). Some farmers do not help their sick birds due to ignorance about duck diseases and treatment and the non-availability of veterinarians while others slaughter and consume sick birds to prevent death, some sell-off sick ducks to avoid total loss of funds invested in duck production, while others use magical rings or clothes which they tie around the legs or wings of sick birds to heal them (Oguntunji *et al*., 2015).

Haematological and biochemical characteristics of ducks

Confirmation of haematological characteristics of an animal is essential for enhancing their productiveness (Okeudo *et al*., 2003). Haematological researches are typically done to generate diagnostic baselines of blood characteristics for

Table 1: Characteristics of some adult indigenous duck breeds.

Breed	Feather colour	Body weight (kg)		Egg colour
		Drake (5-12 mnths)	Duck (5-12 mnths)	
Pekin	White	4.1	3.6	White/blue green
Muscovy	Black/white	4.5	3.0	White/green cream
Indian runner	White	2.0	1.8	White/creamy white
Khaki campbell	Brown/khaki	2.0	1.8	White
Mallard	Brown/khaki	1.4	1.1	Blue green/mottled

Source: Hahn *et al*. (1995).

various livestock (Ologbose and Dick, 2021). Haematological constituents indicate the physiological response of the animal to its environments and for this reason functions as a suitable tool for tracking the health of any animal (Pascalonpekelniczky *et al*., 1994). Reports on haematological standards used to regulate the health status of such animals like the indigenous ducks are limited, even though there are many reports on the haematological values of exotic ducks (Pascalonpekelniczky *et al.* 1994). Nigerian Muscovy ducks have been reported to have lesser erythrocyte and higher leukocyte counts than the values reported for ducks in the temperate zone but at the same time, these values were reported to be higher than erythrocyte count for Nigerian domestic chickens (Yakubu 2013). Again, higher lymphocyte counts (72.75%) and lower basophil counts (0.75%) have been recorded for drakes (Sulaiman *et al.* 2010). Similarly, Okeudo *et al*. (2003) reported PCV values of 46.00% and 41.17% and haemoglobin concentration (HBC) values of 15.67% and 14.17% for drakes and ducks, respectively (Table 2). The mean erythrocyte sedimentation rate (ESR) for drakes and ducks were 1.63±0.35 and 1.95±0.30 mm/hr, respectively. Better nutrition, housing, health, system of rearing and age of the ducks have been reported to influence haematological values of ducks (Okeudo *et al*. 2003), even though some haematological parameters did not show any difference amongst young and adult ducks in Nigerian (Olayemi *et al*. 2003).

Sexual dimorphism of morphometric traits among indigenous ducks

The disparity in body measurements of sexually mature beings is termed as sexual dimorphism and this has been studied in a variety of animals (Oguntunji and Ayorinde, 2014) with dimorphism always superior in males. Sexual dimorphism occurs as a result variances in the levels of male sex hormone which results in better muscle development in males than in females (Semakula *et al*. 2011). Furthermore, sexual dimorphism has been attributed to the factor that produces intersexual differences in growth rate, which can lead to distinctions in growth hormone concentrations or adjustments in allocating energy between growth and reproduction (John-Alder *et al*. 2007). A study on Nigerian Muscovy ducks (Table 3) showed drakes as having significantly better values for all morphometric traits measured (Oguntunji and Ayorinde, 2014). Similarly, Ogah and Kabir (2013) reported male ducklings as having terrific values for body weight (2691.60 g) than females (1504 g) at 20 weeks of age and these variations reported for all growth traits in favour of males could be linked to the hormones which affects growth differently in either sex (Ajayi *et al.* 2012).

Carcass and meat characteristics

Drakes have been reported to performed better for carcass traits than the ducks and these could be as a result of variances in the levels of the male reproductive hormone which accounts for better muscle development in males. Various researchers (Kolluri *et al*. 2015) equally reported higher values in drakes for dressed carcass and cut-out parts. More so, duck meat consists of large amounts of unsaturated fatty acids, approximately 20% crude protein and 2% fat such that consumer preference for such healthy meat has been on the rise (MIFFAF 2013). Muscovy ducks are heavy breeds specifically raised to produce meat and the meat has an alluring look with yellow creamy and firm skin and used to make special delicacy (Szasz 2003) (Table 4).

Table 2: Haematological and bochemical profiles of indigen duck breeds.

Parameters	Muscovy	Mallard
WBC ($\times10^9$/L)	12.21±7.17	12.31±0.91
Red blood cell ($\times10^{12}$/L)	4.62±0.24	4.43±0.27
Hemoglobin (g/dl)	10.35±0.52	10.10±0.62
Packed cell volume (%)	31.00±1.56	31.167±1.26
Platelet ($\times10^9$/L)	249.41±4.91	257.91±7.91
Albumin (g/l)	25.66±1.44	30.00±0.84
Urea (mol/l)	2.78±0.19	3.29±0.42
Creatinine (mol/l)	130.75±3.77b	141.16±3.27
Glucose (mol/l)	5.87±0.50	6.61±0.35
Globulin (g/l)	21.91±1.40	23.41±1.22
Triglyceride (g/l)	1.42±0.09	1.62±0.07

Source: Ologbose and Dick (2021).

Table 3: Sexual dimorphism among adult male and female Muscovy ducks.

Trait	Sex (5-12 months)	Mean ± SD
Body weight (kg)	Male	2.64±0.37[a]
	Female	1.60±0.25[b]
Body length (cm)	Male	30.69±2.87[a]
	Female	23.96±2.43[b]
Wing length (cm)	Male	35.23±3.80[a]
	Female	26.71±2.86[b]
Shank length (cm)	Male	5.71±0.67[a]
	Female	4.57±0.56[b]
Thigh length (cm)	Male	12.14±1.24[a]
	Female	9.90±1.21[b]
Bill length (cm)	Male	5.94±0.54[a]
	Female	5.03±0.42[b]
Total leg length (cm)	Male	17.83±1.37[a]
	Female	14.55±1.59[b]

Source: Oguntunji and ayorinde (2014).

Table 4: Aspect of meat quality characteristics of ducks, broilers and local chicken.

Meat qualities	Ducks	Local chicken	Broiler chicken
Appearance	7.2	8.2	6.5
Juiciness	6.8	7.2	8.7
Tenderness	6.3	5.6	8.5
Flavor	8.2	8.8	6.9
Overall	9.0	9.5	7.1

Source: Oluyemi and Ologhobo (1997).

Duck meat appears darker than other poultry meat due to its high myoglobin and iron contents. People consume duck meat because of its taste and its high nutritional value. It has an excellent composition of essential amino acids and fatty acids as well as greater breast muscle content, high meatiness and lower fat content (Wawro *et al*. 2004). The economic and nutritional benefits of Muscovy ducks could consequently help alleviate protein shortfalls in Nigeria (Ige *et al.* 2014). However, the shortage of ducks, incapability to slaughter the live duck, ambiguity and worry associated with the demand and sale of duck and duck products in Nigeria, hampers the acceptance, preferences and consumption of duck meat (Oguntunji and Ayorinde, 2015b).

Reproductive characteristics of ducks

Ducks are very productive and may lay between 60 and 80 eggs consistently per annum under scavenging setting and approximately 100 to 125 eggs yearly when reared under intensive management systems (Ikani 2003). They equally come into lay significantly earlier (203-207 days) and lay heavier eggs (76 g) as compare to chicken eggs that weigh 41 g on average (Etuk *et al*. 2011). Ogah and Musa (2011) reported body weight at the first egg of 1497 g and 1579 g, at an age of 315 and 332 days, with an average range of 6.30 and 5.60 eggs at point of lay and mean egg weight of 51 g and 53 g, respectively for Muscovy ducks in the guinea and rainforest zones of Nigeria. The disparities could be as a result of environmental alterations predominant in both zones. Similarly, age at first egg has been recorded to range between 6-8 months (Oguntunji *et al.*, 2015). Comparatively, Nigerian ducks compete favourably with ducks from other countries. In a study of Indian ducks, Banerjee (2013) reported the average age at first egg to be 181 days and the age at sexual maturity to be 348 days, while FAO (2009a) reported that an average duck has about 2 to 4 production cycles per year and an average of 13-15 eggs per cycle. Similarly, Banga-Mboko *et al.* (2007) reported a clutch size of 14.6 eggs in Congo-Brazzaville, while Nickolova (2004) reported heavier eggs (78.36 g - 85.32 g) for Muscovy ducks in Bulgaria. These variances in egg weight may be due to environmental settings (Yakubu 2013). Another characteristic of the Muscovy ducks is their readiness to hatch eggs they lay and any other egg set under it. This is advantageous for smallholder farmers with different flocks of birds (Duru *et al*. 2006). Ducks are famous for their high egg productivity and their high hatching rate as reported by Oguntunji *et al*. (2015) and who reported a high hatching rate of above 70% amongst ducks reared in Southwest Nigeria. In a contrast report, Chia and Momoh (2012) reported a reduced hatching rate of 57% for ducks in North-central Nigeria and this decrease could be as a result of excessive ambient temperature which have been reported to distort metabolism all through embryonic development stage and this is due to fluctuations in the chemical constituent of duck eggs under high temperature. Furthermore, female ducks have an average of 2.0 reproductive cycles in a yearly while clutch size of 8-30, eggs have been reported among Nigerian ducks (Oguntunji *et al*. 2015).

Morphological characterization in ducks

Information about growth traits of the indigenous flock is essential to demonstrate that genetic differences exist among populations to a certain extent (Yakubu *et al.* 2009). Multi-coloured, white, black and black and white phenotypes have been reported for Muscovy ducks in northern Nigeria (Yakubu *et al*. 2009). Similarly, Oguntunji and Ayorinde (2015a) discovered four shank colours of yellow, black, slate and ash amongst ducks of Western Nigeria of which the yellow pigmentation was predominant. The wide variation in plumage colour observed amongst duck populations has been attributed to adaptability and survival characteristics (Odubote 1994) and this suggests that the genetic makeup of ducks in Nigeria have not been altered through controlled breeding. This equally implies that significant chances exist for their improvement and one of such opportunities is to drive selection towards particular plumage colours (Dana *et al*. 2010) while considering the rapport between polygenetic effects that exist between various traits (Toth *et al.* 2006). Chia and Momoh (2012) reported predominant shank colour as black-yellow pigmentation, whereas, red coloured caruncle, black coloured bill and bean, brown coloured eyes were reported as predominant among Nigeria ducks. Although caruncle colouration was red, it was bright and distinguished in males but small and dull in females (Oguntunji and Ayorinde, 2015a).

Genetic diversity studies of Nigerian ducks

Polymorphisms are crucial components for the differentiation of populations and individuals. Not much work has been done in this area however Adebambo *et al.* (2017), while assessing genetic diversity and phylogeographic structure of ducks acknowledged seven haplotypes and 70 polymorphic sites respectively. The phylogeny discovered two divergent haplotype clades (Table 5), suggesting two potential maternal lineages in the Nigerian duck population, with the most commonly shared haplotype belonging to Mallard ducks. Genetic variant within and between the populations was reported as 63 and 37% of the total genetic variation and high nucleotide diversity, suggesting high genetic diversity (Adebambo *et al*. 2017). Furthermore, Nigerian indigenous ducks have been described as having high similarity value of 0.86% and small genetic distance of 0.14, suggesting a common ancestry and have evolved minute adaptive variation as a result of the distribution (Ogah and Momoh, 2014). In another study, Ogah *et al*. (2017) reported five haplotypes from the indigenous duck population, while the median-joining tree indicated that the population shared similar maternal inheritance with a unique clustering outline between the Nigeria Muscovy duck and other domestic duck haplotypes. There was also differentiation and breed/ population-specific distribution of duck lineages suggesting high variability among the Muscovy duck with no matrilineal linkage with other duck species.

Table 5: Genetic diversity indices of Nigerian duck population.

Parameters	North	South	Overall
Haplotypes	6	2	7
Haplotypic diversity	0.55±0.06	0.05±0.05	0.38±0.06
Nucleotide diversity	0.45±0.22	0.003±0.004	0.315±0.155
Sum of square frequencies	0.46	0.95	0.624
Mean pairwise differences	31.78±14.12	0.20±0.25	22.33±9.93
Number of polymorphic sites	67	4	70
Number of substitutions	68	4	72
Nucleotide composition (%)			
Cytosine	31.49	28.57	30.15
Thymine	21.73	25.79	23.60
Adenine	32.22	32.79	32.48
Guanine	14.56	12.86	13.78

Source: Adebambo *et al.* (2017).

CONCLUSION

Ducks are non-popular in Nigeria and their production, improvement and conservation have been overlooked due to myths, legends and taboos associated with its production. Within the context of their respective production systems, it is believed that these indigenous ducks, if improved, will compete with improved breeds, with regard to productivity and perform better in terms of disease tolerance and resistance. This will help develop healthy competition with the chicken industry, as well as mitigate the challenges of food insecurity.

Conflict of interest: None.

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