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Original Article

Variation in Some Qualitative Traits of the Indigenous Guinea Fowls in Northern Ghana

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ABSTRACT

The aim of this study was to characterize the local guinea fowls of the Northern Ghana based on some qualitative traits. Three hundred local guinea fowls randomly selected from 204 farmers purposively sampled from the Northern (NR), Upper East (UE), Upper West (UW) and Volta regions (VR) were scored for phenotypic characteristics (variation in plumage and shank colour, helmet colours, ear lobe colour, helmet shape, skin colour, eye colour and ptilopody). Data obtained was analyzed using descriptive statistics in SPSS. Nine colour variations were identified: pearl grey, pearl grey pied, bronze, brown, coral blue, ash, brown pied, bronze pied and white. Birds with pearl grey colour were the majority (43.7%) whereas the least were birds with the brown pied colour (0.7%). Helmet shapes identified were single (42.7%), slanted backwards (34.00%) and erect (23.3%). Earlobe colours identified were white (94.7%), bluish (2.7%) and spotted (2.7%). Shank colours identified were orange (29.00%), black (33.70%), and yellow (0.30%) and white (37.0%). Skin colours identified were dark (40.00%), pale red (19.70%), yellow (18.30%) and red (22.00%). Eye colours identified were white (1%), brown (27.3%), black (71.3%) and pink (0.3%). Skeletal structures identified were normal (94.4%), creeper (5.1%) and polydactyl (0.5%). Helmet colours include purple (28%), brown (41%), black (24.7%) and red (6.3%). The population of Ghanaian local guinea fowls studied showed heterogeneity in the phenotypic traits considered and therefore present a genetic pool from which selection could be made. These findings will help both farmers and breeders to produce guinea fowls with specific phenotypic traits to meet consumer preferences.

Keywords: local guinea fowls, qualitative traits, variation, heterogeneity.

INTRODUCTION

The guinea fowl (*Numida meleagris)* is believed to originate from Africa where today some still remain in the wild. In Ghana, they are found mainly in the Northern sector particularly Northern (NR), Upper East (UE) and Upper West (UW) regions, where their

productions over the years have assumed socio-cultural, economic and nutritional significance. They are raised traditionally under the free range system just as the local fowls (Dei and Karbo, 2004). Though kept mostly under the extensive system of housing, the guinea fowl being a hardy bird has been able to survive, adapt and produce in these areas. Guinea fowl production as a rural poultry enterprise has numerous potentials if properly kept and managed. Guinea fowls are a ready source of animal protein (meat and eggs) and income, helpful in social wealth generation, for welcoming of important guests, funerals, gifts, sacrifices, payments of dowries as well as manure for soil fertility amendments (Teye and Adam, 2000; Dei and Karbo, 2004). The lean meat produced by this bird with its characteristic flavour is relished by Ghanaians and can contribute substantially to supply the protein needs of the country. Mogre (2009) has suggested the need to study guinea fowl populations within the regions. Hence this study aims at providing literature on phenotypic characterization of local guinea fowls in the four regions within northern Ghana.

MATERIALS AND METHODS

Study Area

The survey was carried out from June 2011 to June 2012 in 10 districts randomly selected within the NR, UW, UE and northern Volta regions (VR) in the Guinea Savannah zone of Ghana. The zone constitutes about 63% of the land area in Ghana and lies between latitudes 8^0 30' N and 11^0 00'N of the equator and longitudes 2° 30′ W and 0° 30′E of the Greenwich Meridian. The climate is marked by one dry season (November to April or May) and one rainy season (June to October) with a yearly rainfall varying from 800 to 1000 mm and an average monthly temperature which varies between 26 and 28°C. Considerable number of guinea fowls is produced within this ecological zone in Ghana. According to Veterinary Services Directorate (VSD) (2010), out of a total of 2,574,996 guinea fowls recorded in Ghana, 1,414,649, 622,616, 59360 and 56, 076 were from the NR, UE, UW and VR respectively.

Sampling Procedure and Sample Size

Ten districts were randomly selected within the four regions. These are Tamale metropolis, Savelugu/Nanton and Tolon/Kumbungu districts in the NR, Nadowli, Wa East and Jirapa/Lambussie districts in the UW, Sandema, Bongo and Bolgatanga Municipal in the UE and Nkwanta north district in the VR. A total of 204 farmers were purposively sampled from the ten districts based on secondary information provided by the District Agricultural Production officers and Extension agents at the District Animal Production offices of the Ministry of Food and Agriculture (MOFA) in the districts. Farmers were chosen based on willingness to participate. (*Note: Communities selected never had any instance where exotic guinea fowls were introduced through past intervention programmes*). Each farmer identified for these investigations had a herd of at least 10 guinea fowls during the survey. Three hundred (300) mature local guinea fowls of at least six months of age and of both sexes were selected.

Qualitative (Phaneroptic) traits

The phaneroptic characters including plumage colour, shank colour, skin colour, eye colour, ear lobe colour, helmet shape and colour were determined by direct observation on each bird using Guinea fowl colour chart (GFIA, 2009) and colour patterns of other traits according to Mogre (2009).

Data Analysis

Data obtained was analyzed using descriptive statistics in SPSS Version 17. Results are presented in the form of tables, frequency and percentages.

RESULTS AND DISCUSSION

Qualitative Traits

The frequencies of the various colour variation patterns are presented in Table 1. Table 2 shows the colour variations and their frequencies of occurrence in the regions. Table 3 shows the frequencies of skin colours, shank colours, eye colours, earlobe colours, helmet shapes and helmet colours of the birds from the regions. Nine diverse plumage colours were observed among the local guinea fowls. The colour variations identified were Brown (Bn), White (W), Ash (A), Pearl grey (Pg), Coral blue (Cb), Brown pied (Bnp), Pearl grey pied (Pgp), Bronze pied (Brp) and Bronze (Br). Most of these findings closely agree with those of Mogre (2009) who found Pg, Pgp, Br, W, Bn, Cb and Brp. These variations form part of the twenty two (22) recognized colour variations reported by GFIA (2009).

Table 1: Frequencies of the nine Colour Patterns in the Guinea fowl

Colour variety	Number	Percentage (%)
Pearl Grey	131	43.7
Pearl Grey Pied	94	31.3
Bronze	7	2.3
White	37	12.3
Ash	3	1.0
Brown	15	5.0
Coral Blue	3	1.0
Bronze Pied	8	2.7
Brown pied	2	0.7
Total	300	100

The most frequently encountered colour pattern in the regions was the Pg (43.7%) whiles the least colour pattern was the Bp (0.7%). Pg, Pgp, Br, W and Br colour patterns were common in all the regions. Guinea fowls with Cb colour were only found in the NR whereas Brp colour was found only in NR and UW. Birds with A colour were only found in UE.

Table 2: Distribution of Colour Pattern in the Regions

Variety	NR (%)	UW (%)	UE (%)	VR (%)
Pearl grey	46.0	41.8	41.5	48
Pearl grey pied	33.6	37.8	17.9	30.2
Bronze	0.9	2.0	3.3	2.0
White	9.8	12.2	20.2	17.8
Ash	-	-	3.3	-
Brown	5.2	3.1	6.7	2.0
Coral blue	2.7	-	-	-
Brown pied	0.9	1.0	-	-
Bronze pied	0.9	2.0	6.7	-

According to the farmers, birds with the Pg, Pgp, W and Br colour patterns are relatively heavier than the others. As a result farmers and consumer are more interested in birds with such colour patterns. The findings concur with Guni and Katule (2013) that preference of people in the study area in Tanzania for black and multi-coloured plumage in chicken might also account for the predominant occurrence of the colours since plumage colour might influence consumer preference and utilization. Also in this study, the least colour patterns were Brp and A. In Nigeria, Ayorinde (2004) reported that although earlier publications stated that there were five different varieties of the domesticated helmeted guinea fowl based on plumage colour (Ogundipe, 1976; 1983), he observed that there are actually only four distinct varieties.

These include the P, B, W and Ayorinde *et al.*, (1989) also observed similar Pg, Pgp and A colour patterns except the B colour which is an added variety found in Nigeria flock. Singh and Sharma (2009) confirmed multiple colour patterns in Indian guinea fowl flocks. The Indian pattern common to this study were the Pg, Pgp and W. In all, more than one colour variety was observed in each district.

Cb was only identified in NR whiles Brp was only identified in NR and UW. The most common colour variety among the birds was the Pg (43.7%), followed by the Pgp (31.3%), W (13.3%), Bn (5.0%), Brp (2.7%), Br (2.3%), Cb (1.0%), A (1.0%) and the least was Brp (0.7%). The four most common patterns among the three districts were Pg, Pgp, Bn and W constituting (93.3%). However the Cb variety was only found in NR and not identified in the UE and VR. Bnp birds were found in the NR and UW.

Also, a bird was found in UE district only. No plumage dimorphism was observed in the guinea fowls found in this study. This agrees with Ayorinde (2004) that there is no striking plumage dimorphism in the guinea fowl whereas in some birds certain shapes, colours and sizes of feathers vary with sex as a result of gonadal hormones. Skin colour distributions were as follows: dark (40.00%), pale red (19.70%), yellow (18.30%) and red (22.00%). The colour distributions observed in this study can be explained by the findings of Ayorinde (2004) who reported that the skin of the White guinea fowl variety is light yellow to white depending on the amount of xanthophylls consumed while the skin of the other varieties is either gray or black due to a high melanin concentration.

Table 3: Frequencies of phaneroptic traits of guinea fowls in the regions

Trait		Number of birds	Percentage (%)
Skin Colours	Dark	120	40.0
	Pale red	59	19.7
	Yellow	55	18.3
	Red	66	22.0
Shank Colours	Orange	87	29.0
	Black	101	33.7
	Yellow	1	0.3
	White	111	37.0
Eye colours	White	3	1.0
	Brown	82	27.3
	Pink	1	0.3
	Black	214	71.3
Earlobe colours	White	284	94.7
	Bluish	8	2.7
	Spotted	8	2.7
Helmet colours	Purple	84	28.0
	Brown	123	41.0
	Black	74	24.7
	Red	19	6.3
Helmet shapes	Slanted backwards	102	34.0
	Erect	70	23.3
	Single	128	42.7
Skeleton structure	Normal	283	94.4
	Creeper	15	5.1
	Polydactyl	1	0.5

Shank colours ranged from orange (29.00%), black (33.70%), yellow (0.30%), and white (37.0%). More colour variations were found in this study than what was reported by Mogre (2009) who observed orange and black shank colours which cut across all guinea fowl colour varieties with some cases of a mixture of orange and black also encountered. The eye colours were White (1.00%), Brown (27.30%), Pink (0.300%) and Black being the dominant (71.30%). With regards to earlobe colour, birds with white earlobe colour were the majority

(94.70%). Other colours were bluish white (2.70%) and spotted (2.70%). Majority of the guinea fowls identified were the normal (94.4%). Others were the creeper (15%) and polydactyl (0.5%). The dominant helmet colour shown by guinea fowls was brown (41.00%) and the least was red (6.30%). Other colours exhibited by the birds sampled were purple (28.00%) and black (24.70%). The helmet shapes were single (42.70%), erect (23.30%) and slanted backwards (34.00%). Male guinea fowls had more pronounced helmet than the females. Helmet colours were purple, brown, black or red. Ayorinde (2004) reported that the most prominent feature of the head of both male and female helmeted guinea fowl is the median, caudal-dorsal bony process or helmet of the frontal bones. He indicated that the helmet is slightly longer (3.7 vs. 3.2 cm) and wider (2.2 vs. 2.0 cm) in the males than the females; and that although the size and shape of the head, helmet and wattle (3.1 vs. 2.5 cm) can be used to distinguish sexes within a flock by a trained person, there is need to pursue vigorously the search for more morphological features for sexual differentiation. The rather rare occurrence of guinea fowls with specific traits studied might be an indication of a negative selection against them and vice versa. Alternatively some of these traits may be controlled by genes which are rare mutants with recessive effects and with no selective advantage in the population as reported by Guni and Katule (2013) for the rare occurrence of frizzle chickens in a characterization study in Tanzania.

The results show that the local guinea fowls exhibits much heterogeneity in the phenotypic traits considered**.** They are generally known to be hardy and quite adapted to the local environment. However the degree of tolerance or susceptibility of individual birds to the stressful environment due to pattern in phenotypic characteristics is a subject for further studies (Egahi *et al.,* 2010). Since colour plays a role in the absorption and reflection of ultra violet radiation, birds with black phenotypic characteristics may be more susceptible to heat stress under intense solar radiation. Birds with white plumage characteristics on the other hand may be more tolerant under same conditions. According to Egahi *et al.*, (2010) selection of better performing animals to be parents of the future generation is the basic tool for animal improvement, and this is made possible due to measurable patterns in the animal population. Thus, the diversity in phenotypic characteristics in the population of guinea fowls studied present opportunity for selection. Such selection will be useful in the improvement of the local guinea fowl if one or more of the observed characteristics is/are positively correlated to traits of economic importance.

CONCLUSION AND RECOMMENDATION

The population of Ghanaian local guinea fowls studied showed heterogeneity in the phaneroptic traits considered and will serve as a source of genetic improvement of these traits in guinea fowls in Ghana. Further study is required to establish any positive relationship between the phenotypic traits and the desired metric traits. Also, consumer preferences for the observed phenotypic presentations vary across the country hence breeders may concentrate on consumer preferences in their locality to meet local demand.

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