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DISTRIBUTIONS OF QUALITATIVE TRAITS AMONG WEANER, YOUNG AND ADULT DONKEYS IN NORTHWEST NIGERIA

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ABSTRACT

A study was carried out in Kaduna, Kano, Kebbi, Katsina, Sokoto, Jigawa and Zamfara State to determine the relationship among Red (Auraki), Black (Duni), White (Fari), Brown (Idabari) and Brown-white (Idabari-fari) donkeys using their morphological traits. A total of 700 donkeys were used for the study. The morphological data were collected on hair type, coat colour, skin type, coat colour pattern, tail shape, eye colour and head profile. Data obtained were subjected to statistical analysis to determine the distribution of phenotypic traits across classes based on morphological traits. The distribution of the measured qualitative traits was assessed for significance using Chi-square analysis and computed based on pooled data among strains and age categories using the Frequency procedure of R statistical package. Significant variations were observed among morphological ($P<0.01$) traits. Most of the adult donkeys sampled had short and smooth hair type (90.00%), brown coat colour (88.57%), thick skin type (86.07%), solid coat colour pattern (99.64%), pendent tail shape (50.36%), black eye colour (94.64%) and straight head profile (92.86%). The majority of the young donkeys had short and smooth hair type (90.48%), brown coat colour (88.57%), thick skin type (91.90%), solid coat colour pattern (100.00%), high-set tail shape (51.90%), black eye colour (96.19%) and straight head profile (96.67%) and weaner donkeys which also had short and smooth hair type (40.47%), brown coat colour (87.62%), thin skin type (55.71%), solid coat colour pattern (99.05%), pendent tail shape (76.67%), black eye colour (96.67%) and straight head profile (66.67%) also showed similar trend in the distributions of morphological traits. Donkeys in North West Nigeria were mostly of solid coat colour pattern, short and smooth hair type, brown coat colour, thick skin type, pendent tail shape, black eye colour and straight head profile.

Keywords: Distribution, Qualitative traits, Weaner, Young, Adult & Donkeys.

INTRODUCTION

Morphological characters provide useful information used to detect genetic relationships of strains in different domesticated animal species (Herrera *et al*., 1996). Characterization of livestock genetic resources is the first step to sustainable use (Lanari *et al*., 2003). Despite the introduction of motorized transportation, donkeys remain an important means of transportation in the arid and semi-arid regions. Apart from use by nomads who are continuously seeking grazing and water, these animals are employed in transporting farm produce to local markets (Katsina, 1990). Evidence from mitochondrial DNA studies has confirmed that the present day domestic donkey originated in Africa rather than in Asia (Beja-Pereira *et al*., 2004). It is therefore believed that donkey is the

only domestic animal of African origin. The domestication events of donkey were based on two mitochondrial lineages. The first lineage was closely linked to the Nubian wild ass (*Equus asinus africanus)*. The second lineage showed some similarities to the Somali wild ass (*Equus casinos somaliensis*) (Beja-Pereira *et al*., 2004). Donkeys are kept everywhere in Northern Nigeria, with a broad distinction between their importance and ubiquity in the Northwest and Northeastern parts of the country. There are four major strains of donkeys in Northwest Nigeria which are clearly identified by their coat colours namely Auraki (Red), Fari (White), Duni (Black) and Idabari (Brown) (Blench *et al*., 1990). The coat colour is sometimes used as a determining factor for the price of a donkey in most parts of Northwest Nigeria (Blench *et al*., 1990). This study is aimed at classifying donkey strains into different genetic groups using qualitative traits.

MATERIALS AND METHODS

Experimental Location

The field research was conducted in the semi-arid zone of Nigeria include Sokoto, Jigawa, Kano, Katsina, Kaduna, Zamfara and Kebbi States respectively. The semi-arid zone of Nigeria starts from about 11ºN latitude and ends at the Nigeria-Niger frontier. It encompasses the Sudan and Sahel Savanna and part of the Northern Guinea Savanna. The mean annual temperature runs between 26 and 28ºC. There is a single rainy season from May to October, with mean annual rainfall ranging from 1016mm in the wettest parts to less than 508mm in the driest parts. The length of growing period is about 100-150 days which makes it possible to cultivate a wide variety of crops (Ogungbile *et al*., 1998). The semi-arid zone has a land mass of 113,530km^2 and a population of over 35 million people (NPC, 2006). The major inhabitants of this area are Hausa and Fulani who are predominantly mixed crop-livestock farmers and livestock herders respectively.

Sampling Size and Sampling Structure

Donkeys were sampled using a random sampling method to determine their morphological traits within a given senatorial zone. A total of seven hundred (700) donkeys were used for this study. Thirty-three (33) donkeys were randomly selected from two different senatorial areas while thirty-four (34) donkeys was also selected in third senatorial area in that same State but randomly. A total of one hundred (100) donkeys, that is, weaners, young and adults were observed and measured per each of the seven (7) states.

The weaners, young and adults, of both sexes were observed and measured in almost equal number. Thirty-three (33) weaners, young and adults, males and females were used in two (2) senatorial zones. Thirty-four (34) donkeys were however, observed in the third senatorial areas to make a total of 100 donkeys to be sampled per State. The age of the donkeys was determined using teeth count (FAO, 2003) in combination with the information provided by the donkey owners.

Data Collection

Morphological traits observed

The morphological characters that were observed on each animal include: hair type (HT), skin type (ST), coat colour (CC), coat colour pattern (CCP), tail shape (TS), eye colour (EC) and head profile (HP).

Hair Type: This was observed and categorized into Short-Smooth, Short-Rough and Long-Curly (woolly) hair types

Coat Colour Pattern: This was observed and categorized as solid and patched.

Skin Type: This was observed and categorized as thick and thin.

Coat colour: This was observed and categorized as rust or red, dark brown to black, pale cream to white and grey to light medium brown

Tail shape: This was observed and categorized as pendent and high-set.

Eye colour: This was observed and categorized as black, brown and white.

Head profile: This was observed and categorized as sub-concave and straight.

Statistical analysis

The distribution of the measured qualitative traits was assessed for significance using Chi-square analysis and computed based on pooled data within strain using the Frequency procedure of R 2.13.0 statistical package.

$Y_{ijkl}=\mu + A_i + V_j + \varepsilon_{ijk}$

Where Y_{ijk} = observation of each trait of the ijk^{th} Animal.

μ= population mean

A_i= effect of the i^{th} age (weaners, young and adults)

V_j= fixed effect of j^{th} strain (Auraki, Fari, Duni and Idabari)

ε_{ijk}= residual error

RESULTS AND DISCUSSIONS

The distributions of morphological traits in weaner donkeys are shown in Table 1. Donkeys with short and smooth hair type has high value (40.47%) compared to short and rough (31.43%) and long and curly (28.10%) across the locations were donkeys were sampled. Most of donkeys sampled had brown skin colour (87.62%). Skin type was however predominantly thin (55.71%). Solid coat colour were (99.05%) more predominant than patches (0.95%). Pendent tail shape (76.67%) was higher and black eye colour (96.67%) was more predominant over brown (3.33%). Most of the donkeys sampled had straight head profile (66.67%) than sub-concave shape (33.33%). The distribution of coat colour type variants obtained in the present study agreed with the findings of Blench *et al*., (1990) that Idabari strain (brown donkey) is the most popular donkey strain among small holder farmers and was reported to costs higher than other strains.

Distributions of morphological traits of young donkeys are presented in Table 2. Significant ($p<0.01$) differences existed among hair type variants. Short and smooth was the most (90.48%) predominant hair type across all the locations where donkeys were sampled. Donkeys with short and rough (8.57%) hair type were however higher than long and curly (0.95%). Majority of the donkeys sampled had brown coat colour (88.57%). The thick skin type was predominantly (91.90%). Donkeys with solid coat colour pattern were (100%) observed while the ones with patches were not observed in the sampling location. Donkeys with high-set tail shape were higher (51.90%) than pendent (48.10%). Black eye colour (96.19%) was predominant compared to other colours. Most of the donkeys sampled had straight (96.67%) head profile. Donkeys with solid coat colour pattern were more predominant and showed high level of reproducibility (100%). This is similar with the trend observed in the study of (Blench, 1990) who reported the occurrence of solid coat colour pattern over patched coat colour. However, the preponderance of solid coat colour pattern over patched might be attributed to the genetic factors.

Table 1: Distributions of morphological traits of weaner donkeys

Morphological traits	Frequency	Percent	DF	Chi-square	LOS
Hair type					
Long and curly	59	28.10	2	5.17	*
Short and rough	66	31.43			
Short and smooth	85	40.47			
Coat colour					
Black	10	4.76	4	601.67	**
Brown	184	87.62			
brown-white	2	0.95			
Red	3	1.43			
White	11	5.24			
Skin type					
Thick	93	44.29	1	2.74	*
Thin	117	55.71			
Coat colour pattern					
Patches	2	0.95	1	202.08	**
Solid	208	99.05			
Tail shape					
High set	49	23.33	1	59.73	**
Pendent	161	76.67			
Eye colour					
Black	203	96.67	1	182.93	**
Brown	7	3.33			
White	-	-	-	-	-
Head profile					
Straight	140	66.67	1	23.33	**
Sub-concave	70	33.33			

DF: Degree of freedom; LOS: Level of significance; *P<0.05, **P<0.01

Table 2. Distributions of morphological traits of young donkeys

Morphological traits	Frequency	Percent	DF	Chi-square	LOS
Hair type					
Long and curly	2	0.95	2	310.40	**
Short and rough	18	8.57			
Short and smooth	190	90.48			
Coat colour					
Black	13	6.19	3	453.81	**
Brown	186	88.57			
brown-white	-	-			
Red	2	0.95			
White	9	4.29			
Skin type					
Thick	193	91.90	1	147.50	**
Thin	17	8.10			
Coat colour pattern					
Patches	-	-	-	-	-
Solid	210	100.00	0	0.00	
Tail shape					
High set	109	51.90	1	0.30	*
Pendent	101	48.10			
Eye colour					
Black	202	96.19	1	179.22	**
Brown	8	3.81			
White	-	-	-	-	-
Head profile					
Straight	203	96.67	1	182.93	**
Sub-concave	7	3.33			

DF: Degree of freedom; LOS: Level of significance; *P<0.05, **P<0.01

The distributions of morphological traits in adult donkeys are revealed in Table 3. Short and smooth was the most (90.0%) predominant hair type across all the locations where donkeys were sampled. Short and smooth as well as long and curly hair types were also observed at 5% each.

Most of the donkeys sampled had brown coat colour (88.57%). The skin type was however, predominantly thick (86.07%). Solid coat colour pattern were higher (99.64%) in donkeys that had solid colour than the one with patches (0.36%) observed. The proportions of high set (49.64%) and pendent tail shape (50.36%) were almost equal. Among the eye colours observed, donkeys with black eye colour were however predominantly (94.64%) compared to the other eye colours. Donkeys with straight heads (92.86%) were higher compared to the ones with sub-concave (7.14%) head profile. The preponderance of short-smooth hair type over short- rough and long- curly in this study agreed with the findings of Yakubu *et al*., (2010) who

reported the occurrence of short and smooth hair structure over long and curly hair types. Differences in sampling method, location and source of surveyed animals may be responsible for these variations. This implies that the propensity towards smooth hair structure could be an advantage as it provides a medium for conventional heat loss from the animal body surface from the tropical environment. This is supported by the assertion that hair structures have an important role to play in the adaptability of animals to different ecological zones (Banerji, 1984).

Table 3. Distributions of morphological traits in adult donkeys

Morphological traits	Frequency	Percent	DF	Chi-square	LOS
Hair type					
Long and curly	14	5.00	2	404.60	**
Short and rough	14	5.00			
Short and smooth	252	90.00			
Coat colour					
Black	11	3.92	4	824.18	**
Brown	248	88.57			
brown-white	1	0.36			
Red	12	4.29			
White	8	2.86			
Skin type					
Thick	241	86.07	1	145.73	**
Thin	39	13.93			
Coat colour pattern					
Patches	1	0.36	1	276.01	**
Solid	279	99.64			
Tail shape					
High set	139	49.64	1	0.01	*
Pendent	141	50.36			
Eye colour					
Black	265	94.64	2	474.52	**
Brown	14	5.00			
White	1	0.36			
Head profile					
Straight	260	92.86	1	205.71	**
Sub-concave	20	7.14			

DF: Degree of freedom; LOS: Level of significance; *P<0.05, **P<0.01

CONCLUSSION/ RECOMMENDATION

Donkeys in the Northwest Nigeria were mostly of solid coat colour pattern, brown coloured, black eyed, short-smooth haired type, thick skinned type, pendent tail shape and straight head profiled.

There is need to screen and conserve the four basic donkey strains (Ash-brown, Red, Black and White) to arrest further genetic erosion and dilution in these strains.

Further studies should be carried out on molecular studies for determination of diversity that exists among donkey strains.

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