CLUSTER ANALYSIS OF YEARLING BODY WEIGHT OF SHEEP OF NORTHERN NIGERIA AND THEIR CROSSES

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ABSTRACT

Clumping structure of yearling body weight among sheep of Northern Nigeria and their crosses was investigated using cluster analysis. Body weights of 65yearling sheep were also analyzed using General Linear Model procedure of SAS. Distances were used to construct dendrogram using the Unweighted Pairs Group Method Analysis implemented in R 2.13.0 package. TREE procedure that prints the dendrogram based on the distances between the clusters was introduced in PROC CLUSTER procedure. Yearling genotype affected BWT_12 ($P<0.05$). The pure Balami yearling (BL X BL) had the highest body weight at 12 months (29.10±4.02 kg). Yearling produced from Balami-sired mating with Yankasa ewe had the next heaviest weight (24.00±2.84 kg). This was followed in the third ranking when Balami was as the dam and Uda was used as the sire (20.50±4.02 kg). The least overall weight at 12 months of age was recorded when Yankasa was used as the sire on Balami ewe (15.12±4.02 kg). The BWT_12 recorded for YK × YK (14.79±0.80 kg) was similar ($P>0.05$) to what was obtained when Yankasa was used as sire on Balami ewe. Sheep of Northern Nigeria and their crosses were grouped into two clusters at distance 2.656 on the basis of body weight of the yearling sheep. Pure Balami (BL X BL) formed the first cluster while the rest of the genotypes belong to the second cluster. The yearling body weight of Balami was superior to that of other genotypes. The cluster analysis grouped pure Balami yearling distinctly from other genotypes. Improvement programmes of Nigerian sheep breeds should consider exploitation of the genetic potentials of Balami rams and ewes in terms of fast growth rate.

Keywords: Sheep, yearling genotype, Northern Nigeria, cluster analysis.

INTRODUCTION

There are four main breeds of sheep in Nigeria: Balami, Uda, Yankasa and West African Dwarf (WAD). Balami, Uda and Yankasa are predominant breeds in Northern Nigeria while the West African Dwarf (WAD) is adapted to the humid climate of southern Nigeria. These breeds differ considerably in size, coat-colour and other characteristics (Adu and Ngere, 1979). The Balami is the largest in size (live weight) and is confined to the most arid areas of the country (Sudan savannah) while Yankasa, which is the smallest among the three breeds in the Northern part of the country, is adapted to the areas with relatively more rainfall (Northern Guinea Savannah) (Iyiola-Tunji, 2012). Thus, any strategy for improving breeds (Yankasa, Uda and Balami) adapted to the semi-arid and arid climate (water and feed scarce areas) needs to consider their unique attributes and focus on improving within breed, with some level of crossbreeding with those that are adapted to such climates (Tibbo *et al.*, 2006). Improvement programmes involving sheep in Nigeria will need an appropriate evaluation of all the breeds in an environment where feeds and animal genetic resources (AnGR) is abundant. This study was however aimed at investigating the clumping structure of yearling body weight among sheep of Northern Nigeria and their crosses using cluster analysis.

MATERIALS AND METHODS

This study was conducted at the Sheep Project Unit of Small Ruminant Research Programme (SRRP) of National Animal Production Research Institute (NAPRI), Ahmadu Bello University, Shika-Zaria. The institute is located in Northern Guinea Savannah zone of Nigeria on latitude 11°12′16.78′′N and longitude 7°33′39.18′′E.

Balami, Uda and Yankasa breeds were crossed using diallel breeding pattern. A total of 65 Yankasa, 23 Uda and 16 Balami ewes were served by 4 Yankasa, 3 Uda and 3 Balami rams. One hundred and ninety-two yearling were produced. However, only the 65 yearling that survived up to 12 months of age (yearling) were used for this study. Body weights of the yearling were recorded using Salter® weighing scale to the nearest kilogram. Body weights of yearling sheep was analyzed using General Linear Model of SAS (SAS, 2004). Pair-wise difference was used to compare the means (SAS, 2004). Distances were used to construct dendrogram using the Unweighted Pairs Group Method Analysis implemented in R 2.13.0 (R Development Core Team, 2015) package. TREE procedure that prints the dendrogram based on the distances between the clusters was introduced in PROC CLUSTER procedure.

RESULTS AND DISCUSSION

Table 1 showed the body weight of yearling from diallel crossing among three breeds of sheep of Northern Nigeria and their crosses at 12 months of age (BWT_12).Yearling genotype affected BWT_12 ($P<0.05$). The pure Balami yearling (BL X BL) had the highest BWT_12 (29.10±4.02 kg). Yearling produced from Balami-sired mating with Yankasa ewe had the next heaviest weight (24.00±2.84 kg). This was followed in the third ranking when Balami was used as the dam and Uda was used as the sire (20.50±4.02 kg). The least overall BWT_12 was recorded when Yankasa was used as sire on Balami ewe (15.12±4.02 kg). The BWT_12 recorded for YK × YK (14.79±0.80 kg) was similar ($P>0.05$) to what was obtained when Yankasa was used as sire on Balami ewe.The result indicating Balamias the heaviest yearling supports earlier reports by Adu and Ngere (1979); Oni (2002) and Yunusa *et al.* (2013).

Figure1 showed the hierarchical clustering dendrogram obtained by different distances among genotypes of sheep using BWT_12. Sheep of Northern Nigeria and their crosses were grouped into two clusters at distance 2.656 on the basis of body weight of the yearling sheep. Pure Balami (BL X BL) formed the first cluster while the rest of the genotypes belong to the second cluster. The second cluster was also divided into two sub-groups at 0.796. The first sub-group had UD X UD, UD X YK, UD X BL, BL X UD and YK X UD at 0.514. The pure Yankasa (YK X YK), YK X BL and BL X YK formed the second sub-group at 0.170. The major feature of sub-group 1 of cluster 2 is that Uda (either as sire or dam) was part of the genotypes of yearling of that group. Similar pattern was also observed in sub-group 2 of cluster 2; Yankasa (either as sire or dam) was common to the yearling in that group. One of the reasons for estimating genetic distance is to evaluate the expected heterosis when breeds of the same species are crossed. Genotypes whose genetic distance are farther being expected to express more heterotic effects. Pure Balami sheep in this study had the farthest genetic distance of 2.636 with all the other genotypes considered. This was in agreement with Yunusa *et al.* (2013) who reported that there is room for improvement of the indigenous breeds of sheep especially between Southern and Northern breeds.

CONCLUSION AND RECOMMENDATION

The yearling body weight of Balami was superior to that of other genotypes. The cluster analysis grouped pure Balami yearling distinctly from other genotypes. Improvement programmes of Nigerian sheep breeds should consider exploitation of the genetic potentials of Balami rams and ewes in terms of fast growth rate.

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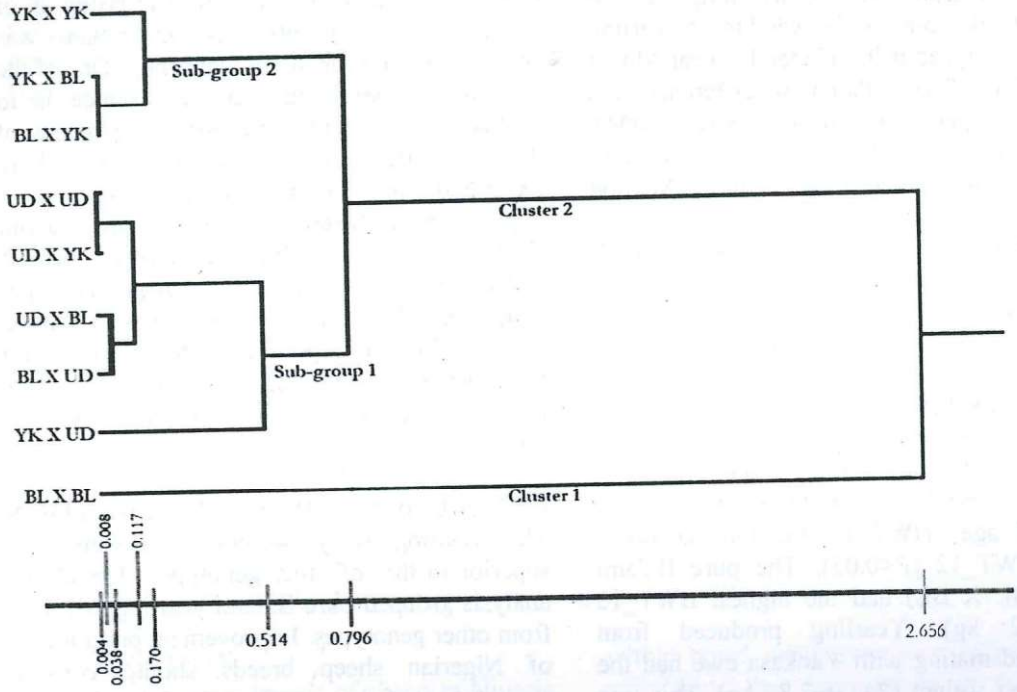

Figure 1: Hierarchical clustering dendrogram obtained by different distances among genotypes of sheep using body weight at 12 months of age

Table 1: Effect of yearling genotypes on body weight of yearling at 12 months of age

Sire breed	Dam breed	Yearling genotype	Number	BWT_12 (kg)
Yankasa	Yankasa	YK X YK	25	14.79 ± 0.80^{f}
Uda	Uda	UD X UD	6	17.43 ± 1.64^{e}
Balami	Balami	BL X BL	3	29.10 ± 4.02^{a}
Yankasa	Uda	YK X UD	9	16.90 ± 1.34^{e}
Yankasa	Balami	YK X BL	3	15.12 ± 4.02^{f}
Uda	Yankasa	UD X YK	8	16.78 ± 1.42^{e}
Uda	Balami	UD X BL	3	20.50 ± 4.02^{c}
Balami	Yankasa	BL X YK	3	24.00 ± 2.84^{b}
Balami	Uda	BL X UD	3	18.20 ± 2.84^{d}
		Overall mean		16.54
		SEM		0.35

BWT_12 = Body weight of sheep at 12 months of age