Relationship among cane rat *(Thryonomys Swinderianus)* families of unknown genetic origins in Ibadan Nigeria

O. M. A. Jesuyon*[1] and S. O. Oseni[2]

[1]*Federal University, P. M. B. 373, Oye - Ekiti, Ekiti State, Nigeria.*

[2]*Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria*

CONCLUSION/RECOMMENDATIONS

1. Seuclid and Cluster procedures were able to detect genetic diversity between experimental cane rat families.
2. The largest genetic distance was obtained between Lawole and Bamidele families.
3. There existed larger dissimilarity between the males than females of families.
4. There is closer genetic relationship between FRIN and Lawole families than other pairings
5. Lawole and Bamidele should be considered for multiplication, urgent protection and conservation to preserve genetic diversity.
6. The knowledge of genetic diversity among sources, would assist in the design of breeding, improvement and conservation programmes for cane rats in the region.

INTRODUCTION AND OBJECTIVE

Population of wild cane rats decline in African countries due to high rate of hunting, destruction of their natural habitats and high demand for cane rat meat. Subsequently cane rat has been classified among the threatened and endangered wildlife (Aluko *et al.*, 2015) in the West African sub-region. Global concerns over hunting of endangered species of animals has led conservationists and advocates to lead campaign for domestication, to increase production and supply of cane rats, thus reducing pressure on wild populations, controlling environmental degradation and conserving biodiversity in the region (FAO1, FAO2).

By studying underlying genetic relationships - which has not yet been determined - among cane rat groups from different primary sources, groups and families; it would be possible to unravel the measure of diversity among them. Novel analytical techniques include Pearson's genetic correlation, r; Multiple linear regression, MLR, Standard Euclidean distance, Seuclid and Cluster procedures. These techniques were used to unravel the relationships among three cane rat groups in a spatial South-west Nigerian environment.

The objective of study was to estimate underlying relationships among cane rat families of unknown genetic origins in the spatial environment of Ibadan in South-west Nigeria.

MATERIALS AND METHODS

Study was conducted over seven months from February to August 2011, at the Grasscutter Unit of the Wildlife and Fisheries Department, University of Ibadan, Nigeria; on Latitude 7.4691, Longitude 3.9049 and elevation of 195.55m above Mean Sea Level, with mean dry and wet season temperatures of 35.95°C and 25.81°C.

Seventy-nine growing cane rats from three Farm (family) sources in Ibadan namely Forestry Research Institute of Nigeria (FRIN) Jericho, Bamidele and Lawole Farms were compared. The cane rats were grouped according to their sources, and randomized within sex into individual cages. All animals were subjected to the same management. Body weight measurements were recorded on monthly basis. Study design was Randomized Complete Block Design (RCBD), using Family as Treatment and Sex as Block.

Data on live weight (kg) were analyzed using ANOVA, Mean separation by Bonferroni (Dunn) t Tests (P<0.05), Pearson's genetic correlation, rG; (ios, 2016), Multiple linear regression (MLR) and Squared Euclidean (Seuclid) genetic distance procedures of SAS® version 8 for Windows (1999). Cluster (dendrogram) analysis by Ward's method was performed using SPSS version 17 software.

Experimental model

Body Weight = general mean + Family + Sex + Interaction + Error

RESULTS AND DISCUSSION

Body weight of males between family sources were significantly different from each other (*P<0.05*). Genetic correlation (r_G) values between family-pairs range from 0.010 – 0.184 but were insignificant (*P>0.05*).

Fig. 1: Thryonomys Swinderianus (FRIN Type) in Ibadan, South-west Nigeria

Fig. 2: Thryonomys Swinderianus (IAR&T Type) in Ibadan, South-west Nigeria

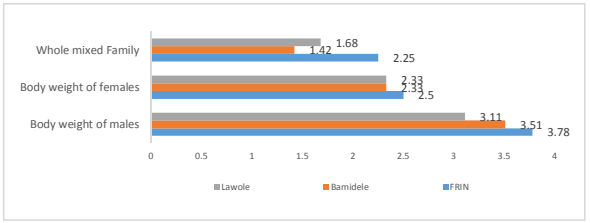

Figure 3: Clustered bar chart showing mean body weight (kg) of cane rats across three Farm sources in Ibadan

Table 1: Growth model for the regression of body weight (Y_{ij} in kg) on chronological age (X, in weeks) in cane rat Families/Sources in Ibadan, Nigeria

Model: $Y_{ij}=\mu + \alpha X + \varepsilon_{ij}$

Sex	Sources	μ	α	SE	Adj. R^2	CV	t-value	Sig	DW	VIF
Males	FRIN	2.97	0.014	0.107	0.1796	13.657	33.74	<0.0001	1.872	1.000
	Bamidele	1.890	0.040	0.295	0.1741	17.990	10.99	<0.0001	2.136	1.000
	Lawole	1.545	0.064	0.694	0.2687	18.230	5.64	<0.0001	2.549	1.000
Females	FRIN	2.330	-	0.045	-	17.56	51.87	-	2.413	-
	Bamidele	0.499	0.067	0.400	0.4430	15.45	6.35	<0.0001	2.271	1.000
	Lawole	0.683	0.056	0.706	0.1159	13.63	51.87	<0.0110	2.094	1.000
Mixed Population	FRIN	2.25	0.023	0.125	0.1857	22.155	25.66	<0.0001	1.715	1.000
	Bamidele	1.42	0.050	0.272	0.2179	19.938	11.21	<0.0001	1.976	1.000
	Lawole	1.68	0.095	0.599	0.2799	24.026	5.18	<0.0001	1.162	1.000

Note: μ= genotypic constant, α= coefficient of age, X= age of cane rat, SE=Standard error, Adj. R^2 = adjusted coefficient of multiple determination, CV= coefficient of variation, Sig.=significance level, DW=Durbin Watson statistics, VIF=variance inflation factor

The intercept (μ) and t-values obtained from various equations of cane rat families gave indications of the basic differences in physiological mechanisms between the sexes of families and between whole families. The low values of R^2 obtained from equations were indications of the low rate of growth exhibited by animals, leading to the low level of relationship returned between body weight and chronological age.

Seuclid between Lawole and Bamidele was largest for males, females and the mixed population. This meant males from both families were distinct genetically from each other. The genetic distance between FRIN and Lawole was least, among pairs of cane rat families. The closeness between FRIN/Bamidele and FRIN/Lawole families implied either purposive crossing or varying levels of admixture over time, between FRIN and these other two families of cane rats. 06/06/2016

Table 2: Standard Euclidean genetic distance measures between cane rat families in Ibadan, Nigeria.

Between Family Pair	Distance between Males of Families	Distance between Females of Families	Distance between entire Families
Lawole/Bamidele	50.95	18.50	110.66
FRIN/Bamidele	28.14	14.66	89.01
FRIN/Lawole	25.53	12.43	82.05

Rescaled Distance Cluster Combine

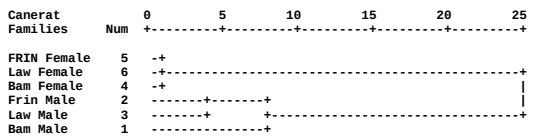

Figure 4: Dendrogram resulting from the Hierarchical Cluster Analysis of cane rat Families by sex using Ward's Method

REFERENCES

Aluko F. A.; Salako A. E.; Ngere, L. O.; Eniolorunda O. O. 2015. Grasscutter: A review of the habitat, feeds and feeding, behavior and economic importance. American Journal of Research Communication, 3(9):96-107. www.usa-journals.com, ISSN: 2325-4076.

FAO Corporate Document repository (FAO1). Wildlife utilization and food security in Africa: Wildlife farming and domestication. Retrieved from in May 2016 www.fao.org/docrep/w7540e/w7540e0h.htm

FAO Corporate Document repository (FAO2). Wildlife utilization and food security in Africa. Subsistence hunting and gathering. Retrieved in May 201 from http://www.fao.org/docrep/w7540e/w7540e0i.htm#4.2.2%20subsistence%20hunting%20and%20gathering

Improved outcomes software (ios). 2016. Pearson Correlation and Pearson Squared. Retrieved in May 2016 from www.improvedoutcomes.com/.../Pearson_Correlation_and_Pearson _Squared.

SAS/STAT Statistical Analytical Systems Computer software, SAS Institute Incorporated, N.C., USA, 1999.

SPSS® Statistics 17.0. 2007. Statistical Package for Social Sciences. Software Package. SPSS Incorporated, Illinois. USA.

CONTACT

*Animal Breeding and Genetics Unit, Department of Animal Production and Health

Federal University, P. M. B. 373, Oye - Ekiti, Ekiti State, Nigeria.

E-mail: oluwatosin.jesuyon@fuoye.edu.ng

GSM No: +234-806-431-033

ACKNOWLEDGEMENT

Thanks to iILINOVA for sponsorship to 3rd Summer School in OAU Ile-Ife, Nigeria, 23-27 November, 2015.

POSTER PRESENTED AT THE FIRST WORLD CONGRESS ON INNOVATION FOR LIVESTOCK DEVELOPMENT, HELD 26-30 JUNE 2016, AT THE SENTRIM ELEMENTAITA LODGE, NAKURU, KENYA.