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RESEARCH ARTICLE

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Factors influencing litter traits and body weight at pre-weaning ages among temperate rabbit breeds in the tropical conditions of Nigeria.

O.M. Akinsola^{1*}, B.I. Nwagu², M. Orunmuyi¹, G.T. Iyeghe-Erakpotobor²,
O.T.F. Abanikannda³, A.J. Shoyombo¹, and U. Louis⁴

¹Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria, Nigeria.

²National Animal Production Research Institute, Shika, Kaduna State, Nigeria.

³Department of Zoology, Faculty of Science, Lagos State University, Ojo Lagos, Nigeria.

⁴Department of Biology, School of Sciences, Federal College of Education, Katsina, Katsina State, Nigeria.

ABSTRACT

The present investigation was aimed at preliminary investigation of growth rate and prolificacy among temperate rabbit breeds namely, New Zealand White and California rabbits, in Kaduna State. Breed effect on litter traits and body weight were analyzed using the general linear model procedure of statistical analysis software (SAS, 9.0). Data from 397 kindling's at different preweaning ages (birth, 7, 14, 21, 28 and 35 days) showed that crossbred rabbits were heavier than the purebred for kit weight but purebred had higher values than the crossbred for litter traits. Breed and sire effects were significant ($p < 0.01$) for both growth and litter traits. The results of the present study confirmed the potential of temperate rabbit breed in significantly enhancing the litter and body weight of the progeny, which can be potentially exploited for the development of meat rabbit suited to Kaduna State.

Keywords: New Zealand White, California, Hyla, Kit weight and Sire

INTRODUCTION

Kaduna state lies at altitude of 10°20' north and longitude 7°45' east and covers area of 45, 711.2 square kilometers. This area is vegetationally a woodland Savanna zone with an average annual precipitation of 1100mm. The huge potential of meat industry in the state is hampered due to non availability of animal genotypes with short generation interval, which can transform this abundant biomass into high quality meat. Hyla rabbit could be a suitable path to develop meat value chain due to structural problems of meat shortage in Nigeria. Productivity of rabbit as a function of growth and litter traits of these major component is essential to improve meat production. Litter traits are considered as character of the doe because there is a larger environmental component of variance associated with the doe during kindling and raising a litter to weaning. Various authors have reported outstanding performance of growth and litter traits at preweaning ages in the temperate region. Vaclavovsky *et al.* [1] obtained litter size of 9.49 in Hyla purebred rabbits reared in Slovenia. Yamani [2] reported BW₅ in Hyla rabbits to be 415 g. However, this goal remains unfulfilled in the tropical countries mostly due to heat stress which had adversely affected the performance of our local rabbits. The present study was undertaken to assess the growth and litter performance of an imported rabbits (Hyla) at pre weaning ages under the tropical conditions of Nigeria.

MATERIALS AND METHODS

The research was conducted at the Rabbitry Breeding Unit of National Animal Production Research Institute (NAPRI), Shika, Zaria. NAPRI is geographically located between latitude 11⁰ and 12⁰N and longitude 7⁰ and 8⁰E at an altitude of 640m above sea level. This area is vegetationally in the Northern Guinea Savanna zone with an average annual. The data generated for this study included 205 New Zealand White purebred and 192 New Zealand White X California F₁ crossbred kits. A total of 397 offspring were born from June 2012 to January 2013. Litter traits investigated includes litter size and weight at birth, 7, 14, 21, 28 and 35 days for both breeds. Individual kit weight was also taken at birth, 7, 14, 21, 28 and 35 days for both breeds. The weaning age was set at 35 days. Housing and feeding were similar in both groups. The does and male rabbits were fed *ad libitum* on a NAPRI formulated pelletized diet.

Litter Traits

Litter Size (LS): This is the number of kits the doe kindles at birth.

Litter Birth (LW): This is the weight of the kits at birth. Measurement was taken in grams (g), using a digital scale (Mettler Toledo, Top Pan Sensitive Balance, J. Liang Int. Ltd. U.K.).

Growth Trait

Individual kit weight was taken by digital weighing scale (Mettler Toledo, Top Pan Sensitive Balance, J. Liang Int. Ltd. U.K.). The measurements were taken while the animals were held in a standing position.

Data Analysis

Effects of genetic groups at pre-weaning ages on growth and litter traits were analyzed using least squares analysis by LSMLMW package [3]. The statistical model was

Y_{ij} = observation of the nth progeny of ith breed with jth sire nested in the ith breed

μ = overall population mean;

B_i = effect of the ith breed

$Sr_{j:bl}$ = fixed effect of the jth sire nested in ith breed

e_{ijk} = random error

RESULTS

The least squares mean (\pm) standard error for litter traits at pre-weaning ages (birth through 35 days) are shown in Table 1. The results showed that values obtained for litter size and weight at different ages were significantly ($P < 0.05$) higher in purebred than the crossbred Hyla rabbits. However values obtained for individual kit weight were significantly ($P < 0.05$) higher in crossbred compared to the purebred Hyla rabbits. Litter size ranged between 6.51 \pm 0.47 – 3.46 \pm 0.32 and 6.24 \pm 0.63 – 2.79 \pm 0.38 in purebred and crossbred Hyla rabbits respectively, from birth through weaning. Litter weight ranged between 331.49 \pm 27.21 g – 2454.86 \pm 177.85 g and 321.91 \pm 36.02 g – 2168.44 \pm 279.40 g in purebred and crossbred Hyla rabbits respectively, from birth through weaning. Individual kit weight ranged between 57.97 \pm 1.41 g – 744.94 \pm 16.64 g and 59.66 \pm 0.92 g – 752.71 \pm 20.23 g in purebred and crossbred Hyla rabbits respectively, from birth through weaning.

DISCUSSIONS

The values of litter size, litter weight and individual kit weight obtained in this study were lower than the range reported in the temperate country at pre-weaning ages, also, within the range reported in the literature for tropical country. Vaclavovsky *et al.* [1] reported litter size of 9.49 in Hyla purebred rabbits reared in Slovenia. On the other hand, Hamouda *et al.* [4] reported litter size value of 8.50 at first generation with Hyla rabbits in Tunisia. The litter size at birth in this study were also lower than 8.3 reported as average in different rabbit breeds in Australia [5], but closer to 6.30 recorded with New Zealand White rabbits in USA [6]. Litter size from birth through 35 days obtained from this study were within the range reported by Kabir *et al.* [7] for pure and crossbred rabbits in Nigeria. The weaned kits' weights were also higher than the value of litter size recorded at 35 days-old in Hyla rabbitry in Tunisia [4] and also higher than those reported by Karikari *et al.* [8] in Ghana. Differences in litter size and weight could be due to climatic conditions and management practice.

Table 1: Least squares means \pm standard error of litter traits and kit weight's for pre-weaning ages of Hyla rabbits

Least squares means \pm standard error of litter traits and kit weight's for pre-weaning ages of Hyla rabbits												
Trait	Birth	NZWXNZW (Purebred)					NZWXCAW (Crossbred)					
		7	14	21	28	35	Birth	7	14	21	28	35
N	205	195	172	160	147	142	192	180	171	157	126	98
LS	6.51	5.41	5.00	4.65	4.16	3.46	6.24	5.06	4.59	4.21	3.58	2.79
	$\pm 0.47^a$	$\pm 0.41^a$	$\pm 0.37^a$	$\pm 0.39^a$	$\pm 0.37^a$	$\pm 0.32^a$	$\pm 0.63^b$	$\pm 0.58^b$	$\pm 0.48^b$	$\pm 0.45^b$	$\pm 0.43^b$	$\pm 0.38^b$
LW	331.49	736.11	1331.60	1943.00	2454.86	2629.70	321.91	706.74	1266.65	1876.80	2137.97	2168.44
	$\pm 27.21^a$	$\pm 55.85^a$	$\pm 101.21^a$	$\pm 150.31^a$	$\pm 177.85^a$	$\pm 201.32^a$	$\pm 36.02^b$	$\pm 72.46^b$	$\pm 135.50^b$	$\pm 195.4^b$	$\pm 256.82^b$	$\pm 279.40^b$
IKW	57.97	138.14	269.25	420.43	585.50	744.94	59.66	139.39	275.25	429.98	595.63	752.71
	$\pm 1.41^b$	$\pm 2.12^b$	$\pm 5.26^b$	$\pm 8.17^b$	$\pm 11.54^b$	$\pm 16.64^b$	$\pm 0.92^a$	$\pm 3.20^a$	$\pm 4.67^a$	$\pm 9.57^a$	$\pm 14.41^a$	$\pm 20.23^a$

^{abc}Means between the same row having the same superscript are not significantly ($P > 0.05$) different
 NZW- New Zealand; CAW-Californian; LW-Litter weight; LS-Litter size; N-Number; IKW-Individual kit weight.

Hyla purebreds produced significant heavier litter weight compared to Hyla crossbred rabbits at all pre-weaning age. This could be explained by the findings of Rao *et al.* [9] who stated that the total weight of rabbit in a given litter increased with increased litter size. This difference could be due to high litter sizes of the Hyla purebred compared to crossbred rabbits in the study. This reflects the superiority of Hyla purebred in their post-natal maternal abilities in terms of milk production, pre-weaning growth and survival, maternal behavior, mothering ability, and so on. The Hyla crossbred kits had significantly ($P < 0.05$) higher individual kit weight (IKW) than Hyla purebreds at all the pre-weaning ages. High body weights obtained in this study agree with earlier reports in literature. The average weights of kits at birth were closer to 58.1 g and 60.2 g but lower than 62.07 g reported respectively by Prayaga and Eady [5] in Australia and Karikari *et al.* [8] in Ghana. However, these kits' weights were higher than the 43.7 g reported in Sudanese rabbits [12]. The weaned kits' weight were also higher than the value recorded in Hyla rabbitry in Tunisia [4] and Egypt [4]. The Hyla crossbred rabbits had heavier kit weights at weaning compared to Hyla purebreds. This might be due to heterotic effect of the crosses. This high genetic value of crossbred on bodyweight can be exploited in commercial rabbit production. In conclusion, growth and litter traits were intermediate; henceforth they can be utilized in genetic upgrading of our low performing local breeds of rabbit in the tropical of Nigeria.

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