



Original article

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

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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.

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1. Introduction

Kaduna state lies at altitude of 10o20' north and longitude 7o45' 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 (Khalil et al., 1986). Various authors have reported outstanding performance of growth and litter traits at preweaning ages in the temperate region. Vaclavovsky et al. (2000) obtained litter size of 9.49 in Hyla purebred rabbits reared in Slovenia. Chrysostome et al. (2011) reported values of 7.29 in France and 6.45 in Benin for Hyla purebred rabbits. Chrystosome et al. (2011) reported that kit weight at birth in Hyla pure NZW lines to be 55.6 g in France and 54.4 g in Benin. Yamani (1994) reported BW5 in Hyla rabbits to be 415 g. Chrystosome et al. (2011) reported BW5 in Hyla rabbits to be 638g. 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.

2. 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.

2.1. 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.).

2.2. 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.

Research on water quality is made by prospective epidemiological and analytical method. Is performed within months from May to June '12. The sampling plan was designed to expand the analysis of drinking water in all residences, respectively from two samples for each watershed. Sampling was conducted for 21 days, taking an average of 3.1 samples per day. Three teams are engaged in sampling. Samples were transferred within 4 to 6 hours, depending on the terrain, to laboratories for microbiological and physicochemical analysis. To facilitate research, the region of Dragash have divided into five areas; Opoja, Brezne, Dragas, Brod and Restelicë. In this way including villages that lie mainly in these areas and have closer communication. Sampling was carried out according to the WHO manual on plastic bottles prepared in advance.

2.3. Data analysis

Effects of genetic groups at pre-weaning ages on growth and litter traits were analyzed using least squares analysis by LSMLMW package (Harvey, 1990). The statistical model was
$$Y_{ij} = \text{observation of the } n\text{th progeny of } i\text{th breed with } j\text{th sire nested in the } i\text{th breed}$$

μ = overall population mean;

B_i = effect of the i th breed

$Sr J:bl$ = fixed effect of the j th sire nested in i th breed

e_{ijk} = random error

3. 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 $331.49 \pm 27.21 \text{ g} - 2454.86 \pm 177.85 \text{ g}$ and $321.91 \pm 36.02 \text{ g} - 2168.44 \pm 279.40 \text{ g}$ in purebred and crossbred Hyla rabbits respectively, from birth through weaning. Individual kit weight ranged between $57.97 \pm 1.41 \text{ g} - 744.94 \pm 16.64 \text{ g}$ and $59.66 \pm 0.92 \text{ g} - 752.71 \pm 20.23 \text{ g}$ in purebred and crossbred Hyla rabbits respectively, from birth through weaning.

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												
NZWXNZW (Purebred)							NZWXCAW (Crossbred)					
Trait	Birth	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 ± 0.47 a	5.41 ± 0.41 a	5.00 $\pm 0.37a$	4.65 $\pm 0.39a$	4.16 $\pm 0.37a$	3.46 $\pm 0.32a$	6.24 ± 0.63 b	5.06 ± 0.58 b	4.59 $\pm 0.48b$	4.21 ± 0.45 b	3.58 $\pm 0.43b$	2.79 $\pm 0.38b$
LW	331.4 9 ± 27.2 1a	736.1 1 $\pm 55.$ 85a	1331.6 0 $\pm 101.$ 21a	1943.0 0 $\pm 150.$ 31a	2454.8 6 $\pm 177.$ 85a	2629.7 0 $\pm 201.$ 32a	321.9 1 $\pm 36.$ 02b	706.7 4 $\pm 72.$ 46b	1266.6 5 $\pm 135.$ 50b	1876. 80 ± 19 5.4b	2137.9 7 $\pm 256.$ 82b	2168.4 4 $\pm 279.$ 40b
IKW	57.97 ± 1.41 b	138.1 4 ± 2.1 2b	269.25 $\pm 5.26b$	420.43 $\pm 8.17b$	585.50 ± 11.54 b	744.94 ± 16.64 b	59.66 ± 0.92 a	139.3 9 ± 3.2 0a	275.25 $\pm 4.67a$	429.9 8 ± 9.57 a	595.63 ± 14.41 a	752.71 ± 20.23 a

abcMeans 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.

4. Discussion

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. (2000) reported litter size of 9.49 in Hyla purebred rabbits reared in Slovenia, while Chrysostome et al. (2011) reported values of 7.29 in France and 6.45 in Benin for Hyla purebred rabbits. On the other hand, Hamouda et al. (1990) 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 (Prayaga and Eady, 2002), but closer to 6.30 recorded with New Zealand White rabbits in USA (Medellin and Lukefahr, 2001). Litter size from birth through 35 days obtained from this study were within the range reported by Kabir et al. (2010) 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 (Hamouda et al., 1990) and

also higher than those reported by Karikari et al. (2011) in Ghana. Differences in litter size and weight could be due to climatic conditions and management practice.

Hyla purebreds produced significant heavier litter weight compared to Hyla crossbred rabbits at all pre-weaning age. This agrees with the report of Hassan (1993) who observed that litter performances in NZW purebred are better than those in crossbred. This could be explained by the findings of Rao et al. (1977) 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 (2002) in Australia and Karikari et al. (2011) in Ghana. However, these kits' weights were higher than the 43.7 g reported in Sudanese rabbits (Elamin et al., 2011). The weaned kits' weight were also higher than the value recorded in Hyla rabbitry in Tunisia (Hamouda et al., 1990), Egypt (Yamani, 1994) and Chrystosome et al. (2011) in Benin. 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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