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Gestational and reproductive performance of rabbit does fed diets containing neem (*Azadirachta indica*) leaf meal

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Abstract

Twenty-four rabbit does with initial body weight between 2110.00g - 2250.00g were used to evaluate the gestational growth and reproductive performance under varying levels of Neem (Azadiractha indica) leaf meal diets. The rabbits were assigned into four treatment groups consisting of six does in a completely randomized design and fed four diets designated diets T1, T2, T3 and T4 with 0, 2.5%, 5.0% and 7.5% Neem Leaf Meal (NLM) inclusion, respectively. The study lasted for 14 weeks. Data collected on gestational growth parameters (initial weight, final weight, weight gain, feed efficiency and mortality) were subjected to one-way analysis of variance (ANOVA) using a General Linear Procedure of SAS (2007) and significant means were separated by Duncan's multiple range test of same statistical package at 5% level of probability. The rabbit does were mated with bucks fed the same treatment diets in a mating ratio of 3:1 (3 does to 1 buck) The reproductive parameters evaluated were the number of does that kindled (NODK), litter size at birth (LSAB), litter weight (LWG), average birth weight (AVBW), gestation length (GL), breeding efficiency, litter size at weaning (LSAW) and pre-weaning loss (PL). These data were subjected to descriptive statistical representation. Results showed that NLM had significant ($P<0.05$) influence only on the total feed intake of the does with does fed T1 (control ration) having the highest feed intake (2916.7g) while does fed T3 (5% NLM) recorded the least feed intake (2486.7g). The highest number of does that kindled (5 does), litter size at birth (26 kits), breeding efficiency (83.33%) and litter size at weaning (13 kits) were obtained in does fed T2 diets (2.5% NLM inclusion) while the least values recorded were obtained in rabbit does on T4 diet. The highest (12) pre-weaning loss was recorded in does fed T2 (2.5%) while no pre-weaning mortality was observed in does fed T1 (0% NLM inclusion) and T4 (7.5% NLM inclusion) diets. It was therefore concluded that NLM had no adverse effect on the reproductive performance of rabbit does and up to 2.5% NLM can be included in the diet of rabbits does meant for breeding purpose.

Keywords: Rabbit does, Neem, gestational, reproductive performance

Introduction

Rabbit is a micro livestock which has been recognized to have played an important role in the supply of animal protein in developing countries including Nigeria especially in rural and peri-urban area. This is because of its ability to convert feed to meat and can utilize up to 30% crude fibre as against 10% used by most poultry species (Makinde, 2014). In addition to the attributes promoting rabbit production which includes high fecundity, growth rate and the ability to utilize forages and turn out of low cost/high quality proteins, nutritious meat, limited competition with humans for food. They have short gestation length, early sexual maturity, high prolificacy and ability to rebreed immediately after parturition, all leading to short generation interval (Biobaku and Dosumu, 2003; Ani,

2006; Ogundele and Apata, 2006). In spite of all these advantages over other livestock, rabbit production has not achieved its potential as cheap animal protein source in thetropics due to high cost of feeds and feeding leading to increased production cost (Herbert and Adejumo, 1995).

However, one possible way of militating against these constraints posed by feed scarcity and high exorbitant price when available is to explore alternative feed resource like leaf meals (Ogunleke *et al*., 2014). Neem leaves contain approximately 20.69% crude protein and 4.13% fat after processing into leaf meal via drying and milling (Oforjindu, 2006). Recently, numerous research efforts have been directed at the optimal utilization of Neem leaves in the feeding and medication of farm animals (Sokunbi and Egbunike, 2000; Oforjindu, 2006; Esonu *et al*., 2006).

Various reports involving animals fed different leaf meals indicate some negative effects.The reported cases of infertility in females and reduced libido in buck rabbits fed leaf meals are sources of concern (Herbert *et al*., 2005; Joshi, 2007). Ogbuewu *et al*. (2010) reported that the use of Neem leaf meal in the diets of rabbit bucks at a maximum of 5% level where there is no specific interest in reproduction. According to this author, feeding rabbits with graded levels of Neem leaf meal had a detrimental effect on rabbit's tract morphometric, testicular growth, spermatogenesis and consequently, semen output. Hence, this study is aimed at examining the gestational and reproductive performance of rabbit does fed graded levels of Neem (*Azadirachta indica)* leaf meal diets.

Materials and methods

Experimental location

The experiment was carried out at the rabbitary unit of the Teaching and Research Farm of Federal University of Agriculture, Abeokuta. The area lies within latitude 905.5'N-708'N and 3011.2'-302.5'E. The climate is humid, and it receives a minimum precipitation of 1037mm with a mean temperature of 34.70C and relative humidity of 82% (Google earth, 2015).

Collection and processing of Neem (*Azadirachta indica*) leaf meal

Fresh leaves of Neem (*Azadirachta indica*) were collected within the environment of Federal University of Agriculture, Abeokuta (FUNAAB). They were harvested by hand-plucking the leaves from the trees, cleaned of sands and other contaminant, air dried at room temperature for 4-5 days so as to maintain its greenish coloration, grounded to particle size of 2mm sieve using a hammer mill and stored properly in an air-tight container for use.

Experimental animals and management

The study was conducted with 24 matured female rabbits with weight ranging from 1.90kg to 2.0kg. They were randomly assigned to 4 treatments of 6 replicates with 1 rabbit doe serving as a replicate group. The rabbits were housed individually in two double tier rabbit hutches. Each cell has the following dimension 2 x 2 x 2 ft with a wired mesh base so as to ease the cleaning of the hutches and for proper ventilation and partitioned with a wooden board. Concrete feeders and drinkers were provided to each cell. All necessary management procedures were carried out.

Experimental diets

Four different experimental diets were formulated with inclusion of Neem leaf meal (NLM) at 0% (control diet), 2.5%, 5%, and 7.5% in the diets and presented as T1, T2, T3, and T4 respectively, as shown in Table 1 below.

Table 1: Gross composition of experimental diets

	Treatment/ NLM Inclusion levels			
Feed ingredients	**T1 (0%)**	**T2 (2.5%)**	**T3 (5.0%)**	**T4 (7.5%)**
Maize	40.00	40.00	40.00	40.00
Rice husk	30.00	27.50	25.00	22.50
Neem leaf meal	0.00	2.50	5.00	7.50
Soya bean meal	24.00	24.00	24.00	24.00
Fish meal	1.00	1.00	1.00	1.00
Oyster shell	1.50	1.50	1.50	1.50
Bone meal	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25
Vitamins/premix	0.25	0.25	0.25	0.25
Total	**100.00**	**100.00**	**100.00**	**100.00**
Calculated analysis				
Crude protein (%)	15.93	16.02	16.11	16.20
Crude fibre (%)	12.71	12.19	11.67	11.15
Ether Extract (%)	3.91	3.82	3.72	3.63
Ash (%)	3.91	3.99	4.07	4.16
Energy (MJ/kg)	9.89	10.03	10.08	10.31

Experimental procedure

After a week of acclimatization, the rabbits were fed the experimental diet for 6 weeks thereafter they were mated per treatment with bucks from the same treatment. They were mated twice (morning and evening) with mating ratio of 3 does 1 buck. They were palpated after 2 weeks to determine pregnancy.At the 26th day of pregnancy, kindling boxes with dimension 12 inches by 12 inches were placed in each cell prior to kindling.

Data collection

Rabbits were weighed individually at the commencement of the experiment and subsequently, on weekly basis to determine weight gain. Each morning, feed that was not consumed (residual feed) was removed and weighed, deducted from the feed given and recorded in order to determine the daily feed intake. Feed efficiency and mortality were also determined. Measurement were taken on breeding efficiency which was taken as the ratio of pregnant does to non-pregnant does multiplied by 100. Gestation length was determined as the difference between date of last mating and kindling date. Litter size at birth was measured by direct counting of kits immediately after kindling. Litter weight at birth was obtained by carefully transferring the kits in a litter with gloved hand into adjusted (zero) weighing pan and their weight were read off from the scale.

Statistical analysis

Data obtained on gestational parameters were statistically analyzed with the general linear model of SAS (2007) and meansseparated by Duncan multiple range tests while reproductive parameters are presented using descriptive statistics.

Results

Gestational performance of rabbit does fed diets containing graded levels of *Azadirachta indica* leaf meal is presented on Table 2. Results showed that no significant ($P>0.05$) difference was observed in all the parameters examined except total feed intake. Total feed intake was significantly ($P<0.05$) highest in rabbit does fed 0 % and lowest in those fed 5 % (2916.7g and 2486.7g, respectively) NLM diets. Mortality was recorded in all the parameters examined except rabbits fed 2.5 % NLM diet.

Table 2: Gestational performance of rabbits does fed graded levels of Neem leaf meal diets

Parameters	NLM Inclusion Levels				
	0%	2.5%	5%	7.5%	SEM
Initial weight (g)	2250.0	2125.0	2143.3	2110.0	93.90
Final weight(g)	2333.3	2325.0	2240.0	2200.0	94.77
Total weight G (g)	83.33	200.00	156.67	90.00	30.82
Total feed intake(g)	2916.7^{a}	2625.0^{ab}	2486.7^{b}	2786.7^{ab}	71.75
Feed efficiency (g)	0.07	0.08	0.05	0.03	0.02
Mortality	1	0	1	1	0.06

^{a,b} Means on the same row having different superscripts are significantly different (P<0.05)

Table 3 shows the post-gestational performance of rabbit does fed graded levels of *Azadirachta indica* leaf meal diets. Results showed that no significant (P>0.05) difference was observed in all the parameters examined. Total weight gain ranged from 66.7g to 200.0g with rabbit does on 7.5% NLM having the highest weight gain while does on control diets (0% NLM) recorded the least weight gain.

Table 3: Post-gestation performance of rabbits does fed graded levels of Neem leaf meal diets

Parameters	NLM Inclusion Levels				
	0%	2.5%	5%	7.5%	SEM
Initial weight (g)	2333.3	2325.0	2240.0	2200.0	94.77
Final weight(g)	2400.0	2450.0	2350.0	2400.0	140.85
Total weight Gain (g)	66.7	125.0	110.0	200.0	45.34
Total feed intake(g)	2978	2540	3570	4275	399.08
Feed efficiency (g)	0.02	0.05	0.03	0.05	0.01
Mortality	1	1	1	1	0.08

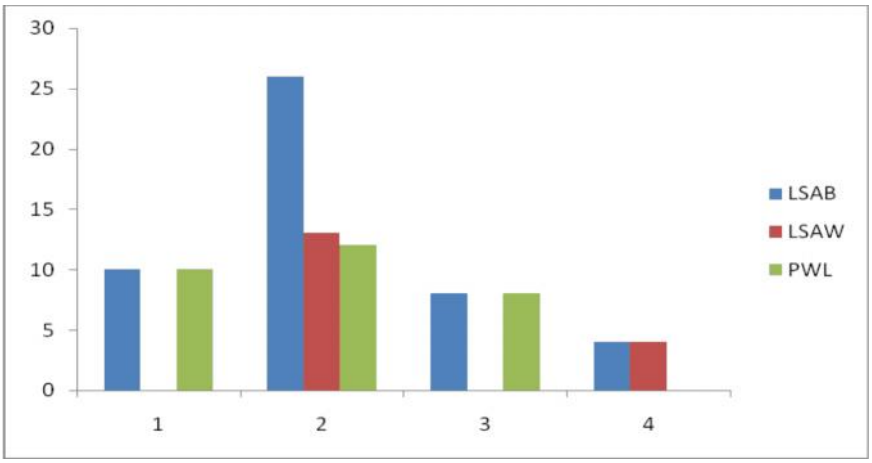

Figure 1: Effect of graded levels of NLM diets on rabbit does LSAB, LSAW and PWL

The effects of graded levels of Neem (*Azadirachta indica*) leaf meal (NLM) diets on the reproductive performance of rabbit does are presented in Figures 1, 2 and 3. Figure 1 shows the effect of the diets on the litter size at birth (LSAB), litter size at weaning (LSAW) and the pre-weaning loss (PWL). Litter size at birth and weaning ranged from 4-26 and 4-13 respectively with the highest values obtained in does fed T2 (2.5% NLM) diet while does fed diets T1 and T3 (0% and 5% NLM respectively) had no litter size at weaning. Highest pre-weaning loss of 12 was also recorded in rabbit does fed diets containing 2.5% NLM; diet T4 recorded zero pre-weaning loss.

The effect of the NLM diets on number of does that kindled after mating, gestation length and breeding efficiency is shown in figure 2. The number of does that kindled and breeding efficiency ranged from 1 to 5 and 16.67% to 83.33%, and their values were significantly ($p<0.05$) highest in rabbit does fed diets T2. Does fed diets T1 and T2 had similar lower gestation length of 31 days while similar and higher gestation length (32 days) was recorded for does fed T3 and T4 diets.

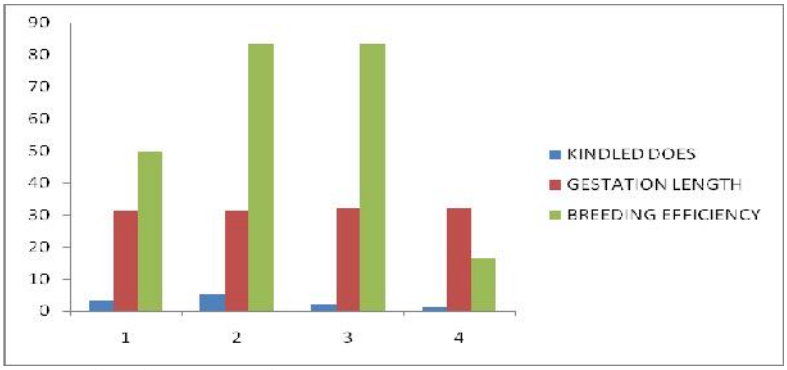

Figure 2: Effect of graded levels of NLM on rabbit does kindling, gestation length and breeding efficiency

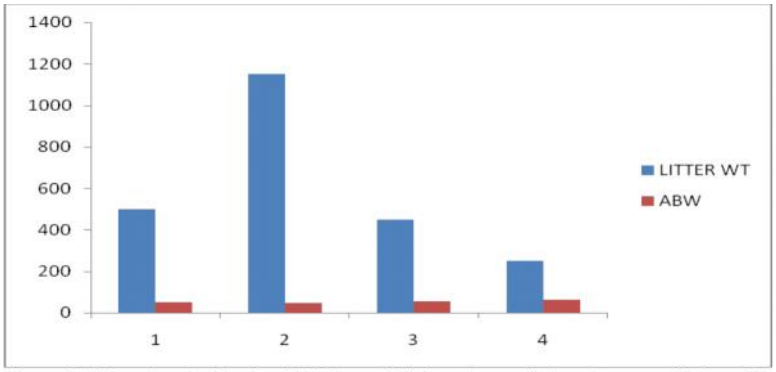

Figure 3: Effect of graded levels of NLM on rabbit does litter weight and average birth weight

Effect of graded levels of NLM on rabbit does litter weight and average birth weight is presented in Figure 3. Litter weight and average birth weight ranged from 250g-1150g and 50g-62.5g respectively; does fed 2.5% NLM had the heaviest litter weight (1150g) while the lightest litter weight (250g) was observed in does fed 7.5% NLM. However, average birth weight of kits from does fed 7.5% NLM was the highest (62.5g) while the kits from does fed T2 diet had the least average birth weight value (50g).

Discussion

It has been documented that the best way in assessing the suitability of a feeding material in rabbit nutrition is to integrate it to the rations of the rabbit in varying levels and at the same time ensuring that all nutrients required by the animal were supplied by the composite and the measure of performance to know the optimum inclusion level (Dauda *et al*., 2009).

The initial and final weights of the rabbits showed no significant ($p>0.05$) differences, these revealed that weight of the rabbits

used in the study was not a source of biasness in relation to other results from the study. Generally poor feed efficiency obtained in this present study might be due to genetic differences, reduced palatability of the diet (Kakengi *et al.,* 2003) and probably feed wastage by the rabbits. The breeding efficiency ranges from 16.67 to 83.33% in this study, this might be as a result of unsuccessful mating or an intrinsic factor with some of the does on 7.5% Neem leaf meal. This suggests that the Neem leaf meal diets did not provide enough nutrients for maintenance and reproduction of the rabbits. This result disagrees with the 67 to 100% conception rate reported by Abdelli-Larbi *et al*. (2014) in New Zealand White breed of rabbits and the study of Odeyinka *et al*. (2008) who fed Moringa leaf in place of *Centrosema pubescens*. Gestation duration ranged from 31 to 32 days in this present study which is in line with 30.50±0.35 days to 31.50±0.00 days reported by Imasuen *et al.* (2001) on rabbits fed some tropical leafy forage. Ajayi *et al.* (2005) enthused that gestation length in rabbit is fixed and only varies within a very narrow gap as observed in this study. The observed zero pre-weaning loss recorded in T4 with the lowest litter size is in agreement with the observation of Schloant (1980) who stated that most cases of pre-weaning kit mortality occurred because of inadequate milk production by does.

The highest numerical value recorded for litter size at birth and weaning for does on 2.5% NLM shows that this inclusion level of Neem leaf meal had no negative influence on the litter size of rabbit does.According to Inglis (1980), litter size and birth weight vary depending on the breed and size of the dam. Factors that increase litter size include the age at which the does are served and the optimum weight at service, which is an index of breed (Hafez and Hafez, 2000). The lowest birth weight recorded in T2 is in conformity with the earlier report by Hafez and Hafez (2000) who reported decrease in birth weight with increase in litter size. These workers attributed the weight advantage to competition for nutrients and the lesser inter-uterine space in cases where does carry more foetuses. Eze *et al.* (2009) observed that in rabbits the blood supply to each implantation site is reduced when the number of foetus increases.

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