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# EFFECT OF VARYING LEVELS OF INCLUSION OF SHEA NUT (*Vitellaria paradoxa*) MEAL ON THE REPRODUCTIVE PERFORMANCE AND MORTALITY RATE OF RABBIT (*Oryctolagus cunniculus*).

BY

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## ABSTRACT

Twenty (20) rabbit does aged between 4 – 5 months with average body weight of 1. 75 kg, were used to study the effect of feeding varying level of inclusion of shea nut meal (SNM) on the reproductive performance of doe rabbits. The does were randomly assigned into five groups comprising four rabbits each and were fed diets designated $T_1$, $T_2$, $T_3$, $T_4$ and $T_5$ which contained varying level of SNM. $T_1$ which served as control, had 0% SNM while $T_2 - T_5$ had 10, 15, 20 and 25% SNM, respectively. Parameters measured were gestation length, litter size, litter weight, kitten mortality, and milk yield. The result obtained indicated no significant ($P<0.05$) difference in litter size and milk yield. However, birth weight of kitten, mortality and gestation length differed significantly ($P<0.05$) among the different groups. Does on $T_3$ recorded the highest birth weight (3.50 kg) and the least mortality rate (7.14 %). Does in $T_4$ and $T_5$ which had higher levels of SNM recorded a lower kitten birth weight (2.50 kg, respectively), higher mortality (50.00 % and 41.18 %) and higher gestation length (31.33 and 30.33 days). Does fed $T_1$ which served as the control diet produced kittens with the least birth weight (1.75 kg). Kittens in this group recorded the highest mortality rate (70 %). It was concluded that up to 15 % of SNM can be incorporated into the diet of rabbits without any adverse effects on reproductive parameters.

**Keywords**: Shea Nut Meal (SNM), Rabbits, Reproduction, Mortality.

## INTRODUCTION:

Domestic rabbits (*Oryctolagus cunniculus*) are emerging viable species which can be successfully raised on diets that are low in grain and high in roughage (Cheeke, 1986[a]). They are well adapted to backyard rearing system and do not require much capital. Rabbits are herbivores and have a number of specific characteristics such as small body size, short generation interval (28–23 days) and rapid growth rate (Cheeke, 1986[b]). In view of the above qualities, the rabbit, if successfully reared, can help to solve the problem of protein malnutrition that is currently afflicting developing countries.

This problem is further heightened by the strong competition that exists between man, animals and industries for the few available conventional protein sources and has led to the escalating cost of conventional feed ingredients which has incurred feed cost to above 70 % of the total cost of production (Akinmutimi, 2004) and has served as the strongest motivation for continuous research into alternative feedstuffs that can meet the nutritional requirement of livestock and reduce cost of feed and animal production.

Proteins are essential organic constituents of living organisms and can be synthesized by all living cells. Lower dietary protein is likely to reduce the productive and reproductive performance whereas excess dietary protein would increase production cost. Cheeke *et al.* (1982) identified nutritional status, parity and environment among other factors influencing litter traits of breeding does which are very important features that determine the efficiency of rabbit production (Olubole and Akinokun, 1991). Inadequate nutrition may also lead to ovarian inactivity and caesation of oestrus in severe cases and consequently, low litter size which result in low production (Ezekwe *et al.*, 2005).

Shea butter cake (SBC), a waste product of the indigenous technology for extraction of fat from the seed of shea butter tree (*Vitellaia paradoxa*) remains under exploited, judging from the scanty information on its utilization in livestock species (Morgan and Trader, 1980). About 500,000 million tones of SBC are produced annually in the savanna region of West Africa (Okai and Bonsi, 1989). Unfortunately, they are usually disposed via incineration without attracting any financial benefit. Since it in readily available in Minna and its environs, this study sought to evaluate the effect of inclusion of varying levels of shea nut cake on the gestation length, litter size, litter weight, kitten mortality and milk quality of dams.

## MATERIALS AND METHODS

The experiment was conducted at the rabbitary unit of the Veterinary Centre, Minna. Nigeria. Minna is situated on latitude 9`37$^0$ North and longitude 6` 33$^0$ East of the equator with a mean annual rainfall of 1,200 - 1,300 mm and mean temperature of 38 – 42 $^0$C. It falls within the southern guinea savanna agro climatic zone and is characterized by a distinct wet (March – October) and dry (November – March) season.

Twenty (20) rabbit does purchased from Minna and its environs were used for this study. The rabbits were aged 4 – 5 months and weighed an average of 1.75 kg. They were randomly assigned to five Treatment groups designated $T_1$, $T_2$, $T_3$, $T_4$ and $T_5$ of four does each, and fed diets formulated to contain 0, 10, 15, 20 and 25 % SNC, respectively. Water was provided *ad libitum* and normal routine management practices were employed (Table1).

The parameters measured were feed intake, Gestation length, litter size, litter weight, litter mortality and milk yield which was estimated using the equation proposed by Nguyen *et al.* (2000). Data obtained were subjected to analysis of variance (ANOVA) using MINITAB (2003) while means were separated using Duncan's Multiple Range Test as described by Steel and Torrie (1995).

**Table 1: Composition of the experiment diets (%) fed to rabbit does.**

| Ingredients | Diets | | | | |
|---|---|---|---|---|---|
| | T1 | T2 | T3 | T4 | T5 |
| Maize | 60.54 | 50.99 | 44.65 | 41.42 | 36.66 |
| Ground cake | 25.21 | 24.76 | 26.11 | 24.33 | 24.09 |
| Rice offal | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 |
| Shea nut cake | 0.00 | 10.00 | 15.00 | 20.00 | 25.00 |
| Salt | 0.50 | 0.50 | 0.50 | 0.25 | 0.50 |
| Lysine | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Methionine | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Vit/Min * | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Bone | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| Total (Kg) | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Crude protein (CP %) | 17.99 | 18.00 | 18.01 | 18.00 | 17.99 |

***Vit/Min Composition**: To provide vitamin and mineral per 2.5kg diet. Vit. A contains 8,000.000.00 I.U Vit $D_3$ 1,500,000.00 I.U Vit. E 7,000.00 Mg, Vit. $K_3$ 1,500.00 Mg, Vit.$B_1$ 2,000 Mg, Vit. $B_2$ 2,500.00 Mg, Niacin 15,000.00 Mg, antithetic Acid 5,500.00 Mg, Vit. $B_6$ 2,000.00 Mg, Vit. $B_{12}$ 10.00 Mg, Folic acid 500.00 Mg, Biotin 12,250 Mg, Choline chloride 175,000.00 Mg, Cobalt 200.00 Mg, copper 3,000.00 Mg, Iodine 1,000.00 Mg, Iron 21,000.00 Mg, Manganese 40,000.00 Mg, Selenium 200.00 Mg, Zinc 31,000.00 Mg and Antioxidant 1,250 mg respectively.

## RESULT AND DISCUSSION

Although significantly higher values were recorded for feed intake in does fed shea nut meal (SNM) based diets compared with the control, feed conversion ratio as well as body weight did not differ significantly ($P>0.05$) between the treatments and control groups (Table 2). This result agrees with that of Liyod *et al.*, (1998) who reported that at maturity, body weight of animal may not increase anymore irrespective of the quality of diet offered.

There was significant ($P<0.05$) differences observed in the values of litter birth weight across the treatment groups. Kittens in $T_3$ (15 % SNM) recorded the highest body weight at birth (3.50 kg) while those in the control group ($T_1$) had the least birth weight (1. 75 kg) (Table 3). Body weight gain of kittens appeared to be better in the treatment groups than the control whose diet lacked SNM. This was in line with the observation of Atuahene *et al.* (1998) who observed a significant relationship between body weight gain and shea nut cake ($r = 0.97$) in animals. The trend observed for body weight gain in this study may be attributed to the processing methods of sun–drying and roasting which were both used in detoxifying and reducing the anti–nutritional factors of the SNM before incorporation into the ration. In this study, gestation length was observed to increase significantly ($P<0.05$), as the level of SNM rose. Contrary to the findings of Hasanat *et al.* (2006) who did not observe any significant ($P<0.05$) difference in the average gestation length of rabbits.

Milk yield did not differ significantly (P>0.05) between the treatments and control groups, even though the highest kitten birth weight was recorded in $T_3$. The anti - nutritional factors present in the feed as a result of inclusion of SNM might have been optimally beneficial to the animals, thereby enabling their ability to utilize feed for growth, reproduction and milk secretion which the kittens had assess to. AOAC (1999) stated that high amount of anti- nutrients would affect homeostasis of zinc and iron, inhibit enzymatic digestion of protein by forming complexes with large quantities of protein and would be toxic to the body. This may be responsible for the decreased mortality of kittens from does fed 15 % SNM inclusion compared to mortality of kitten from does fed 0 % SNM (control).

**Table 2: Performance of rabbit does fed varying levels of shea nut meal**

| Parameters | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | SEM | LS |
|---|---|---|---|---|---|---|---|
| Initial body weight (kg) | 1.89 | 2.26 | 1.25 | 1.60 | 1.75 | | |
| Final body weight(kg) | 2.20 | 2.26 | 1.53 | 1.95 | 2.10 | | |
| Body weight gain (kg) | 0.31 | 0.50 | 0.28 | 0.35 | 0.35 | 0.05 | NS |
| Feed intake (kg) | $0.06^{C}$ | $0.07^{b}$ | $0.07^{b}$ | $0.08^{a}$ | $0.08^{a}$ | 0.98 | * |
| F.C.R (kg) | 0.19 | 0.14 | 0.25 | 0.23 | 0.23 | 3.52 | NS |

$^{a,b,c}$ Means with different superscripts in the same column are significantly different. ($p<0.05$)
SEM (Standard Error Mean)
LS (Level of significant)
* (significant $P< 0.05$)
NS (Not significant $P > 0.05$)

**Table 3: Reproductive parameter of does with experimental diet.**

| Parameters | Experimental diets T1 | T2 | T3 | T4 | T5 | SEM | LS |
|---|---|---|---|---|---|---|---|
| n | 4 | 4 | 4 | 4 | 4 | | |
| Number Kindled | 2 | 3 | 2 | 3 | 3 | | |
| Percentage Kindled (%) | 50 | 75 | 50 | 75 | 75 | | |
| Mean Gestation Length (days) | $30.00^{b}$ | $30.00^{b}$ | $30.50^{ab}$ | $31.33^{a}$ | $30.33^{ab}$ | 0.18 | * |
| Mean Litter Size | 5.00 | 6.00 | 7.00 | 5.33 | 5.67 | 0.32 | NS |
| Mean Birth Weight Of Kittens (kg) | $1.75^{b}$ | $2.50^{b}$ | $3.50^{a}$ | $2.50^{b}$ | $2.50^{b}$ | 16.47 | * |
| Milk yield (glday) | 0.11 | 0.15 | 0.10 | 0.20 | 0.13 | | NS |

$\overline{n}$ = Number of rabbits
a, b and c = Means on the same row with different superscripts differ significantly ($p<0.05$)
* = significantly different ($p < 0.05$)
NS = not significant ($p > 0.05$)
SEM = Standard error of mean
LS = Level of significance

**Table 4: Mortality record of Kittens**

| | Experimental diet | | | | |
|---|---|---|---|---|---|
| Parameters | T1 | T2 | T3 | T4 | T5 |
| Total number of Kittens / treatment | 10 | 18 | 14 | 16 | 17 |
| Total number of Kittens lost/treatment | 7 | 6 | 1 | 8 | 7 |
| Percentage Mortality (%) | 70.00 | 33.33 | 7.14 | 50.00 | 41.18 |

## CONCLUSION AND RECOMMENDATION

Result from this study revealed that feed intake of does, kitten birth weight, body weight gain of kitten and kitten mortality were better in the treatment groups that had varying levels of shea nut meal in their diet than the control. Gestation length, however, appeared to be only a few hours longer in the does fed SNM based diet. On the basis of the above, it is recommended that up to 25 % of SNM can be incorporated into the diet of rabbits without any deleterious effect on the overall performance of rabbits.

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