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# REPRODUCTIVE PERFORMANCE OF RABBITS FED VARYING LEVELS OF SOYA BEAN MILK RESIDUE

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**Abstract**
*Twenty (20) female rabbits of mixed breeds aged between 5- 6 months were used to evaluate the reproductive performance of rabbits fed Soya bean Milk Residue (SBMR). They were divided into five dietary groups; formulated with soya bean residue replacing Groundnut Cake (GNC) as a source of protein at 0 %, 8 %, 16 %, 24 %, 32 % levels respectively. The litter size, birth weight, gestation gain, gestation length, kindling loss, neo natal mortality and coefficient of milking capacity were not affected ($p>0.05$) by the dietary treatment. However, significant ($p<0.05$) differences were observed in litter size at weaning, weight gain of kittens, weight of kitten at weaning and survival rate to weaning. It was concluded that soya bean milk residue could be included in the diets of rabbit does up to 24 % without any deleterious effect on both pre-natal and post-natal performance of kittens.*

**Key words: Rabbits, soya bean milk residue, reproduction.**

## Introduction

In developing countries, the rapid growth in human population coupled with the competition between human and animals for the few available conventional feed ingredients has necessitated the search for alternative sources of protein to meet up the population challenges. Economic indices indicate that as this population trend continues, more people are to be fed and Agriculture outputs needs to be increased rather through food importation into such countries (Allen, 1993). In order to maximize food production and meet animal protein requirements, viable options need to be explored and evaluated (Owen *et al.,* 2008).These options include the rearing of animals with short gestation periods such as rabbits. The rabbit (*Oryctolagus cuniculus)* is the most productive meat producer among all domesticated animals whose feeding habits offer no appreciable competition with man simply because it can subsist on greens as basal diets. Rabbit meat is acknowledged as being cheap and of high quality protein (about 22 %) and low in fat (4 %) and cholesterol (5 %) (Jones, 1990; Handa *et al.,* 1995) and thus possesses health promoting qualities (Aduku and Olukosi,1990).

Growing rabbits can be maintained satisfactorily on diets of 100-200 g green roughage and 40-60 g of concentrate mixture for maximum production (Ranjhan,1980) and about 4 months are required to produce a 2 kg market rabbit under subsistence condition (NRC, 1990). In addition to this, rabbits have a number of other characteristics that might be advantageous to subsistence farming system such as their small body size and short generation interval with a relatively short gestation period average of 30-31 days. The daily weight gain is high in proportion to the body weight which gives them a rapid growth rate, and sexual maturity is early. These factors result in the rabbit reaching the weight of a sexually mature animal 30% faster than other animals (Ajayi *et al.,*2005) and also make rabbits suitable as meat producing small livestock in developing countries (Arijeniwa *et al.,*2000).

Rabbit grow fast like broiler chickens and can utilize feed protein more efficiently than broilers. Improving the nutrition of breeding females is of primary importance for increasing the productivity of domestic rabbit (Ren *et al.,* 2003). Supplementation with soya bean meal as a source of protein has been suggested for enhanced growth and reproductive performance of rabbit (Rahim *et al.,*1997). The nutrition of rabbit in Nigeria is primarily based on *Tridax procumbens* and or *Centrosema pubescens* whose growth and availability in the dry season cannot sustain all-year rabbit production (Odeyinka *et al.,*2007). Soya bean belongs to the family of *fabaceae* and the kingdom of *plantae.* It is a specie of legume native to Africa. It plays an important role in livestock feeding by providing a reasonable animal protein The by-product of turning soya beans into soya beans milk or tofu which is the ground up fibrous part of the beans is referred to as soya bean milk residue. The soya beans milk residue is a nutritional powerhouse containing soluble and non-soluble fibre, protein, calcium and other minerals (Yang, 2005). However, the use of soya bean milk residue in livestock feeding has not been well documented, rather, it is discarded as waste following soya bean milk extraction. This study will evaluate the reproductive performance of rabbits fed soya bean milk residue.

## MATERIALS AND METHODS

The study was carried out at the Rabbitry unit of the Ministry of Livestock and Fisheries, Minna, Niger State. Minna is located in the Southern Guinea savannah vegetation belt of Nigeria between

longitude $6^0$32 ' E and latitude $9^0$37 ' N, at an elevation of 258.5 m above sea level. Its mean annual rainfall is about 1312 mm, its annual temperature ranges from 19 - 37 $^0$C. Minna is characterized by two seasons, the wet season (April – October) and the dry season from November to March ( Federal University of Technology, Minna Student Handbook ,2008).

Twenty (20) female rabbits of mixed breed, obtained from Minna and its environs, and aged 5 - 6 months were used in the study which lasted for three months. Soya bean milk sievate was collected free of charge from within Minna. The sievate was air dried and ground afterwards to make it into a powdery, ready to use form to be included in the feed composition. The rabbits were randomly assigned in a complete randomized design into five dietary groups; T1, T2, T3, T4 and T5 formulated with soya bean residue replacing groundnut cake as a source of protein at 0%, 8%, 16 %, 24%, 32% level, respectively and were isonitrogenous and isocaloric. The rabbits were housed individually in metallic cages provided with feeders and drinkers. The major source of energy in the diet was maize, while rice bran served as source of fibre. Other ingredients used include bone meal, vegetable oil, salt, premix, lysine and methionine (Table 1). All routine management practices were carefully observed.

Data were collected on the following birth traits: Litter Size at Birth (LS), Litter Birth Weight (LBW), Gestation Length (GL), Gestation Gain (GG), Kindling Loss (KL), Neo- natal Mortality (NNM), Coefficient of milking capacity (M) and Weaning traits: Litter Size at Weaning (LSW), Litter Weight at Weaning (LWW), Litter Weight Gain (LWG), Weaning Sex Ratio (WSR) and Survival Rate to weaning (SRW) in the experimental rabbits. Data collected were subjected to one way analysis of variance. Duncan's multiple range tests was used to separate means using SPSS 16.0 (2006)

**Table 1. Composition of the experimental diets**

| | DIETARY TREATMENT | | | | |
|---|---|---|---|---|---|
| **Ingredients** | **0 %** | **8 %** | **16 %** | **24 %** | **32 %** |
| Maize | 42.86 | 37.67 | 31.94 | 30.08 | 28.91 |
| GNC | 28.72 | 22.99 | 17.63 | 11.90 | 6.15 |
| Rice bran | 22.17 | 25.09 | 28.18 | 27.77 | 26.69 |
| Vegetable oil | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| SBMR | 0.00 | 8.00 | 16.00 | 24.00 | 32.00 |
| Bone meal | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| Salt | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Premix | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Methionine | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Lysine | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Total | 100 | 100 | 100 | 100 | 100 |
| **Calculated analysis** | | | | | |
| Protein | 18.10 | 18.01 | 17.99 | 18.01 | 18.00 |
| Metabolizable Energy (kcal/kg) | 2379 | 2371 | 2316 | 2309 | 2301 |

**GNC-** groundnut cake **SBMR-** soyabean milk residue

***Vitamins: A = 10,000IU; $D_3$ = 2,000IU; E = 5IU; K = 2mg; Riboflavin = 4.2mg; $B_{12}$ = 0.01mg; Pantothenic acid = 5mg; Nicotinic acid = 20mg ; Folic acid=0.5mg.***

***Minerals: Se = 100mg; Cu = 1.0mg; Fe = 20mg; Iodine = 0.8mg; Choline = 3mg; Mg = 56mg; Co = 1.25mg; Lysine, Methionine and Tetramycine (Broad-spectrum anti-biotics and growth promoters).***

**RESULTS AND DISCUSSION**

The proximate composition of the soyabean milk residue and experimental diets as presented in Tables 2 and 3 revealed that soya bean milk residue is very rich in crude protein (34.47 %) and crude fibre (26.00 %) with low level of ether extract (8.50 %). These high levels of protein and fibre are qualities that portray SBMR as an ideal feed ingredient for rabbits. The same trend was observed with the formulated feed where crude protein, crude fibre and ash content were high. The high crude protein and fibre values of SBMR means it is adequate for both growing and breeding rabbits. The high values are in agreement with Pyke *et al.* (1981) and Okoye *et al.* (2008) who reported that legumes are good sources of ash, protein and fibre. The value obtained for crude protein was high and falls within the range of 9 – 20 % and 18.56 % reported by Dairo (2008) and Esonu *et al.* (2006) who fed dried bovine rumen digesta to growing rabbits and broiler finisher respectively.

Table 4 which shows the results obtained for birth traits of rabbits fed varying level of soya bean milk

residue revealed that there were no significant ($p>0.05$) differences among the mean values obtained for all the parameters measured ( litter size at birth, litter birth weight, gestation length, gestation gain, kindling loss, neonatal mortality and coefficient of milking capacity). However, Table 5 showed that the values of the average litter size at weaning (LSW), litter weaning weight (LWW), litter weaning weight gain (LWG) and survival rate to weaning (SRW) differed significantly ($P<0.05$), revealing better performance with rabbits fed the test diets. SRW and LSW improved with addition of SBMR while LWW and LWG were significantly ($P<0.05$) better in rabbits fed the diets with 8 % and 16 % SBR level of inclusion. 'The better survival rate to weaning observed in rabbits on the 16% SBMR diet may be attributed to the lower number of kittens in that treatment which paved way and easy access to does nipples without much competition among the kittens thereby enhancing their chances of surviving. Similarly, increase in the average litter size at weaning with increasing level of SBMR in the diet may be attributed to the high level of crude protein and crude fibre in SBMR. According to Aganga *et al.*(1998), crude protein plays an important role in ovulation rates, fertility, development as well as litter size and has an important role in cell growth and transportation of substances in the body.Peteducation.com (2011) reported that because of the unique nature of the digestive system of rabbit, they require diets that are high in fibre while Ngu (2001) noted that high dry matter intake can be improved by supplementary feed with high fibre content.This in turn could facilitate the performance of rabbits

**Table 2.Proximate composition of soya bean milk residue (%)**

| Composition | Soya bean milk residue (%) |
|---|---|
| Dry Matter | 94.1 |
| Moisture | 5.9 |
| Crude Protein | 34.47 |
| Crude Fibre | 26 |
| Ether Extract | 8.5 |
| Ash | 6.5 |
| Nitrogen Free Extract | 18.63 |
| Metabolizable Energy (Kcal/Kg) | 2998.9 |

## CONCLUSION AND RECOMMENDATION

Based on the results of this study, it is concluded that replacing of groundnut cake with soya bean milk residue as a source of protein has no harmful effect on the birth traits of rabbits, Also, up to 24 % level of soya bean milk residue can be included in the diet of rabbits to achieve a good reproductive performance.

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**Table 3. Proximate composition of experimental diets**

| | DIETARY TREATMENTS | | | | |
|---|---|---|---|---|---|
| **Parameters** | **0%** | **8%** | **16%** | **24%** | **32%** |
| Dry matter | 94.2 | 93.8 | 94.8 | 93.5 | 94.3 |
| Moisture content | 5.8 | 6.2 | 5.6 | 6.5 | 5.7 |
| Crude protein | 18.16 | 17.73 | 17.9 | 17.26 | 18.26 |
| Crude fibre | 13.4 | 13.8 | 12.8 | 13.6 | 13.4 |
| Ether extract | 11.86 | 12.27 | 10.2 | 11.96 | 13.18 |
| Ash content | 19 | 19.38 | 18.5 | 18.42 | 18 |
| Nitrogen free extract | 31.78 | 30.62 | 35.4 | 32.26 | 31.46 |
| Energy (kcal/Kg) | 3185 | 3118.3 | 2934 | 3069.2 | 3091 |

**Table 4. Birth traits of rabbits fed varying levels of inclusion of soya bean milk residue.**

| | **DIETARY TREATMENT** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Parameters** | **0 %** | **8 %** | **16%** | **24%** | **32%** | **SEM** | **LS** |
| Litter size at birth | 12 | 12 | 10 | 12 | 12 | 0.32 | NS |
| Litter birth weight (g) | 49.75 | 56.25 | 57.75 | 54.25 | 46.50 | 1.59 | NS |
| Gestation gain (kg) | 0.28 | 0.32 | 0.39 | 0.36 | 0.21 | 0.04 | NS |
| Gestation length (Days) | 30 | 31 | 30 | 31 | 30 | 0.11 | NS |
| Kindling loss (kg) | 0.26 | 0.26 | 0.31 | 0.29 | 0.18 | 0.02 | NS |
| Neo natal mortality (%) | 6.25 | 6.25 | 0.00 | 2.08 | 4.17 | 1.41 | NS |
| Coefficient of milking capacity | 0.31 | 0.29 | 0.28 | 0.27 | 0.28 | 0.08 | NS |

**Table 5. Effect of feeding SBMR on weaning traits of rabbits**

| | **DIETARY TREATMENT** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Parameters** | **0%** | **8%** | **16%** | **24%** | **32%** | **SEM** | **L** |
| Average Litter Size at Weaning(LSW) | $9^{b}$ | $9^{b}$ | $10^{ab}$ | $11^{a}$ | $10^{ab}$ | 0.34 | * |
| Litter Weaning Weight (LWW) (kg) | $0.56^{b}$ | $0.67^{a}$ | $0.61^{ab}$ | $0.55^{bc}$ | $0.50^{c}$ | 0.02 | * |
| Litter Weaning Weight gain (LWG) (kg) | $0.51^{b}$ | $0.61^{a}$ | $0.56^{ab}$ | $0.50^{b}$ | $0.47^{c}$ | 0.22 | * |
| Survival Rate to Weaning (SRW) (%) | $70.83^{c}$ | $79.17b^{c}$ | $100.00^{a}$ | $91.67^{ab}$ | $87.50^{b}$ | 5.17 | * |
| Weaning Sex Ratio (Male: Female) | 5:04 | 6:03 | 3:07 | 4:07 | 6:04 | 23 | |


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