

REPRODUCTIVE PERFORMANCE OF RABBITS ADMINISTERED GRADED DOSES OF TIGER NUT (*Cyperusesculentus*) EXTRACT

Adama, J.Y., Idris, F. M and Usman, A.

Department of Animal Production, Federal University of Technology, Minna

ABSTRACT

A total of 60 rabbits (36 does and 24 bucks) of mixed breeds, aged between four to five months were used to determine the effect of tiger nut extract on reproductive performance of rabbits for 12 weeks. They were randomly allotted into four treatment groups, each with three replicates of three does with two buck per replicate. The crude tiger nut extract was measured at 0 g, 2 g, 4 g and 6 g soaked in 20 ml of fresh water for an hour to mixed very well and then administered to the animals as treatment T_1 , T_2 , T_3 , and T_4 , respectively. The extracts were administered to the animals daily through oral gavage, throughout the experimental period. Reproductive performance parameters measured were mating frequency, pregnancy rate, gestation period, litter size, litter mortality rate, progesterone and testosterone levels. Progesterone levels in does and testosterone levels in bucks were measured using Enzyme Linked Immunosorbent Assay (ELISA) technique. The results showed no significant ($p > 0.05$) differences in gestation period, litter size, and pregnancy rate. However, significant ($p < 0.05$) differences were observed in frequency of mating with 6g showing a significantly lower values (1.00) when compared to T_1 (control) (1.86) and 2 g of tiger nut (1.43) but similar to rabbits given 4 g of tiger nut (1.13). The litter mortality rate obtained was 5.6, 6.66, 6.27 and 3.42 % for T_1 , T_2 , T_3 , and T_4 , respectively; 6 g had lower litter mortality rate when compared to other treatments. Significant ($P < 0.05$) difference were observed in progesterone and testosterone levels with rabbits given 6g revealing a significantly ($p < 0.05$) higher progesterone value (3.040) than other treatments at week 1 and 2; similar trends were observed in testosterone levels. But during pregnancy and lactating period at week 2, does on 2 g indicated significantly ($p < 0.05$) higher progesterone and testosterone values 2.81, and 10.15, respectively, when compared to the other treatment groups. Based on the result of this study, farmers are encouraged to feed rabbits with 6 g of tiger nut extract a week before mating for optimal reproductive performance as it has shown to enhance sexual drive.

INTRODUCTION

The low consumption of animal protein in Nigeria has become a challenge to animal nutritionist, particularly in less income earners (Obioha and Amaefule, 2005 and Akinola, 2009). In order to meet up with the animal protein needs of Nigerian populace, viable and sustainable options need to be explored and evaluated (Owen *et al.* 2008). Fast-growing livestock such as rabbits which have some characteristics that could be beneficial in the small-scale farming, integrated and subsistence farming system in less developed countries (Mailafia *et al.*, 2010).

The short gestation period, quick generation intervals and prolific nature of rabbits makes it suitable as a quick means of expanding animal protein intake of high

quality (Owen and Amakiri, 2010). For rabbit production to be significant in improving high quality protein consumption in Nigeria, certain factors of production such as reproductive performance must be considered.

It has been discovered that Tiger nuts possessed some bioactive compounds which are beneficial to body physiology; the milk of tiger nut is very rich in vitamin E, thus, serve as fertility booster in both women and men (Oyedepo and Odoje, 2004). The aim and objective of this research was to investigate the effect of tiger nut (*Cyperusesculentus*) extract on reproductive performance of rabbits.

MATERIALS AND METHODS

The experiment was conducted at the Rabbitry Unit of the Teaching and Research Farm of the Department of Animal Production, School of Agriculture and Agricultural Technology, Federal University of Technology Minna, Niger State.

Fresh tiger nuts were purchased from Kure ultra-modern Market, Minna, Niger state, Nigeria. The tiger nuts were screened and washed to remove sand and other debris, sun dried and pulverized into fine powder using pestle and mortar (Ekaluo *et al.*, 2015). The tiger nut powder was soaked in fresh water for 24 hours, mixed in every 4 hours then filtered and the filtrate was evaporated/concentrated using rotary evaporator, the crude extract were collected and kept in fridge at 4°C for future use.

A total of sixty (60) mixed breed rabbits (36 does and 24 bucks) aged between four (4) to five (5) months old were used for the experiment. They were allotted to four treatment groups each with three (3) replicates of three (3) does with two (2) buck per replicates in a complete randomised design (CRD).

Management of experimental animals

The animals were housed in a wooden hutch frame with wire mesh at the bottom, top and both sides of the hutches, the rabbits were allowed to acclimatize for a period of two weeks before the commencement of the experiment. The experimental animals were given Ivomectin and gendox for endo-parasites and ecto-parasites treatments. The animals were fed concentrate and mixed forages (Tridax and potato leaves) throughout the experimental period. Clean fresh water was also supplied *ad libitum*. The hutches, Feeders and watering trough of the experimental animals were regularly cleaned on a daily basis. The crude tiger nut extract was measured at 0g, 2g, 4g and 6g soaked in 20ml of fresh water mixed very well and then administered to the animals as treatment T₁, T₂, T₃ and T₄ respectively. The extracts were administered to the animals daily through oral gavage, throughout the experimental period in line with the procedure of (Ekaluo *et al.*, 2015). After a week of taking tiger nut extract the does were mated, by taking the does to bucks pen and all does were mated within a period of one (1) week. At 14 days after mating, pregnancy test were conducted by abdominal palpation. The non-pregnant animals were re-mated.

Data collection

- i. The pregnancy rate was calculated for each treatment as follows:
Pregnancy rate = $\frac{\text{number of pregnant does}}{\text{number of mated does}}$
- ii. Gestation length was determined by recording the difference between the date of successful mating and kindling date.
- iii. The litter size was determined by recording the total (alive and dead) number of kits at birth and 21 day. Litter weight was measured by carefully transfer of the kits into aad justed weighing pan and their weight were recorded.
- iv. Litter mortality rate was calculated as follows:
Mortality rate = $\frac{\text{litter size at 21 days}}{\text{litter size at birth}}$

Hormonal assay

One (1) ml of serum processed through 3mls of blood samples obtained from the experimental animals via the ear veins was used to analyse for progesterone levels in does and testosterone levels in bucks using Enzyme Linked Immunosorbent Assay (ELISA) technique, according to the method described by Ochei and Kolhatkar (2000).

Proximate analysis

The proximate analysis of the Tiger nut was determined in line with the method of AOAC (2003) standard procedure.

Statistical Analysis

Data collected were subjected to Analysis of Variance (ANOVA) using SPSS 16.0 (SPSS, 2007). Difference among treatment means were compared using Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

Proximate Composition of Tiger Nut

The result of the proximate analysis of tiger nut used in the study is shown in Table 1. The result shows that tiger nut contain 9.20 % moisture, 18.90 % crude protein, 9.14 % crude fibre, 1.50 % ash, 26.84 % fat, and 34.42 % nitrogen free extract. The crude protein of the experimental tested ingredients composition is in contrast to Agbabiaka *et al.* (2013); Ekeanyanwu and Ononogbu, (2010) who obtained 8.44 % and 8.07 % respectively. The crude fibre 9.14 %, ash 1.5 %, fat 26.84 % and nitrogen free extract 34.42 % is in agreement with composition obtained by Agbabiaka *et al.* (2013) who observed similar values.

Table 1 proximate composition of tiger nut

Parameters	Composition %
Moisture	9.20
Crude protein	18.90
Crude fibre	9.14
Ash	1.50
Fat	26.84
Nitrogen free extract	34.42

Reproductive performance of rabbits fed graded doses of tiger nut extract

The results of reproductive performance of rabbits fed graded doses of tiger nut extract are presented in Table 2. Significant ($P < 0.05$) difference was observed in frequency of mating, rabbits in the control group had significantly ($P < 0.05$) higher value than rabbits administered various doses of tiger nut extract. However those administered 5g of tiger nut had significantly ($P < 0.05$) lower value. The low mating frequency observed in rabbits administered 6g of tiger nut indicates that those administered 6g had higher sexual receptivity than other experimental groups, this result agrees with the findings of (Allouh *et al.*, 2015) who reported tiger nut to enhance sexual motivation and to improve the sexual performance in moderately active highly active rats. Litter mortality rate in rabbits administered 6g of tiger nut was significantly ($P < 0.05$) lower than the rest of the treatment groups. However those administered 2g and 4g did not show any significant difference among the groups. There were no significant ($P > 0.05$) difference observed in litter size, pregnancy rate, and gestation period. The litter mortality rate obtained in this study may be due to the effect of season and parity as indicated in this experiment took place during the harmattan period. Effects of season and parity order are important for rabbit management as higher litter mortality have been reported during winter months in does at the first kindling (Tuma *et al.*, 2010). Winter is somewhat similar to harmattan and hence the results on mortality observed in the current study are not too surprising.

Table 2 . Reproductive performance of rabbits administered graded doses of tiger nut extract

Parameters	0Gtn	2gTN	4gTN	6gTN	SEM	p- values
Frequency of mating (n)	1.86 ^a	1.42 ^b	1.13 ^{bc}	1.00 ^c	0.08	0.01
Pregnancy rate (%)	72.22	61.11	88.89	100.00	7.34	0.26
Gestation period(day)	30.60	31.50	30.57	33.33	-	-
Litter size (n)	2.71	1.57	3.13	2.00	0.39	0.52
Litter weight (g)	133.03	80.65	155.23	121.32	9.52	0.01
Litter mortality rate (%)	5.55 ^b	6.67 ^b	6.27 ^b	3.42 ^a	8.36	0.04

Means within a row with different superscripts differ significantly ($p < 0.05$).

TN = 0g of Tiger nut, 2gTN = 2g of Tiger nut, 4g TN = 4g of Tiger nut, 6g TN = 6g of Tiger nut

Progesterone and testosterone levels of rabbits fed graded doses of tiger nut extract

The results of progesterone and testosterone levels of rabbits fed graded doses of tiger nut extract are presented in Table 3. At the week 1 of the experiment, rabbits administered 6g of tiger nut had significantly ($P<0.05$) higher progesterone levels, there were no significant ($P>0.05$) difference in rabbits in the control, and those administered 2g and 4g. There were no significant ($P>0.05$) differences in testosterone across the experimental groups. At week 2 There were no significant ($P>0.05$) difference in progesterone levels across the experimental group. Rabbits administered 6g of tiger nut had significantly ($P<0.05$) higher testosterone level, however, rabbits in the control group and those administered 2g are comparable to those administered 6g and 4g of tiger nut, although those administered 4g had significantly ($P<0.05$) lower testosterone levels.

During pregnancy (from week 5) rabbits administered 2g of tiger nut extract had significantly ($P<0.05$) higher progesterone level, rabbits in the control group and those administered 6g shows no significant ($P>0.05$) differences, rabbits administered 4g had significantly lower progesterone level, however, rabbits in the control group and those administered 6g of tiger nut are comparable to both rabbits administered 2g and 4g. Furthermore rabbits administered 2g had significantly ($P<0.05$) higher testosterone level, there were no significant difference ($P>0.05$) between rabbits in the control, and those administered 4g and 6g of tiger nut. Lactating rabbits administered 4g had significantly ($P<0.05$) higher progesterone level, there were no significant ($P>0.05$) difference between control, and rabbits administered 2g and 6g of tiger nut. Also testosterone levels showed no significant ($P>0.05$) difference across the experimental groups.

The results obtained from this study showed that tiger nut had influence on progesterone and testosterone levels. During pregnancy particularly rabbits administered 2g of tiger nut showed increase levels of progesterone and testosterone, respectively. This agrees with the findings of Ekaluo *et al.* (2015) who reported that Serum testosterone levels increased significantly after tiger nut administration. Similarly, Oral administration of *tiger nut* improved reproductive functions in adult male albino rats by changing the plasma levels of gonadotropins, testosterone and sperm functions in a dose-dependent manner (Agbai and Nwanegwo, 2013).

Table 3: Progesterone and testosterone levels of rabbits administered graded doses of tiger nut extract

Exp. period	Parameters (ng/ml)	0gTN	2gTN	4gTN	6gTN	SEM	p-value
Week1	Progesterone	2.38 ^b	2.48 ^b	2.44 ^b	3.04 ^a	0.08	0.01
	Testosterone	5.30	4.77	4.83	5.67	0.10	0.07
Week2	Progesterone	2.40	2.20	2.40	2.33	0.05	0.52
	Testosterone	5.53 ^b	5.75 ^b	5.01 ^c	7.12 ^a	0.39	0.04
Pregnant rabbits	Progesterone	2.53 ^{ab}	2.81 ^a	2.35 ^b	2.53 ^{ab}	0.06	0.05
	Testosterone	8.00 ^b	10.15 ^a	7.33 ^b	7.91 ^b	0.29	0.02
Lactating rabbits	Progesterone	2.06 ^b	1.94 ^b	3.30 ^a	2.37 ^b	0.14	0.01
	Testosterone	5.50	5.75	6.32	6.32	0.22	0.56

^{a,b} Means within a row with different superscripts differ significantly ($p<0.05$)

0g TN = 0g of Tiger nut, 2g TN = 2g of Tiger nut, 4g TN = 4g of Tiger nut, 6g TN = 6g of Tiger nut

CONCLUSION

Tiger nut had a positive effect in the reproductive performance of rabbits. This was clearly demonstrated in T4 (6 g TN) that exhibited low mating frequency with resultant good pregnancy rate of 100 % when compared with the control that had 72.4%. The progesterone and testosterone levels increased significantly in rabbits administered 2g of tiger nut extract during pregnancy period when compared to the other treatments.

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