# Effects of Graded Levels of *Tridax Procumbens* on Semen Qualities and Morphologies of Rabbit Bucks

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## Abstract

The effects of graded levels of dietary *Tridax procumbens* (*T. procumbens*) on semen qualities and morphologies in the rabbit buck were investigated using a completely randomized design. Forty-eight (48) growing rabbit bucks of 16 to 18 weeks of age and weighing 1260 -1305 grams were used in the investigation. The rabbit bucks were randomly assigned to four dietary treatments of rabbits (12) per treatment and 4 replicates of 3 rabbits/replicate. The four treatments contained all nutrients at similar concentrations, except varied levels of dietary *T. procumbens* contents as: $T_1$ (negative control) contained 0g of the test ingredient, that is, *T. procumbens*. $T_2$, contained 200g of *T. procumbens*, $T_3$, contained 300g of *T. procumbens* and $T_4$, contained 400g of *T. procumbens*/kg of feed respectively.The rabbit bucktreatment groups received their respective diets for two months (8 weeks). Semen were collected from the bucks by teasing them with a doeusing artificial vagina.Each ejaculate was evaluated for pH, volume, motility, viability and morphology. There were no differences ($P > 0.05$) amongst treatments in semen pH. However, semenvolume, motility, viability and normal morphologies of rabbits increased linearly ($P <0.05$) as the levels of dietary *T. procumbens* increased; whereas, abnormal morphology of semen linearly ($P < 0.05$) decreased as the levels of dietary *T. procumbens* increased. It was concluded that *T. procumbens* can be used to improve semen quality and morphology of rabbit bucks.

**Key words**: *Tridax procumbens*, Semen, Quality, Morphology and Rabbit bucks

## Introduction

Rabbits have a short gestation period, early sexual maturity and ability to rebreed several times in a year generation interval (Sharp *et al*., 2007).Despite these reproductive advantages, rabbit

production has not achieved its full reproductive potentials due to some militating factors (Herbert and Adejumo, 1995).Poor reproduction and management systems, including nutrition and environmental factors, such as heat stress are some of the major militating factors (Gbadamosi and Egbunike, 1999). The efficiency of sperm production, libido and quality of sperm tend to enhance the productivity of an animal but may be significantly altered by age, nutrition, environment, health status, drugs, and chemicals (Togun and Egbunike, 2006). According to the data of Abdel-Azeem, (2010), adequate nutritional treatment has been used for improving reproductive efficiency of livestock including the use of selenium supplementation in rabbits. Furthermore, various plants' leaf meals have been employed in improving reproductive potentials in rabbits (Ogbuewu*et al*., 2012).

Plants such as *Tridax procumbens* contain several essential nutrients that can enhance growth and reproduction. *Tridax procumbens* leaf contains substances that influence steriodogenesis (Chew, 1993) which could have some effects on reproductive hormones such as oestrogen, testosterone and progesterone. Lack of smooth reproduction is one of the constraints to efficient rabbit production. The efficiency of sperm production, libido, and semen quality changes throughout the reproductive life of an animal is primarily due to nutrition and environment (Ifeanyi 2009). For example, in the tropics, high temperature hinders successful rabbit farming (Marai*et al.,* 2002).

An important limitation to rabbit production in hot climatic areas is heat stress. Susceptibility to heat stress produces a series of changes in biological functions which in turn lead to impairment of production and reproductive functions (Marai *et al.,* 2002). These detrimental effects are mostly evident during the hot season of the year, which is the breeding season of rabbits and also during the summer in the Northern hemisphere (Marai *et al.,* 2002).

*Tridax procumbens* is an herbaceous plant that is higly abundant in the tropics, including Nigeria. To these standpoints the potentials of *Tridax procumbens* need to be evaluated on the reproductive potentials of the rabbit buck. Therefore, the objectives of this study are to investigate the effects of graded levels of *Tridax procumbens* on semen qualities and morphologies of rabbit bucks.

## Materials And Methods

### *Experimental Site*

This study was carried out at the rabbitry unit of the Teaching and Research Farm, of the Rivers State University (RSU), Port Harcourt, Nigeria. The RSU farm is situated at latitude $4^0$48'North and longitude $6^0$48'East (Diri *et al*., 2023).

### *Animals and Management*

**P**rior to the introduction of the experimental rabbits to the experimental unit of RSU, the hutches, feeding and water troughs, including the floors were thoroughly washed with detergent and water and allowed to dry for one week. These were done to ensure good sanitary conditions as to eliminate or significantly reduce pathogenic microbes in the environment for the animals to avoid pathogenesis. Forty-eight buck New Zealand White rabbits of 16 to 18 weeks of age and weighing 1.26 -1.305 kg were used in the trial. Animals were pre-conditioned to their new environment for one week and were similarly managed prior to presenting them with their experimental diets. There were 12 rabbits per treatment with 3 replications of 4 rabbits per replicate.

### *Experimental Diets*

Pfizer grower mash feed supplemented with *Tridax procumbens* was used in the study. Four levels of *Tridax procumbens* were used resulting in four experimental diets as: Treatment 1 ($T_1$) contained no *Tridax procumbens* and served as the control diet. Treatment 2 ($T_2$) contained 200g of *T. procumbens*/kg of diet. Treatment 3 ($T_3$) contained 300g of *T. procumbens*/kg of diet and Treatment 4 ($T_4$) contained 400g of *T. procumbens*/kg of diet. Animals received their respective experimental diets for two months (8 weeks).

### *Semen Collection and Analysis*

Semen were collected between 9:00am and 10:00am at the end of the duration of the experiment. A doe was used to tease the bucks and then semen was collected using artificial vagina. Each of

the ejaculate were evaluated for quality and morphological parameters that includes: semen pH, volume, motility, viability, sperm count, normal and abnormal morphologies according to the method of Herbert and Adejumo (1995).

***Data Analysis***

Data obtained were subjected to analysis of variance (ANOVA) using the general linear model (GLM) procedure of SAS. Treatment means were compared using Tukey's test. The experimental design used was the completely randomized design with linear model:

$Yij = \mu + Ti + E_{ij}$; where

*Yij* = individual observation of any rabbit $j^{th}$ receiving the $i^{th}$ treatment

$\mu$ = Population mean; *Ti* = effect of the $i^{th}$ level of treatment (i=1,2,3,4); $E_{ij}$= error mean

An*α-level* of *0.05* was used for all statistical comparisons to detect significance.

**Results**

The results of feeding graded levels of *Tridax procumbens* on semen pH, volume, motility and viability on rabbit buck qualities are shown in **Table 1**.

**Table 1**. Mean semen pH, volume, motility, viability and sperm count of buck rabbits fed graded levels of dietary *Tridax procumbens*

| **TREATMENTS** | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **$T_1$** | **$T_2$** | **$T_3$** | **$T_4$** | **SEM** | ***P-value*** |
| Semen pH | 7.48 | 7.48 | 7.48 | 7.47 | 0.02 | 0.34 |
| Volume (ml) | $0.50^a$ | $0.86^b$ | $1.23^c$ | $1.96^d$ | 0.11 | 0.01 |
| Motility (%) | $56.65^a$ | $60.86^b$ | $74.00^c$ | $79.32^d$ | 1.32 | 0.001 |
| Viability (%) | $51.50^a$ | $56.75^b$ | $62.25^c$ | $68.56^d$ | 1.14 | 0.01 |
| Sperm count ($x10^3$ ejaculate$^{-1}$) | $386^a$ | $629^b$ | $646^b$ | $753^c$ | 16.28 | 0.001 |

$^{a,b,c,d}$Means with different superscripts within the same row differed significantly ($P < 0.05$)

Dietary *Tridax procumbens* had no effects (*P > 0.05*) on semen pH. However, there were significant (*P < 0.05*) differences in semen volume, motility, viability and sperm counts as dietary *Tridax procumbents* levels increased in the positive control treatment groups ($T_2$, $T_3$ and $T_4$), respectively compared to the negative control ($T_1$). The results of the effects of dietary *Tridax procumbens* on buck rabbit semen morphologies are presented in Table 2.

**Table 2**. Mean semen normal and abnormal morphologies of buck rabbits fed graded levels of dietary *Tridax procumbens*

**TREATMENTS**

| **Parameter** | **$T_1$** | **$T_2$** | **$T_3$** | **$T_4$** | **SEM** | ***P-value*** |
|---|---|---|---|---|---|---|
| Normal morphology (%) | $77.50^a$ | $83.50^b$ | $84.75^b$ | $92.50^c$ | 4.30 | 0.04 |
| Abnormal morphology (%) | $22.50^a$ | $16.50^b$ | $15.25^b$ | $7.50^c$ | 1.91 | 0.04 |

$^{a,b,c}$Means with different superscripts within the same row differed significantly (*P < 0.05*)

As was in the rabbit buck semen qualities, dietary *Tridax procumbens* had profound effects on rabbit buck semen morphologies. Dietary *Tridax procumbens* significantly (*P < 0.05*) improved normal morphology of rabbit buck, especially as the dietary levels of *T. procumbens* increased and simultaneously significantly (*P < 0.05*) reduced semen abnormality in the rabbit buck (Table 2).

**Discussion**

All rabbits used in the investigation were observed to be healthy throughout the study duration. Furthermore, they readily consumed their respective diets without any signs of rejection, suggesting that the test ingredient did not affect diet palatability. Fielding (1991) gave the average volume of rabbit semen as 0.6ml. Average sperm concentration is150 - 500 (x $10^6$) spermatozoa per ml (Lebas *et al.*, 1997). Therefore, the values obtained in this study are in tandem with the values of these workers. Normal sperm cells usually possess oval head with long tail while abnormal sperms have their heads or tails defects, such as large head, misshapen head, crooked tail or double tail and cytoplasmic droplet (Lebas *et al.*, 1997).

The speed at which the sperm ascends the female tract is apparently dependent on its motility and viability. It is imperative to state here that adequate nutrition is a major factor in attaining good quality sperm, particularly sperm motility, viability and concentration (Oyeyemi *et al.,* 1998) and reduces the number of abnormal sperm cells (Oyeyemi and Okediran, 2007).

The findings of this current study is in tandem with the data of these researchers, including those of Umesiobi *et al.* (2000) that reported that the parameters for measuring reproductive performance in the female animal include conception rate, litter size, milk production and fecundity whereas that of the males could be measured using the sperm concentration, sperm motility, live/dead spermatozoa and proportion of morphological deformed sperms. To these points, *Tridax procumbens* proved to be a good candidate in enhancing sperm qualities as well as normal morphologies of the sperm as it benefits the male rabbit as per semen volume, motility, viability and in maintaining normal morphologies. These findings in this study are in agreement with the data of Oyeyemi *et al.* (1998) and those of Oyeyemi and Okediran (2007).

The influence of nutrition on reproductive performance cannot be over-emphasized. El-Masry *et al.* (1994) that supplemented the diets of the male animal with a suitable supplement found increased total sperm concentration, semen volume, total live sperm concentration and sperm motility.Cajuday and Poscidio (2010) demonstrated that the administration of hexane extracted fraction of *Moringa oleifera*leaf enhanced development of seminiferous tubules, epididymis, testis and seminal vesicle in rats. These data again support the findings of this study as judged from the improved qualities of sperm and maintenance of normal sperm morphology when a suitable supplement is included in the diets of the rabbit buck as is the case of *Tridax procumbens i*n this study.

In a study (Odeyinka*et al.,* 2008) that evaluated the reproductive performance of rabbit does fed *Tridax procumbens* as a replacement for *Centrosemapubescens* offered to the animals at 2% of their live weights at the ratios of 100:0, 75:25, 50:50, 25:75 and 0:100 to the animals, respectively found differences in the dry matter intake of does on the different treatments observed that *Tridax procumbens* can be successfully used to replace *Centrosema pubescens* without any adverse effect on the reproductive performance of the does. These observations are

indications that *Tridax procumbens* could be used for both bucks and does to enhance their reproductive indices without any detrimental effects.

## Conclusions

Dietary *Tridax procumbens* prompted enhanced reproductive qualities and improved normal sperm cell morphology of the rabbit buck, especially at the inclusion level of 400g/kg of diet. Thus, the use of *Tridax procumbens* as dietary additive to improve reproductive potentials of the rabbit is recommended.

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