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THE TESTICULAR MORPHOMETRY AND SPERM QUALITY OF RABBIT BUCKS FED GRADED LEVELS OF *Moringa oleifera* LEAF MEAL (MOLM)

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ABSTRACT

In developing nations, Moringa oleifera leaves are used for their nutritional and medicinal values and are rich in minerals and vitamins. Twenty rabbit bucks of mixed breeds, aged four to five weeks which weighed between 627.4g to 631.5g were used to evaluate the effect of Moringa oleifera leaf meal (MOLM) on testicular morphometry and sperm quality. Five bucks were randomly assigned to each of the four diets containing MOLM at 0%. 5%, 10% and 15% levels of inclusion. After eight weeks of ad libitum feeding, the bucks were sacrificed and evaluated for testicular morphometry and epididymal sperm characteristics. No significant effect (p > 0.05) of diets was observed on all the parameters studied. The results show that MOLM had no adverse effect on the testicular morphometry and epididymal sperm quality of rabbit bucks at inclusion level of up to 15%. It is suggested that Moringa oleifera leaves could be used in rabbit diets.

Keywords: *Moringa oleifera*, rabbit, sperm quality and testicular morphometry.

INTRODUCTION

Moringa oleifera Lam. (Moringaceae) is shrub plant of about 7 meters tall, commonly called "drumstick" or "horse radish" (Anwar *et al*., 2007) and is native to India, but planted around the world. All of its parts are edible and have nutritional as well as medicinal values. According to Nouala et *al*. (2006), *Moringa oleifera* leaves when mixed with groundnut cake concentrate could improve its utilization. Experimental studies have confirmed the strong antibacterial activity of benzene, methanol and aqueous extracts of *Moringa oleifera* leaves, bark and seeds (Priya *et al*., 2011). Also, Tende *et al*. (2011) showed that the ethanolic extract of *Moringa oleifera leaves* possess hypoglycemic activity in STZ-induced diabetic Wistar rats. An *in vitro* study has validated the traditional use of Moringa leaf as an anti-cancer agent (Khalafalla *et al.*, 2011). Anti-trypanosomal (Mekonnen *et al*., 1999), anti-oxidant (Ogbunugafor *et al*., 2011) and hepatoprotective (Buraimoh *et al*., 2011) properties of this multi-purpose plant have been reported. Although there are reports on its traditional use as abortifacient or antifertility agent (Nath *et al*., 1992; Shukla *et al*., 1988; Tarafder, 1983), there is little or no information on the effect

of *Moringa oleifera* leaf meal on sperm quality of rabbit bucks. This study evaluated the testicular morphometry and sperm quality of rabbit bucks fed graded levels of *Moringa oleifera* leaf meal (MOLM).

MATERIALS AND METHODS

Location of the Experimental Site: The experiment was conducted at the rabbitry unit of the Livestock Teaching and Research Farm, University of Agriculture, Makurdi, Benue state with an average maximum and minimum temperature of 35º C and 40º C respectively. The state receives an annual rainfall of between 350 mm 378 mm and has a relative humidity of between 47 85 %.

Animals: Twenty male weaner rabbits of mixed breeds, weighing between 627.4g and 631.5g, were purchased from a breeder in Jos, Plateau state and used for this study. All the rabbits were kept individually in hutches measuring 65cm x 46cm x 55cm and raised 74cm above the ground level. All the hutches were kept under a single roof which afforded the animals protection against inclement weather. Metallic drinkers and feeders were provided in each cage. Before the commencement of the experiment, the animals were kept for two weeks to enable them acclimatize to their new environment.

Experimental design: At the end of the period of acclimatization, initial weight of each animal was obtained and thereafter, randomly allocated to four treatment groups with five rabbits per treatment. Each rabbit served as a replicate and was weighed weekly. Throughout the eight-week experimental period, the animals were provided known quantity of the experimental diet and cool clean water freely. The drinkers were washed daily and faecal droppings cleaned and properly disposed of.

Four diets, (each diet representing a treatment) were formulated. Treatment one (T1) which served as the control contained 0% Moringa oleifera leaf meal. For treatments two (T2), three (T3) and four (T4), the Moringa oleifera leaf meal was included at 5% 10% and 15% respectively (Table 1). Moringa oleifera leaves were obtained from different farms in Makurdi, dried under the shade and powdered into a meal.

Determination of testicular morphometric and epididymal sperm characteristics: At the end of the eight-week experimental period, three rabbits were randomly selected from each treatment and sacrificed. The scrotal sacs were incised to exteriorize the testes. The epididymides were carefully separated from the testes, blotted and trimmed free of connective tissues. The testes were weighed. Their volumes using Archimedes volume displacement, lengths and circumference were determined. The cauda epididymides were placed in beakers containing physiological saline (maintained at 37 ºC) and several lacerations were made on them to enable the spermatozoa swim out. Sperm motility was immediately determined by placing a drop of the suspension on a clean glass slide under the cover slip and viewed on a binocular microscope. Sperm motility was also assessed immediately by counting both motile and immotile spermatozoa per unit area at the magnification of ×40. Sperm count was done using the improved Neubauer's haemocytometer under the light microscope at ×400 magnification. The count was expressed as million/ml of suspension. Sperm viability was assessed using eosin-nigrosin test. The percentages of unstained (live) and stained (dead) spermatozoa were calculated by counting 200 spermatozoa

per sample. Morphological appearance of normal and abnormal spermatozoa was determined by examining stained smears under the oil immersion (×100) and their percentages were calculated.

STATISTICAL ANALYSIS

The statistical evaluation of data was carried out using Genstat Discovery Edition (Lawes Agricultural Trust Rothanmsted). The data was subjected to one way analysis of variance and means were separated using Duncan Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

The present study evaluated the testicular morphometry and epididymal sperm characteristics of rabbits fed graded levels of *Moringa oleifera* leaf meal. The mean testicular weights (Table 1) were not significantly (P>0.05) different, with the values ranging between 1.22 and 1.62 g. The results showed that *Moringa oleifera* leaf meal did not significantly (P>0.05) influence sperm motility of the rabbits and is in agreement with the similar report on sperm motility of rabbits fed graded levels of blood-sunflower meal (Ajayi *et al*., 2009). However, the present range of values (77 81%) is higher than the values (66 77%) obtained by Ajayi and co-investigators. Similarly, the results of this study are much higher than those reported by Abu and Uchendu (2010), who studied the antispermatogenic effects of aqueous ethanolic extracts of *Hymenocardia acida* stem bark on sperm motility of laboratory rodents and obtained values of 23 28%.

The results (Table 3) showed that there was no significant (P>0.05) influence of graded levels of *Moringa oleifera* leaf meal on sperm concentration of the rabbits. Ajayi *et al*. (2009) reported similar results when they conducted a trial on blood-sunflower leaf meal. Range of values (126 154 x10^6/ml) of sperm concentration obtained in the present study is higher than the values reported by Ajayi *et al*. (2009). However, a positive correlation was observed between inclusion levels of *Moringa oleifera* leaf meal and sperm concentration (r=0.44, Table 4), suggesting *Moringa oleifera* leaf meal might have increased the sperm concentration of the rabbits.

Results of this trial compare favourably with those of Nwagwu and Nzekwe (2006) who reported that feeding a combination of forage and concentrate is superior to feeding concentrate or forage alone with regards to the reproductive performance of the does or bucks. Although the sperm concentration of control rabbits is lower relative to those fed *Moringa oleifera* leaf meal, there was no corresponding increase when the rabbits were fed increasing inclusion levels of the meal. It is conceivable that the increase in sperm concentration might lead to higher fertility which is supported by the findings of Oyeyemi *et al*. (2008). The percentage of live spermatozoa which indicates sperm viability and possibly higher fertilizing capacity did not change significantly (P>0.05). The range of values (90.70 93.70%) for normal spermatozoa, which also indicates sperm viability and fertilizing capacity, did not change significantly (P>0.05) when the rabbits were fed graded levels of *Moringa oleifera* leaf meal.

The mean testicular weights of the rabbits in the treatment groups were not significantly different (P>0.05) from the control. However, the results showed positive correlation between levels of incorporation of *Moringa oleifera* leaf meal and testis weight (r = 0.68, Table 4). Morris *et al.* (1979)

reported that there is a correlation between testicular weight and sperm production. Although no significant (P>0.05) difference in the length of testis was observed, there was however, a slight increase in the range of values obtained (2.73 2.85 cm). According to Perry and Petterson (2001), testis length reflects the present and future sperm production as well as breeding quality of the male. The average testicular circumference with range of values between 1.47 and 1.80 cm did not differ significantly (P>0.05) between the control and the treatments. This is in agreement with the report of Iheukwuemere *et al*. (2008) on reproductive characteristics of male rabbits fed raw and boiled pigeon pea seed (*Cajanus cajan*) meal. This study has established the fact *M. oleifera* leaf meal did not adversely affect testicular morphometry and epididymal sperm characteristics of rabbits. The results of this study suggest that *Moringa oleifera* leaf meal could be included up to 15% in the diets of growing rabbits.

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Table 1: Percentage composition of experimental diets

Ingredient	T1	T2	T3	T4
Maize	35.00	35.45	35.25	34.00
Full fat soya bean	25.00	24.50	23.70	22.95
Maize bran	21.95	17.00	13.00	10.00
MOLM	0	5.00	10.00	15.00
Rice offal	15.00	15.00	15.00	15.00
Bone meal	2.50	2.50	2.50	2.50
Premix	0.25	0.25	0.25	0.25
Salt	0.30	0.30	0.30	0.30
Total	100.00	100.00	100.00	100.00
Calculated values				
Crude protei n %	17.07	17.09	17.06	17.06
Crude fibre %	9.24	9.25	9.34	9.51
Dry matter %	95.69	95.42	95.34	95.39
Calcium %	0.50	0.50	0.50	0.50
Phosphorus %	0.51	0.51	0.50	0.50
ME (kcal/kg)	2506.50	2521.51	2514.80	2514.10

Table 2: Testicular morphometry of rabbits fed *Moringa oleifera* leaf meal

Parameters	T1 (control - 0% inclusion)	T2 (5% inclusion)	T3 (10% inclusion)	T4 (15% inclusion)
Average testis weight (g)	1.39 ± 0.14	1.64 ± 0.05	1.58 ± 0.08	1.22 ± 0.15
Average testis length (cm)	2.62 ± 0.14	2.73 ± 0.04	2.88 ± 0.0003	2.78 ± 0.25
Average testis Circumference (cm)	3.05 ± 0.15	3.00 ± 0.10	2.98 ± 0.15	2.87 ± 0.18
Average testis volume (ml^3)	1.47 ± 0.17	1.80 ± 0.10	1.67 ± 0.17	1.47 ± 0.14

Table 3: Epididymal sperm characteristics of rabbits fed *Moringa oleifera* leaf meal

Parameters	T1 (control - 0% inclusion)	T2 (5% inclusion)	T3 (10% inclusion)	T4 (15% inclusion)
Sperm motility (%)	81.00 ± 3.51	77.67 ± 4.30	79.00 ± 0.58	77.00 ± 1.53
Sperm Concentration ($x10^6$/ml)	156 ± 3.53	163 ± 2.52	161 ± 2.50	160 ± 2.65
Live sperm cells (%)	83.30 ± 2.40	90.00 ± 1.41	84.30 ± 0.88	83.30 ± 1.76
Dead sperm cells (%)	17.00 ± 2.08	10.30 ± 1.32	15.70 ± 1.20	16.70 ± 1.76
Normal morphology (%)	93.00 ± 1.05	90.70 ± 0.67	93.00 ± 1.05	93.00 ± 0.58
Abnormal morphology (%)	7.00 ± 1.08	9.33 ± 0.88	6.33 ± 0.67	7.00 ± 0.58

Table 4: Correlation between levels of inclusion of *Moringa oleifera* leaf meal an`d testis parameters

Parameters	Correlation (r)
Moringa oleifera leaf meal and testis weight	0.68
Moringa oleifera leaf meal and sperm concentration	0.44
Moringa oleifera leaf meal and testis length	0.80
Testis length and sperm concentration	0.66
Testis length and testis weight	0.62
Testis volume and *Moringa oleifera* leaf meal	0.73

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