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Research Article

Testicular Characteristics and Daily Sperm Production of Rabbit Bucks Fed Diets Containing Neem (Azadirachta Indica A. Juss) Rind Meal

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ABSTRACT

Forty mixed breed pre – pubertal male rabbits were used to determine the effect of treated (24 hours soaked and 48 hours soaked in water) and untreated neem rind as inclusion at 10% in rabbits diet on performance (final weight gain, average daily weight gain, average daily feed intake and feed to gain ratio), reproductive characteristics and daily sperm production. Data were analyzed using analysis of variance. Significant ($p<0.05$) reduction was observed for testes weight, paired testes weight, relative testes weight, testes volume, testes density and daily sperm production from bucks both treated and untreated neem rind when compared to those on the control diet. Soaking neem rind in water up to 48hours appears not to reduce its anti-nutritional and anti-fertility principles.

INTRODUCTION

Within the past three decades, the interest of Nigerian animal producers like those elsewhere has been centered mostly on the search for cheaper feed ingredients that are always available and have no competition with man's dietary demands (Egbunike and Ikpi, 1988; Egbunike 1997). Recent research efforts in the nutrition of non-ruminants have focused on the use of agricultural by-products and residues, some of which are abundant and available all year round.

The utilization of these products in livestock feeds is subject to some inherent constraints; of particular importance are problems associated with procurement, storage, poor feed intake and high fibre content, all of which result in poor performance. Onifade and Tewe (1993) reported that tropical agricultural extraction industries turn out large number of by-product which feeding values are yet to be harnessed. Some agro- industrial by-product and plants have been used so far with varied degree of success. The neem tree and its products are presently being focused as potential ingredients for livestock nutrition.

The products of neem plant such as leaves, fruits, seeds, kernels, oils and cakes have been used to feed poultry, pigs, cattle and sheep with varied results. The neem rind (epicarp of neem fruit) has received less attention as a source of animal feed. The possibility of neem as animal feed source and its toxic effects have been reported. Neem extracts have been found to be toxic to Guinea pigs (NRC, 1992). Neem leaf meal has also been implicated for kidney damage when taken over a long period in human use (NRC.1992). Other trials have found no toxicity problems and satisfactory growth rate has been reported from rabbits fed neem leaf inclusion up to 10% in the diets (Sokunbi and Egbunike, 2002). Neem rind could be a promising candidate as it can be a cheap and all year round source of supplement for rabbit nutrition.

MATERIALS and METHODS

Preparation of experiment diets

Neem rinds were collected from under matured trees during the late rainy season (July - September). The neem rinds were spread out in the shade for 12 hours before sun drying. A portion of the sun dried neem rind was not treated (UNR). Second portion was soaked in water for 24hours and subsequently sun dried (TNR24). Third portion was soaked in water for 48 hours and subsequently sun dried (TNR48). Each portion was milled separately and stored in airtight containers. Samples were taken for proximate composition determination using the analytical methods of A.O.A.C. (1990). Table 1 shows the proximate composition of untreated, 24 hrs and 48 hrs treated neem rind.

Experimental Animals and management

A total of 40 mixed breed pre-pubertal male rabbits aged 12 weeks and weighing between 1000 – 1006g were randomly allotted to four diets (Table 2) in a completely randomized design. The rabbits were fed commercial rabbit grower's diet for two weeks to stabilize them and they were later placed on experimental diets for eight weeks. The animals were individually housed in washed and disinfected hutches, raised 90 cm above the floor, measuring 40 x 25 x25 cm and provided with wire screened floor which permit faeces and urine to drop. Each animal was provided with water trough and feeder. All were injected with ivomec^{R} (1ml/50kg) 2 weeks before experimental feeding. The experimental diets were offered *ad- libitum.* Records of feed intake and body weight changes were kept while feed conversion was calculated (Feed: weigh gain).

Puberty attainment was determined through penile smear. The animals were sacrificed by dislocation of the neck and the following parameters were measured:

Body weight: Differences in the body weight at the beginning and at the end of the experiment were determined.

Testes weight: Left and right testes were weighed separately and the results were recorded to the nearest 0.01g

Paired testes weight: Both left and right testes were weighed and the results were recorded to the nearest 0.01g

Volume of testes: The volume of left and right testes were determined separately using Archimedes' principle of water displacement. The results were recorded in milliliters.

$$\textbf{Relative testes weight} = \frac{\text{Paired testes weight} \times 100}{\text{Body weight}}$$

$$\textbf{Testes density} = \frac{\text{Testes weight}}{\text{Testes volume}}$$

Daily sperm production (DSP) determination

Testes of known weights were homogenized in normal saline solution with a dilution ratio 1:20 for each homogenate. Counting was done with an improved Neubauer haemocytometer.

DSP = Sperm count
Time divisor

A time divisor of 3.34 proposed by Amann (1970) was used.

Data analysis

Data were subjected to statistical analysis using one way analysis of variance (ANOVA) using SAS (1999) package.

Table 1: Proximate composition (%) of untreated and treated neem rind

Parameters	UNR	TNR24	TNR48
Dry matter	93.43	98.00	96.00
Crude protein	5.37	4.12	3.24
Crude fibre	9.66	12.46	12.97
Ether extract	2.26	1.52	0.94
Nitrogen free extract	74.23	72.02	72.52
Ash	8.66	9.88	10.33

Table 2: Composition of Experimental Diets (%)

Ingredients	Control	UNR	TNR24	TNR48
Maize	19.0	16.0	16.0	16.0
Groundnut Cake	10.0	14.0	14.0	14.0
Wheat Offal	20.0	10.0	10.0	10.0
Neem Rind Meal	-	10.0	10.0	10.0
Brewery Dried Grain	34.0	34.0	34.0	34.0
Palm Kernel Cake	6.0	6.0	6.0	6.0
Fish Meal	2.5	2.5	2.5	2.5
Palm Oil	4.0	3.0	3.0	3.0
Bone Meal	2.0	2.0	2.0	2.0
Oyster Shell	1.0	1.0	1.0	1.0
Salt	0.4	0.4	0.4	0.4
Premix	0.5	0.5	0.5	0.5
Lysine	0.2	0.2	0.2	0.2

Methionine	0.4	0.4	0.4	0.4
Nutrient composition (calculated)				
Energy (Kcal/ME/Kg)	2509.06	2539.09	2539.09	2539.09
Crude protein (%)	18.63	18.97	18.97	18.97
Crude fibre (%)	10.13	10.38	10.38	10.38

Micro mix grower: 2.5kg of premix contains vitamin A (10, 000,000 iu), vitamin D3 (2,000,000 iu), vitamin E (20,000mg), vitamin K3 (2,000 mg), vitamin B1 (3,000mg), vitamin B2 (5,000mg), Niacin (45,000mg), Calcium Panthothenate (10,000mg), vitamin B6 (4,000mg), vitamin B12 (20,000mg), Folic Acid (1,000mg), Biotin (50mg), Choline Chloride (3,000,000mg), Manganese (120,000mg), Iron (100,000mg), Zinc (80,000), Copper (8,500mg), Iodine (1,500mg), Cobalt (300mg), Selenium (120mg), Antioxidant (120,000mg).

RESULT and DISCUSSION

Table 1: Growth performance of rabbit fed neem rind meal

Parameters	Control	UNR	TNR24	TNR48	SEM
Initial weight (g)	1000	1005	1002	1006	0.01
Final weight (g)	1880.25^{a}	1303.00^{b}	1237.50^{b}	1161.75^{c}	6.40
Average feed intake (g/day)	104.04^{a}	50.50^{b}	50.58^{b}	48.93^{c}	0.22
Average daily weight gain (g/day)	12.97^{a}	3.09^{b}	2.11^{b}	1.85^{b}	1.08
Feed to gain ratio	9.91^{d}	16.54^{c}	29.16^{a}	23.70^{b}	0.37

SEM = Standard Error of the Mean. Within a row, values with different superscripts differs significantly ($p < 0.05$)

Table 2: Testicular characteristics and daily sperm production of rabbit bucks fed diet containing neem rind meal

	Dietary neem rind meal				
Parameters	Control	UNR	TNR24	TNR48	SEM
Liveweight (Kg)	1.86^{a}	1.30^{b}	1.17^{b}	1.23^{b}	0.03
Testicular characteristics					
Left testis weight (g)	2.74^{a}	0.24^{b}	0.64^{b}	0.88^{b}	0.13
Right testis weight (g)	2.46^{a}	0.37^{b}	0.61^{b}	0.69^{b}	0.12
Paired testes weight (g)	5.17^{a}	0.61^{b}	1.24^{b}	1.57^{b}	0.24
Relative testes weight (%)	0.28^{a}	0.05^{b}	0.10^{b}	0.13^{b}	0.12
Left testis volume (ml)	0.30^{a}	0.05^{b}	0.08^{b}	0.13^{b}	0.02
Right testis volume (ml)	0.33^{a}	0.06^{b}	0.08^{b}	0.14^{b}	0.03
Testes density (g/ml)	10.07^{a}	5.13^{b}	7.16^{ab}	6.38^{ab}	0.70
Daily sperm production ($x10^{6}$)	21.73^{a}	6.80^{b}	7.39^{b}	10.11^{b}	0.61

SEM = Standard Error of the Mean. Within a row, values with different superscripts differs significantly ($p < 0.05$)

Significant ($p<0.05$) differences were observed for testes weight. The left testes weight of bucks on control diet was 91%, 77% and 67% higher than those on UNR, TNR24 and TNR48 respectively. The same pattern of increase was observed in the right testes of the rabbits. Paired testes weight showed significant difference ($p<0.05$) with the control having the weight value of 5.17 and bucks on UNR had the lowest value of 0.61. Testes volume, also showed significant differences ($p<0.05$) with the control animals, having the highest weight value while the least value was
found with bucks on UNR. Significant difference ($p<0.05$) in the mean value of testes density was also observed. Control animals had highest value while the least was found with those on UNR.

Daily sperm production showed significant difference ($p<0.05$) in favor of bucks placed on control diet. The mean values for daily sperm production showed the same pattern as mean values for testes weight. This agrees with the report of Swierstra (1966) and Ekeocha (2002) that within species, sperm production is a function of testicular size. This low sperm production observed in the bucks fed neem rind diets could result from the factor that caused retardation of spermatogenesis in male animals fed neem cake (NRC, 1992). It has been shown that neem cake retards spermatogenesis in male mammals without inhibiting sperm production (NRC, 1992). The present result also agrees with the report of Amann (1981), Egbunike and Steinbach (1976) that there is a correlation between testes weight and testicular sperm reserve.

CONCLUSION

Soaking neem rind in water up to 48 hours appeared not to reduce its anti-nutritional and anti-fertility principles. Feeding rabbit bucks 10% of water treated neem rind will lead to a reduction of reproductive potentials. More processing methods such as fermentation, ensiling and alkaline treatment should be investigated for further studies.

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