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Growth Performance, Sperm Quality and Testicular Morphometry of Buck Rabbits Fed Dietary Levels of Pumpkin (*Cucurbita pepo L)* Leaf Meal

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Abstract

A study was conducted to determine growth performance, sperm quality and testicular morphometry of buck rabbits fed dietary levels of Pumpkin (*Cucurbita pepo L)* leaf meal. Thirty (30) buck rabbits mixed breeds between the aged 11 - 12 weeks; weighing 950±0.25 were used for the study. The buck rabbits were randomly assigned into five dietary treatments, designated as T1, T2 T3 T4 and T5 containing 0, 5, 10, 15 and 20% of pumpkin leaf meal respectively. Feed and water were offered *ad libitum* throughout the experimental period (52 days). At the end of the study period, three buck rabbits per treatment were sacrificed; internal organs and reproductive parts were carefully dissected and grouped. Internal organs were weighed and testicular morphometry and cauda epididymal sperm characteristics were determined. The result showed that growth performance, testicular morphometry and sperm characteristics as well as the internal organ weights of the buck rabbits were not significantly (P> 0.05) effected by the dietary inclusion of pumpkin leaf in the diets. It can be concluded that pumpkin leaf meal can be included up to 20% in a buck rabbit diets without negative effect on testicular morphometry, sperm quality and internal weight organs of buck rabbits.

Keywords

Performance, Morphometry, Sperm Quality, Buck Rabbit, Internal Organ Weight

1. Introduction

In Nigeria like other developing countries, the supply of adequate animal protein at a lower cost throughout the year has continued to remain one of the major challenges of livestock sub- sector. This situation may not be due to insufficient number of livestock to meet the animal protein requirement but could be due to low quality and quantity of feed during the dry season. Little knowledge on the potentials of non-conventional feed resources has led to underutilization of non- conventional feedstuffs [1 and 2].

The exploitation of non – conventional feedstuff of low economic importance to human and the use of fast growing animals such as rabbits and poultry would be a step towards better resource utilization in meeting animal protein supply which is in line with the strategy towards achieving sustainable animal production.

Rabbit is an economic animal that could be used in bridging the wide gap between animal protein supply and its demand in most developing countries [3] This is because is socially acceptance on the combine basis of space requirement, climatic condition, absence of taboos, high fecundity, short generation interval and as well as its distinctive digestive physiology which allows the use of Agro by- products and forage [4 and 5]. Use of forages such as

Gliricidia sepium [6], *Moringa oleifera* leaf meals by [7] and carrot leaf meal by [8] have showed good performance by rabbits fed such meals.

Pumpkin (*Cucurbita pepo*) is an annual green leafy vegetable which plays an important role in the traditional setting as a cover crop and weed control agent. It is however, grown among Nigerian tribes as a vegetable crop mainly for its leaves, fruits and seed and consumed either by boiling the leaves and the fruits or roasting or baking the seeds [9 and 10]. It is known among some Nigerian ethnic groups as '*Kabewa*' in Hausa language and '*Elegede*' in Yoruba language. The proximate compositions of the leaves on Dry matter basis contain 7.33±0.41% crude protein, 12.64±0.064% crude fibre and 0.83±0.92% Ether extracts [11]. The leaves have nutrient composition that could be harnessed in rabbit production but there is lack of information on the effect of pumpkin leaf meal on rabbit's performance and reproduction. This study was therefore designed to investigate the effect of feeding varying levels of pumpkin leaf meal on performance, cauda epididymal sperm characteristics and testicular morphometry of male rabbits.

2. Materials and Methods

2.1. Study Area

The study was carried out at Concordia College Farm located at Ngurore. Ngurore lies between latitude 9° 16'59" North and longitude 12° 13' 59" East. Temperature is high from February to April because of high radiation, which is evenly distributed throughout the year. Maximum temperature reaches about 40°C particularly in April, while minimum temperature drops as low as 18°C between December and January [12]

2.2. Processing of Pumpkin Leaves

Pumpkin leaves were harvested around the study area in the month August, 2012. The leaves were removed from the stems and later dried in a well-ventilated room under room temperature (25°C) until they were crispy to touch, then milled using a hammer miller to obtain the pumpkin leaf meal (PLM).

2.3. Experimental Animals and Their Management

Thirty (30) buck rabbits aged between 11 – 12 weeks old with an average weight of 950±0.25g were used for the study. The rabbits were obtained from National Veterinary Research Institute, Vom Plateau State. They were randomly divided into five groups of six rabbit per treatment with two rabbits per replicate in a Completely Randomized Design. Metallic Feeders and plastic drinkers were provided in each of the cages.

2.4. Experimental Diets

Five experimental diets were formulated using pumpkin leaf meal (PLM) at, 0.00%, 5.00%, 10.00%, 15.00% and 20.00% which were designated as diet T1, T2, T3, T4 and T5 respectively (Table 1). T1 was served as the control diet devoid of PLM. The study lasted for fifty six (56) days.

Table 1. *Ingredient Composition of Experimental Diets.*

Inclusion levels of pumpkin leaf meal					
Ingredients	**T1 (0%)**	**T2 (5%)**	**T3 (10%)**	**T4 (15%)**	**T5 (20%)**
Maize	30.95	30.95	30.90	30.00	29.00
Full fat soybean meal	29.55	29.05	27.67	21.50	20.00
Pumpkin leaf meal	0.00	5.00	10.00	15.00	20.00
Maize Offal	25.00	20.50	19.45	19.00	16.70
Brewers dried grain	11.00	11.00	11.00	11.00	11.00
Fishmeal	2.50	2.50	2.50	2.50	2.50
Premix[*]	0.50	0.50	0.50	0.50	0.50
Methionine	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Determined composition % (DM)					
Crude protein	17.12	17.40	17.50	17.11	17.20
Crude fibre	8.10	9.10	9.20	9.06	9.12
Ether extracts	4.23	4.05	4.03	4.08	4.07
Ash	7.03	7.10	7.09	7.12	7.11
Nitrogen Free Extracts	63.52	62.35	62.18	62.68	62.50

0.25kg of Mineral/ Vitamin Premix premix manufactured by Animal care LTD contained the following: Vitamin A 1,800IU, Vitamin D 250IU, Vitamin E 8,000IU, Vitamin K 750mg, B1 750mg, B_2 1000 mg, B_6 800mg, B_{12} 25mg Folic 300mg, Niacin 5000mg, Pantothenate 3000mg, Biotin 25mg, Choline 160g, Thyroxine 300mg, Copper 0.4g, Iron 4g, Manganese 5.5g, Iodine 0.2g, Zinc 5g, Cobalt 0.15g, Selenium 0.15g.

2.5. Data Collection

2.5.1. Growth Performance Evaluation

Experimental diets were offered *ad libitum* every morning at about 08.00am. The quantity of feed offered daily and leftover were weighed to determine the daily feed intake while Feed conversion ratio was determined by dividing the feed intake by the weight gain. Water was provided *ad*

libitum in plastic containers. At the commencement of the experiment, all the rabbits were weighed to determine their initial weight before assigning them to their treatments. The rabbits were weighed weekly to determine the weight gain.

2.5.2. Reproductive Indices

The scrotal sacs of the rabbit were incised to exterionize the testis, and then epididymides were removed from the testes and other adhering tissues. Testes were weighed using electronic scale and water displacement method was employed to determine their volume. The lengths and widths of the testes were measured using a tape. The cauda epididymides were also excised from the epididymides thereby making several lacerations on them; they were later placed in separate beakers containing 5mls of Physiological saline solution into which spermatozoa were liberated. Sperm concentrations were determined using the improved Neubauer haemocytometer. Sperms' progressive motility, percentage live spermatozoa and morphology of spermatozoa were determined by conventional methods described by [13] as cited by [5].

2.5.3. Chemical Analysis

The proximate analysis of the pumpkin leaf meal and experimental diets was done to obtain values for the dry matter, protein, ether extracts, crude fibre and ash content following the procedures of [14], while Anti-nutritional analysis Saponin was determined by the method of [15], tannin by using Folin-Deins spectrophotometric method [16]. Oxalate was also determined using [17] procedure while phytate was determined by the method of [18].

2.5.4. Data Analysis

Data obtained were subjected to analyses of variance using statistical package (SPSS version 19). Significant differences between treatment means were separated using Duncan's Multiple Range Test [19] as outlined by [20]

3. Results

3.1. Proximate Composition of Pumpkin Leaf Meal

The result of the proximate composition of pumpkin leaf meal (PLM) is shown in Table 2. PLM had crude protein (CP) content of 12.59% while the crude fibre (CF) was 3.56%. The ether extract (EE) and ash contents were 1.27 and 3.23% respectively. Saponins, tannin, phytate and oxalate contents were 10.01, 7.12, 3.21 and 3.27mg/100g.

Table 2. *Chemical Composition of Pumpkin (Cucurbita pepo L) Leaf Meal.*

Parameters	% composition
Dry matter	87.48
Crude protein	12.59
Crude fibre	3.56
Ether extracts	1.27
Ash	3.23
Nitrogen Free Extracts	78.87
Saponin	10.01mg/100g
Tannin	7.12mg/100g
Phytate	3.21mg/100g
Oxalate	3.27mg/100g

3.2. Growth Performance of Buck Rabbits Fed Pumpkin Leaf Meal

The result of growth performance of buck rabbits fed pumpkin leaf meal is presented in Table 3. The result showed no significant differences (P>0.05) in all the parameters studied. The final body weight ranges from 1853.97 – 1940.47g with T2 recording the highest value of 1940.47g and the lowest (1853.97g) in T1. Average daily feed intake (ADFI) ranged from 65.87g in T1 to 70.73g in T5 while average daily weight gain (ADWG) was between 16.65g in T4 and T5 to 17.54g in T2.

Table 3. *Growth Performance of Buck Rabbits Fed Pumpkin Leaf Meal.*

Inclusion levels pumpkin leaf meal						
Parameters	**T1 (0%)**	**T2 (5%)**	**T3 (10%)**	**T4 (15%)**	**T5 (20%)**	**SEM**
Initial body weight (g)	914.04	957.81	950.63	925.03	940.83	17.39^{NS}
Final body weight (g)	1853.97	1940.47	1932.91	1857.73	1880.43	45.92^{NS}
Total body weight gain (g)	939.92	982.66	982.27	932.70	972.93	40.67^{NS}
Average body weight gain (g)	16.78	17.54	17.53	16.65	16.77	0.59^{NS}
Total feed intake (g)	3688.53	4012.40	3945.38	3939.78	3960.88	10.43^{NS}
Average feed intake (g)	65.87	71.65	70.45	70.45	70.73	1.97^{NS}
Feed conversion ratio	3.95	4.12	4.01	4.22	4.22	0.24^{NS}

SEM = Standard error of mean, NS = Not significant (p>0.05).

3.3. Testicular Morphometry of Buck Rabbits Fed Pumpkin Leaf Meal

Table 4 presents the result of testicular morphometry of buck rabbits fed pumpkin leaf meal. Paired testis, testis length, testis width and testis volume were not significant (p>0.05) affected by dietary inclusion of pumpkin leaf meal. The paired testis weight and testis length ranged from 2.26 to 2.72 g and 2.12 to 2.50cm^3 respectively. Testis width however varied from 2.50 cm in buck rabbit fed 10% (T3) inclusion levels of pumpkin leaf meal to 2.26cm in (T1) 0.0% inclusion.

Table 4. *Testicular Morphometry of Buck Rabbit Fed Pumpkin Leaf Meal.*

Inclusion levels of pumpkin leaf meal						
Parameters	**T1 (0%)**	**T2 (5%)**	**T3 (10%)**	**T4 (15%)**	**T5 (20%)**	**SEM**
Paired testis (g)	2.25	2.59	2.53	2.72	2.46	0.27^{NS}
Testis width (cm)	1.42	1.32	1.47	0.90	1.17	0.14^{NS}
Testis length (cm)	2.26	2.18	2.50	2.12	2.33	0.32^{NS}
Testis volume (cm^3)	2.00	2.02	2.05	1.90	2.08	0.25^{NS}

SEM = Standard error of mean, NS = Not significant (p>0.05)

3.4. Sperm Characteristics of Buck Rabbits Fed Pumpkin Leaf Meal

The results of the sperm characteristics of buck rabbits fed pumpkin leaf meal are shown in Table 5. The result of sperm motility was not significantly (p>0.05) influenced by dietary treatments. The values recorded varied from 64.87% in T5 to 66.08% in T1. However sperm concentration observed in this study ranged from 127.78 to 131.27x106/ml. The percentage live sperm and percentage abnormal sperm also ranged between 77.25 to 78.93% and 7.11 to 7.31% respectively.

Table 5. *Sperm Characteristics of Buck Rabbit Fed Pumpkin Leaf Meal.*

Inclusion levels of pumpkin leaf meal						
Parameters	**T1 (0%)**	**T2 (5%)**	**T3 (10%)**	**T4 (15%)**	**T5 (20%)**	**SEM**
Sperm motility (%)	66.08	65.38	65.85	65.83	64.87	2.17^{NS}
Sperm concentration ($x10^6$)	127.78	128.17	131.27	129.55	129.19	3.43^{NS}
Live sperm (%)	77.25	78.10	77.82	78.93	77.29	1.30^{NS}
Abnormal (%)	7.11	7.28	7.14	7.14	7.31	0.77^{NS}

SEM = Standard error of mean, NS = Not significant (p>0.05).

3.5. Internal Weight Organ of Buck Rabbits Fed Pumpkin Leaf Meal

The result of the internal weight organ of buck rabbits fed pumpkin leaf meal is presented in Table 6. All parameters measured were not significantly (p>0.05) affected by inclusion levels of pumpkin leaf meal. Relative of weight (19.67g) of liver was higher in buck rabbits fed T5 diet and lowest weight (18.99g) was recorded in T3. Kidney and spleen weights ranged between 5.47g to 5.68g and 0.70g to 0.76g respectively.

Table 6. *Internal organ weight of buck rabbit fed pumpkin leaf meal.*

Dietary treatments						
Parameters	**T1 (0%)**	**T2 (5%)**	**T3 (10%)**	**T4 (15%)**	**T5 (20%)**	**SEM**
Liver (g)	19.61	19.16	18.99	19.19	19.67	0.49^{NS}
Lungs (g)	4.50	4.47	4.53	4.32	4.30	0.45^{NS}
Kidney (g)	5.68	5.47	5.97	5.99	5.66	0.29^{NS}
Spleen (g)	0.70	0.76	0.75	0.74	0.70	0.03^{NS}
Heart (g)	4.00	4.33	4.29	4.60	4.18	0.29^{NS}

SEM = Standard error of mean, NS = Not significant (p>0.05).

4. Discussion

All the parameters determined for pumpkin proximate analysis in this study are within the range reported for other Nigerian vegetables [21] but lower than 7.33±0.41, 0.83±0.92, 2.64±0.64 and 2.90±0.64 reported for Crude protein, ether extracts, crude fibre and Ash by [11]. However, Saponins, tannin, phytate and oxalate contents were observed to be lower than the values reported for various vegetables by [11]

The ADFI value observed in this study was higher than the values 56.19 -66.28g reported by [22] and 45.83-51.63g reported by [23]. However, the ADFI is within the range of 60.00 to 71.34g reported by [24]. Average Daily weight gain (ADWG) was higher than that of 13.01-15.03g recorded by [25] and 11.13-12.14g by [26] and 9.39- 10.29g by [23]. Better performance of buck rabbit observed in this study was achieved probably as result of better growth rate and genetic differences.

The result of testicular morphometry in this study is similar to the report of [27] who fed pawpaw peel meal (PPM) up to 30% to male rabbits and observed non-significant difference (p>0.05) on testicular morphometry parameters. However, the result also agreed with the findings of [28] who observed non- significant differences (p>0.05) in testis weight among rabbits fed fumonisin contaminated diets and [5] who fed water spinach leaf meal to male rabbits. The result, however, contradicts the findings of [29] who reported a decrease in paired testes weight of cockerels fed cassava peel meal up to 30% inclusion levels. Non variation of

morphometry parameters observed in the control diet and pumpkin supplemented diets are indications that pumpkin leaf meal has no negative effects on the testiscular morphometry parameters. [30] described morphometry parameters as good indicators of present and future sperm production of animals. The study of morphometric characteristics of male reproductive organs is important this is because it is used for assessing and predicting sperm production, storage potential and fertilizing ability of the male animal [31]. The finding from this study showed that pumpkin leaf meal support testicular morphometery development in buck rabbits.

The sperm motility were lower than the range 65.00 to 68.30% reported by [5] in the cauda epididymis of male rabbits fed varying levels of water spinach. Non-significant influence of the dietary treatment on the sperm motility is an indication that pumpkin leaf meal has supply adequate to support sperm motility in buck rabbit fed dietary treatments.

[32] reported that adequate nutrition with high percentage of crude protein enhance motility and concentration of spermatozoa. The finding from this study confirms earlier study conducted by [33] that attributed increase in motility to the high level of protein and fat in the diet of male. Sperm concentration is within the range of 126.00 to 154.00 x 106/ml and 123.30±1.76 to 138.30±1.20 reported by [34 and 5] respectively. High concentration of sperm recorded in this study is a sign of high possible fertility at the time of copulation. According to [35] a good semen samples show an average of 25% dead sperms. Therefore, the percentages of live sperm obtained in this study are indication of good semen samples. The percentages of abnormal sperm were within the range of 6.00 to 16.00% and 9.60±0.88 to 10.90±0.78 reported by [34] and [5] respectively.

Internal organ weight were similar to the report of [5 and 23] who observed non - significant effect on organ weights of rabbits fed water spinach meal and *Leptadenia hastata* leaf meal respectively. This is an indication that feeding pumpkin leaf meal has no negative effects on organs functions and developments. The study however, showed that pumpkin leaf meal up to 20% inclusion supports the development of reproductive tract, sperm quality and internal organ weights of buck rabbit.

5. Conclusion

It can be concluded that pumpkin leaf meal can be included up to 20% in a buck rabbit diets without negative effect on testicular morphometry, sperm quality and internal weight organs of buck rabbits.

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