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THE EFFECT OF PAWPAW PEEL MEAL ON TESTICULAR MORPHOMETRY CARCASS YIELD AND ORGAN WEIGHTS IN MALE RABBITS

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ABSTRACT

16 bucks were used to evaluate the effect of pawpaw peel meal on testicular morphometry, carcass yield and organ weights in male rabbits. 4 bucks each were allotted to any of 4 dietary treatments containing 0%, 20% and 30% pawpaw peel meal in a completely randomized design. The results after 7 weeks of feeding showed only similarities between the diets (P>0.05) in all testicular morphometric characteristics except in the derivations where the relative paired corpus weight was significantly higher (P<0.05) in the pawpaw peel meal diets then in the control, even as the relative paired ductus deferense weight was significantly higher (P<0.05) in the diet with 30% pawpaw peel meal than in the other diets. The weight of the ductus deferense expressed per weight of the reproductive tract *intoto* like wise showed a superiority of the control diet (P<0.05) to all the pawpaw peel meal diets. Treatment however had no effect (P>0.05) on carcass yield and visceral organ weights.

KEYWORDS: Rabbits, pawpaw peel meal: morphometry; carcass; organs.

INTRODUCTION

The acceptability of rabbit meat as a relatively cheap source of animal protein for human beings and the recognition of the potential of rabbits to mitigate the shortage of animal protein in the diets of people living in the humid tropics has been documented (Owen, 1981; Cheeke 1981; Schlolant, 1985; Ekpenyon, 1988, Abe 1989, Aduku and Olukosi, 1990, Awosanya et al, 1999).

One of the advantages of rabbits over other classes of livestock in developing countries like Nigeria is their ability to convert forages and agro-by products into meat more efficiently. This efficient utilization of fibre-bond proteins in forages and agro-byproducts in the hind gut digestion (Cheeke, 1979; Aduku and Olukosi, 1990) coupled with the synthesis of B-complex vitamins in the caecum (Janis, 1979; Ekpenyonge, 1988, Carabano and Piquer, 1998) and the supplementation of protein quantity and quality through coprophagy (Carabano and Piquer, 1998) contribute to the good growth rate reported in young rabbits maintained on sufficient quantity of low energy, high fibre diets (Butcher et al, 1981).

Parts of the pawpaw plant (*Carica papaya, Linn*) have been reported to be high in nutrients (Oyenuga, 1968; Aduku and Olukosi, 1990) Pawpaw, peels with a constant availability all year round in Nigeria and other tropical countries therefore become a promising alternative source of nutrients for rabbits in these regions of the world.

Papain the proteolytic enzyme contained in the latex found in pawpaw parts has however been implicated in the removal of the zona pellucida of mouse eggs (Gwatkin, 1964) and shown to have anti-implantation activity in rats (Grag et. al, 1970). In the male, while Egbunike et. al, (2000) found adverse effects of dietary pawpaw leaves, seeds and peels on sperm production and storage in rats, Bitto and Gemade (2001) found no significant effect of pawpaw peel meal on growth, organ weights (except the liver), testicular morphometry and the hematology of male rabbits.

The report of Bitto and Gemade (2001) was however preliminary with only one level of pawpaw peel meal inclusion (20%). Information on the effect of graded levels of pawpaw peel meal inclusion in the diets of male rabbits on testicular morphometry, carcass yield and organ weights in male rabbits is to the best of over knowledge lacking. We therefore designed this work to evaluate the effect of pawpaw peel meal on testicular morphometry, carcass yield and organ weights in male rabbits.

MATERIALS AND METHODS

Location

This study was conducted at a standard Rabbitary (approved for research by the Department of Animal Production, University of Agriculture Makurdi) at the Federal Housing Authority Estate Makurdi, Nigeria. Makurdi is located at latitude 7°14N and longitude 8°31E with an annual rain fall ranging from 1270-1397mm and a temperature range of 21°c - 42°c.

Animals and Management

16 grower rabbits of mixed breeds (Chinchilla California x Newzealand White) between the ages of 9 and 11 weeks with a mean initial weight of 1,200g were used for this study. They were housed in individual cages measuring 1.5m x 1m x 1m with corrugated roofing sheets and wire mesh floor with wooden frames. They were fed a maize based concentrate diet for a week of acclimatization with cool clean drinking water always before the commencement of experimental feeding.

Pawpaw Peels

Unripe pawpaw fruits were obtained from Gboko, Otukpo and Makurdi towns in Benue State. The peels were carefully removed from the pulp immediately after harvest and sun dried for 7 consecutive rain free days and there after ground for incorporation into the test diets as pawpaw peel meal (PPM).

Experimental diets

Four (4) isocaloric and isonitrogeneous diets were compounded with diet 1 (control) containing no PPM while diets 2, 3, and 4 contained 10%, 20% and 30% PPM respectively. A completely randomized design was used to assign the animals to the experimental diets such that there were 4 bucks on each diet. The animals were fed the diets *ad libitum* with cool clean drinking water supplied always. The bucks were weighed individually weekly. The proximate

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compositions of the experimental diets were determined by the A.O.A.C. (1990) method. The bucks were feed the test diets for 7 weeks.

Sampling

After 7 weeks of feeding, all the animals were starved for 12 hours and thereafter sacrificed by stunning and decapitation.

Carcass And Organ Weights

Evisceration was done immediately after slaughter as outlined by Aduku and Olukosi (2000). The weights of carcasses and visceral organs were obtained using a highly sensitive digital balance.

Testicular Morphometry

Each reproductive tract was obtained *intoto* and weighed after which the testes and epididymis were dissected out, trimmed free of adhering fat and connective tissue for morphometric analysis as earlier reported (Bitto and Gemade 2001).

Statistical Analysis

Data were subjected to the one way analysis of variance (ANOVA) using the completely randomized design while the least significant Difference (LSD) was used to assess the differences between means. All statistical analysis were by methods outlined by (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

The gross and chemical compositions of the test diets are presented in Tables 1 and 2 respectively, while the effect of PPM on testicular morphometry and the derivations based on body weight, reproductive tract weights and paired testes weights are summarized in Tables 3,4,5, and 6 respectively.

While there were only similarities (P>0.05) between the diets in the absolute weights of all organs and in most of the derivations from testicular morphometry, the control diet had significantly lower (P<0.05) relative corpus epididymal weights than all the PPM based diets while the 30% PPM based diet had significantly higher (P<0.05) relative paired ductus deferense weights than the other diets. The weights of the ductus deferense relative to the weights of the reproductive tract at and paired testes weight on the other hand showed significantly higher (P<0.01) values in the control diet than in all the PPM based diets.

The significant effect of diet on the relative weights of the corpus epididymis suggests that PPM may have affected the epididymal transit time of sperm in these animals in agreement with the report of Egbunike et. al. (2000) in rats. The effect of diet on the ductus deferense on the other hand suggests an influence of PPM on Sperm transport. Further investigations are required to elucidate the mechanisms involved with these results.

Diet similarly had no effect on carcass and organ weights (P>0.05) inspite of the apparent decline in live weights and eviscerated carcass weights with increasing levels of PPM inclusion (Table 7).

These results are in agreement with our earlier report (Bitto and Gemade, 2001) except in the absolute and relative

Table 1: Composition of the Experimental Diets (%)

Ingredients	1(0%)	2(10%)	3(20%)	4(30%)
Maize	30.16	33.39	37.66	41.43
Soyabean meal	28.12	22.67	17.19	11.81
Rice offals	35.32	27.54	18.75	10.36
Pawpaw peels	-	10	20	30
Vitamin premix	0.5	0.5	0.5	0.5
Palm Oil	1	1	1	1
Bone meal	4.0	4.0	4.0	4.0
Methionine	0.4	0.4	0.4	0.4
Salt	0.5	0.5	0.5	0.5
Total	**100.00**	**100.00**	**100.00**	**100.00**

Table 2. The Chemical Composition of the Experimental Diets (%)

Parameters	1(0%)	2(10%)	3(20%)	4(30%)
Dry matter	98.50	97.98	97.87	97.87
Either extract	11.20	12.67	10.47	11.71
Crude fibre	19.40	17.69	15.18	12.94
Crude protein	20.25	20.94	18.38	17.44
Ash	13.82	12.91	11.70	11.68
M.E. (Kcal/kg)*	2850.46	2992.60	3012.40	3041.66

* = Calculated from Pauzenga (1985).

Table 3: The Effect of Pawpaw peel meal on testicular morphometry of male rabbits (mean + s.e.m)

Parameters	Diets			
	1(0%)	2(10%)	3(20%)	4(30%)
Body weight (g)	1650 ± 12.08	1600 ± 11.73	1450 ± 16.96	146.5 ± 13.90
Reproductive tract weight (g)	4.15 ± 10.88	5.27 ± 10.79	4.48 ± 10.33	3.88 ± 0.48
Paired testes weight (g)	1.63 ± 0.37	1.34 ± 0.30	1.66 ± 0.39	1.64 ± 0.31
Paired tunic weight (g)	0.56 ± 10.12	0.52 ± 0.14	0.51 ± 0.05	0.38 ± 0.10
Paired corpus weight (g)	0.29 ± 0.04	0.46 ± 0.09	0.33 ± 0.06	0.46 ± 0.07
Paired cauda weight (g)	0.35 ± 0.06	0.40 ± 0.10	0.14 ± 0.05	0.27 ± 0.07
Paired epididymal weight (g)	0.92 ± 0.09	1.17 ± 0.25	1.03 ± 0.02	0.94 ± 0.07
Paired ductus deferens weight (g)	0.61 ± 0.25	0.23 ± 0.05	0.27 ± 0.01	0.21 ± 0.05
Mean testes density (g/cm^3)	0.82 ± 0.19	0.86 ± 0.15	0.83 ± 0.16	0.82 ±0.16
Mean testes Volume (ml)	1.00 ± 0.00	1.00 ± 0.00	1.00 ± 0.00	1.00 ± 0.00

s.e.m. = standard error of mean

* = (P>0.05).

Table 4: The effect of pawpaw peel meal on the derivations (1) from the morphometric characteristics of the reproductive organs (mean + s.e.m.)(%).

Parameters	Diets			
	1(0%)	2(10%)	3(20%)	4(30%)
Paired testes weight / Body weight	0:190 ± 0.070	0.078 ± 0.019	0.098 ± 0.015	0.120 ± 0.020
Paired tunic weight / Body weight	0.035 ± 0.008	0.028 ± 0.009	0.040 ± 0.000	0.028 ± 0.005
Paired caput weight / Body weight	0.018 ± 0.003	0.018 ± 0.003	0.023 ± 0.005	0.023 ± 0.005
Paired corpus weight / Body weight	0.018[a] ± 0.003	0.030[b] ± 0.003	0.030[b] ± 0.005	0.030[b] ± 0.05
Paired cauda weight / Body weight	0.043 ± 0.000	0.020 ± 0.004	0.033 ± 0.006	0.018 ± 0.003
Paired epididymal weight / Body weight	0.053 ± 0.005	0.070 ± 0.009	0.083 ± 0.009	0.065 ± 0.003
Paired ductus weight / Body weight	0.026[a] ± 0.015	0.015[a] ± 0.003	0.031[a] ± 0.025	0.065[b] ± 0.003

s.e.m = standard error of mean

a,b, = values in the same row bearing different superscripts are significantly different (P<0.05).

(I) = Based on body weight.

Table 5:The effect of pawpaw peel meal on derivations (II) from the morphometric characteristics of reproductive organs of male rabbits (%). (mean ± s.e.m.)

Parameters	Diets 1(0%)	2(10%)	3(20%)	4(30%)
Paired testes weight / weight reprod. tract	40.50 ± 9.53	13.22 ± 26.00	26.23 ± 36.03	68.18 ± 42.92
Paired tunic weight / weight reprod. tract	14.59 ± 3.18	9.94 ± 2.42	12.11 ± 1.43	9.37 ± 1.27
Paired caput weight / weight reprod. tract	7.28 ± 1.12	3.24 ± 0.72	6.50 ± 0.68	6.25 ± 1.29
Paired corpus weight / weight reprod. tract	8.26 ± 2.20	9.28 ± 2.02	7.57 ± 1.92	8.21 ± 2.22
Paired cauda weight / weight reprod. tract	9.16 ± 2.47	7.86 ± 1.68	8.79 ± 0.78	6.90 ± 0.77
Paired epididymal wt. / weight reprod. tract	24.69 ± 4.70	23.55 ± 4.88	24.64 ± 1.99	1496 ± 7.65
Paired ductus weight / weight reprod. tract	14.30[a] ± 3.85	4.70[b] ± 1.04	6.04[b] ± 0.45	6.96[b] ± 1.36

s.e.m = standard error of mean
a,b, = values in the same row bearing different superscripts differ significantly ($p<0.05$).
(II) = Based on weight of the reproductive tract.

Table 6: The effect of pawpaw peel meal on derivations (III) from testicular Morphometry of male rabbits (means ± s.e.m.)

Parameters	Diets 1(0%)	2(10%)	3(20%)	4(30%)
Paired tunic weight(g) / Paired testes weight(g)	36.91 ± 2.84	38.09 ± 5.11	26.03 ± 9.13	24.72 ± 5.39
Paired ceput weight(g) / Paired testes weight(g)	20.05 ± 4.24	12.19 ± 1.66	19.12 ± 3.61	14.49 ± 1.45
Paired corpus weight(g) / Paired testes weight(g)	26.25 ± 12.62	34.46 ± 5.19	23.77 ± 9.05	31.48 ± 7.81
Paired cauda weight(g) / Paired testes weight(g)	22.62 ± 1.81	29.56 ± 3.12	24.90 ± 2.86	16.82 ± 4.25
Paired ductus weight(g) / Paired testes weight(g)	47.08[a] ± 21.19	17.57[b] ± 2.55	17.69[b] ± 2.66	13.83[b] ± 2.67

s.e.m. = standard error of mean.
a,b, = values in the same row bearing different superscript differ significantly ($P<0.05$).
(III) = Based on paired testes weight.

Table 7: The effect of pawpaw peel meal on carcass yield and organ weights of male rabbits (means ± s.e.m)

Parameter	Diet			
	1(0%)	2(10%)	3(20%)	4(30%)
1. Live weight (g)	1650 ± 104.5	1600 ± 101.5	1462.5 ± 146.8	1462.5 ± 120.38
Eviscerated carcass wt. (g)	1037.5± 77.5	950 ± 79.1	937 ± 71.53	850.0 ± 80.04
Singed carcass wt. (g)	975 ± 67.3	990.0 ± 141.9	900.0 ± 63.73	825.0 ± 96.01
Dressing percent	62.87 ± 4.25	59.37 ± 2.44	64.90 ± 3.50	58.12 ± 3.22
2. Visceral organs:				
Absolute				
Paired Kidney (g)	9.111±0.591	7887 ± 0.797	8.206 ± 0.350	7.978 ± 0.773
Heart (g)	3.667 ± 0.19	3.234 ± 0.471	3.175 ± 0.350	4.603 ± 1.269
Liver (g)	29.33 ± 2.35	30.52 ± 1.60	27.37 ± 0.565	25.736 ± 1.263
Lungs (g)	6.085 ± 0.48	7.285 ± 0.72	7.825 ± 1.063	8.061 ± 0.287
Spleen (g)	0.521 ± 0.16	0.442 ± 0.062	0.285 ± 0.030	0.307 ± 0.035
Relative (%)				
Paired kidney (%)	0.598 ± 0.0310	0.489 ± 0.023	0.583 ± 0.048	0.559 ± 0.065
Heart (%)	0.224 ± 0.0096	0.209 ± 0.0069	0.225 ± 0.0165	0.111 ± 0.065
Liver (%)	1.777 ± 0.095	1.921 ± 0.095	1.962 ± 0.217	1.784 ± 0.089
Lungs (%)	0.042 ± 0.033	0.452 ± 0.017	0.540 ± 0.044	0.560 ± 0.030
Spleen (%)	0.032 ± 0.010	0.027 ± 0.002	0.022 ± 0.004	0.012 ± 0.002

s.e.m. = standard error of mean
• = (P>0.05)

weights of the liver which in contrast to our earlier observation showed similarities between the diets (P>0.05) in the present study. This disparity may be due to the age of the animals, as whereas the bucks in our earlier report were only 4-5 months in age, the ones in the present study being 9 – 11 months old could better handle dietary PPM in relation to the development and functioning of the Liver.

CONCLUSION

The results of this study confirm our preliminary observations (Bitto and Gemade, 2001) that pawpaw peal meal could be fed to rabbits without deleterious effects on the physiology of reproduction in these animals. We however recommend further work with a wider scope with respect to the key aspects of the physiology of reproduction in both male and female rabbits.

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