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Full Length Research Article

Reproductive Tract Morphometry and Some Haematological Characteristics of Female Rabbits Fed Pawpaw Peel Meal Based Diets

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ABSTRACT

16 female grower rabbits were randomly assigned to any of 4 iso-nitrogeneous and iso-caloric diets containing 0%, 10%, 20% and 30% pawpaw meal (PPM) such that to each dietary treatment were 4 does. After 7 weeks of ad libitum feeding, all the animals were sacrificed and evaluated for reproductive tract morphometry and some haematological characteristics. The results showed similarities (P>0.05) between the diets for all the parameters evaluated. The results suggest that dietary PPM up to 30% level of inclusion may support normal body functions and the physiology of reproduction in female rabbits. **(Afr. J. Biomed. Res. 9: 199 – 204)**

Keywords: *Pawpaw peels, haematology, reproductive tract, morphometry*

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INTRODUCTION

The ability of rabbits to convert forage crop residues and agro-industrial by-products more efficiently into meat than most other livestock (Aduku and Olukosi, 1990, Fielding, 1991) has not been applied much beyond research in the country. It is hoped that many of the unconventional feed stuff now being tested in practical diets for rabbits will soon become popular with rabbit farmers just like *Tridax procumbens*, a popular forage which is used in many parts of the guinea savannah as a sole diet for rabbits. Tridax is however seasonal in the guinea savannah as the practice of "bush burning" by hunters destroys much of the vegetation during the dry season.

The pawpaw plant (Carica Papaya Linn) which stands about 4-5m tall on the average but could reach 10m in height always survives the "bush fire" as it is grow mostly around homes. Parts of the pawpaw plant have been reported to be rich in nutrients (Oyenuga, 1968; Aduku, 1988; Nakasone and Paul, 1998) and are suitable for the feeding of rabbits especially, in the dry season. The latex in all parts of the pawpaw plant however contains a high percentage of papain- a proteolytic enzyme used in several industries. Papain however has been implicated in reproductive disorders in both male and female animals (Gwatkin, 1964; Grag, *et al* 1970; Egbunike *et al*, 2000) and shown to significantly decrease the absolute and relative weights of the liver in rabbits (Bitto and Gemade, 2001). Feeding pawpaw parts therefore must be balanced with an assessment of possible effects of residual papain in processed or fresh pawpaw parts on the physiology of reproduction in the sexes. The current lack of information on reproductive tract morphometry and the hematology of female rabbits fed pawpaw parts therefore necessitated this work.

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 $7^0$14N and longitude $8^0$21E with an annual rain fall ranging from 1270-1397mm and a temperature range of 21^0c-42^0c.

Animals and Management: 16 grower rabbits of mixed breeds (Chinchilla x California x Newzealand White) between the ages of 9and 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 x1m 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 supplied always before the commencement of experimental feeding.

Pawpaw Peels: Unripe pawpaw fruits were obtained from Gboko, Otukpo and Makurdi towns in Benue State, Nigeria. The peels were carefully removed form 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: 4 isocaloric and isonitrogenous diets were compounded with diet I (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 does on each diet. The animals were fed the diets *ad libitum* with cool clean drinking water supplied always. The does were weighed individually weekly. The proximate compositions of the experimental diets were determined by the A.O.A.C (1990) method. The does were fed 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.

Haematological Analysis: Blood samples were collected at slaughter into clean dry test tubes containing a pinch of an anticoagulant - Ethylene diamine tetra acetic acid (EDTA) for haemotological analysis. All haematological parameters were evaluated as earlier fully described by Bitto and

Gemade (2001).

Reproductive tract morphometry: Each animal was dissected immediately after slaughter and the reproductive tract obtained *intoto*, trimmed free of fat and adhering connective tissue before morphometric analysis. The weight of each reproductive tract was taken *intoto* after which each ovary was carefully removed from its ovarian bursa at the end of its infudibulum. The infundibulum was next removed followed by the oviduct. The uterine horn was then taken from the end of the two cervixes to the rosette projection of the uterotubal junction. Morphometric evaluations were done using highly sensitive digital balances while linear measurements were taken with well-calibrated rules.

Statistical Analysis: Data were subjected to the one way analysis of variance (ANOVA) using the completely randomized design as outlined by Steel and Torrie (1980).

RESULTS AND DISCUSSION

The gross and chemical compositions of the diets and PPM are shown in Tables 1 and 2 respectively, while the effects of PPM on reproductive tract morphometry are summarized in Tables 3 and 4. PPM had no effect (P>0.05) on the morphometric characteristics of the reproductive organs and their derivations from body weight. Even though there is a lack of data in the literature on the morphometric characteristics of the reproductive organs of female rabbits with which our results could be compared, the non effect of diet on reproductive tract morphometry obtained in this study suggests that the development of the reproductive organs, reproductive processes and perhaps fertility may not be affected when PPM is included in the diets of female rabbits up to a level of 30%. Being that uterine weight increase in rodents has been used as a bioindicator of the presence of estrogens (Hafez, 1980), further work establishing endogenous levels of estrogens when female rabbits are fed PPM is required. Also, going by the parameters investigated in the present study, the implication of papain in reproductive disorders in the mouse (Gwatkin, 1964) and in the rat (Grag *et al*, 1970) are at variance with our results.

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	4	4	4
Methionine	0.4	0.4	0.4	0.4
Salt	0.5	0.5	0.5	0.5
Total	100	100	100	100

Table 2:
The Chemical Composition of the Experimental Diets and Pawpaw peel meal (%)

Parameters	1(0%)	2(10%)	3(20%)	4(30%)	PPM**
Dry matter	98.50	97.98	97.87	97.87	97.20
Crude protein	20.25	20.94	18.38	17.44	17.50
Crude fibre	19.40	17.69	15.18	12.94	13.30
Ether extract	11.20	12.67	10.47	11.71	8.75
Ash	13.82	12.91	11.70	11.70	9.10
M.E (Kcal/kg)*	**2850.46**	**2992.60**	**3012.40**	**3041.66**	**3073.00**

- *= Calculated from Pauzenga (1985); ** =Paw paw peel meal*

Table 3:
The effect of pawpaw peel meal on female reproductive tract morphometry (mean ± s.e.m)*

Parameters	**1(0%)**	**2(10%)**	**3(20%)**	**4(30%)**
Body weight (g)	1383 ±116.91	1600±94.39	1500±108.14	1550±23.60
Weight of tract (g)	2.24 ±0.0659	3.40±0.77	1.62±0.38	1.94±0.66
Paired ovary weight (g)	0.229 ±0.022-	0.294±0.036	0.234±0.016	0.119±0.043
Paired infundibulum Weight (g)	0.12 ±0.025	0.101±0.023	0.154±0.19	0.124±0.038
Paired uterine horn weight (g)	0.64 ±0.232	1.33±0.343	0.55±0.076	0.97±0.043
Cervix weight (g)	0.49±0.152	0.58±0.213	0.25±0.042	1.097±0.409
Vagina weight (g)	0.58±0.199	0.93±0.223	0.46±0.215	0.36±0.076
Paired oviduct Weight (g)	0.122±0.37	0.196±0.023	0.109±0.031	0.183±0.074
Width of uterine horn (cm)	0.933±0.054	1.067±0.152	0.933±0.027	0.90±0.180
Length of cervixes	0.87±0.196	1.37±0.191	0.92±0.027	0.87±0.189
Length of ovary (cm)	1.90±0.163	1.73±0.089	2.27±0.348	0.90±0.189
Length of oviduct (cm)	6.00±0.794	9.20±0.601	8.73±0.04	
Length of uterine horn (cm)	8.07±0.409	6.40±2.130	10.83±0.34	0.87±160±0.191

*sem = standard error of mean: * = (P>0.05)*

Table 4: Derivations from reproductive tract morphometry based on body weight (mean± s.e.m)*

Parameters	**1(0%)**	**2(10%)**	**3(20%)**	**4(30%)**
Vagina	0.039±0.012	0.057±0.012	0.029±0.012	0.066±0.038
Cervixes	0.033±0.009	0.035±0.011	0.017±0.002	0.023±0.011
Paired Infundibulum	0.009±0.002	0.006±0.001	0.010±0.001	0.009±0.002
Paired oviduct	0.008±0.002	0.012±0.001	0.007±0.002	0.012±0.005
Paired ovary	0.017±0.003	0.019±0.003	0.015±0.002	0.008±0.003
Paired uterine horn	0.043±0.014	0.082±0.019	0.036±0.003	0.063±0.026

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

Table 5: The effect of pawpaw peel meal on the haematology of grower female Rabbits (means ± sem)*

Parameters	1(0%)	2(10%)	3(20%)	4(30%)
Hb (g/dl)	7.86±0.65	7.55±0.43	6.80±0.93	6.64±0.84
PCV(%)	24±1.17	23±1.36	20±1.36	20±1.85
WBC ($X10^3$/mm)	3.13±0.05	3.97±0.09	3.1±0.07	3.56±0.79
MCV (μ^3/m)	68.00±0.96	65.7±0.58	66.66±84	66.66±84
MCH (µ/g)	22.45±0.76	21.57±0.61	22.66±0.40	22.13±0.73
MCHC (%)	32.750.95	32.82±1.20	34.00±0.86	33.20±100

SEM = Standard error of means; Hb= haemoglobin ; PCV = packed cell volume; WBC= white blood cell count ; MCV=mean corpuscular volume, MCH =mean corpuscular haemoglobin, MCHC = mean corpuscular haemoglobin concentration

It is hard to tell if this disparity is due to species differences or due to the concentration of papain that could induce such disorders (as we could not evaluate the papain concentrations of the diets). It is hoped that an analysis of the papain concentration in pawpaw peels and the test diets will provide a better understanding of the safe levels of inclusion of PPM in the diets of female rabbits.

The non effect of diet on the haematological characteristics of female rabbits obtained in this study is in agreement with the earlier report of Bitto and Gemade (2001) in male rabbits fed PPM. HB, PCV, and WBC values in female rabbits in the present study were however generally lower than corresponding values reported for male rabbits fed PPM (Bitto and Gemade, 2001). This disparity may be due to differences in sex and age of animals, as sex and age (which differed between the two reports) are among the factors reported to be responsible for variations in haematological vales of rabbits (Mitruka and Rawnsley, 1977). Laird *et al* (1970) earlier reported significant effects of age on some haematological parameters in rabbits as well as significantly higher Hb and hematocric values in males. This probably explains the lower values of Hb and PCV in female rabbits fed PPM in the present study compared to males fed PPM in an earlier report (Bitto ad Gemade, 2001). The lower leucocyte counts in female rabbits in the present study compared to males fed PPM (Bitto and Gemade, 2001) and normal values for males and females elsewhere (Mitruka and Rawnsley, 1977) may in addition to other factors (age, sex and nutrition) be due to diurnal variation which has been reported to considerably influence leucocyte count (Mitruka and Rawnsley, 1977).

MCV, MCH and MCHC values obtained in this study were however comparable to normal values reported for both male and female rabbits (Mitruka and Rawnsley, 1977). The red blood cells in these animals could therefore be classified as normochromic, further confirming the suitability of PPM for the feeding of female rabbits in the humid tropics.

Conclusion: We conclude from the results of this study that even though PPM up to 30% level of inclusion may support growth, the development of the reproduce tract and probably other body activities in female rabbits, further work on the effect of PPM on other aspects of the physiology of reproduction like endocrinology, the histometry of the reproductive organs and the fertility of these animals may be required for the establishment of optimum levels of PPM inclusion in the diets of female rabbits.

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