

PRELIMINARY INVESTIGATIONS ON THE EFFECT OF PAWPAP PEEL MEAL ON GROWTH VISCERAL ORGAN AND ENDOCRINE GLAND WEIGHTS TESTICULAR MORPHOMETRY AND THE HAEMATOLOGY OF MALE RABBITS.

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ABSTRACT

Nine (9) bucks were exposed to two treatments of either a complete concentrate diet (4 Bucks) or a pawpaw peels based diet (5 bucks) with the objective of obtaining basic information for further investigations to establish pawpaw peels as a feed for rabbits. The diets had no significant effect ($P > 0.05$) on growth rate. Both diets however supported a normal and steady growth pattern.

Besides the significant difference between the groups in both the absolute and relative weights of the liver ($p < 0.05$), all other visceral organ weights were similar between the diets. There were likewise no significant differences ($p > 0.05$) between the diets in both the absolute and relative weights of endocrine glands. Similarly, there were no significant differences between the groups ($p > 0.05$) in all testicular morphometric characteristics. The derivations from testicular morphometry were all likewise similar between the groups. All haematological indices were also unaffected ($p > 0.05$) by dietary treatment. These results indicate that pawpaw peels could safely be incorporated in the diets of rabbits up to 20% without deleterious physiological and reproductive responses. The results also provide information for further experimentation on graded levels of inclusion of pawpaw peels in rabbit rations with actual analysis of the papain contents of such rations.

KEY WORDS: *Pawpaw peels; rabbits; visceral; endocrine; haematology; testicular morphometry.*

INTRODUCTION

Several authors have investigated and documented the potential of the rabbit as a meat animal with multifarious advantages over other classes of livestock in diverse socioeconomic structures especially the hot humid tropics faced with protein shortage and malnutrition (Cheek, 1984; Schlotant, 1985; Abe, 1989; Aduku and Olukosi; 1990). It is hoped that more farmers in these regions of the world will adopt intensive management for their rabbits with the provision of well balanced concentrate rations for optimal performance to enhance reproductive efficiency in both sexes.

As yet cereal grains are competed for by humans and other classes of livestock. Rabbit feeding is sustained mostly by the use of forages (Crowder and Chedda, 1982). However, the scarcity of forages during the dry season

coupled with the practice of "bush burning" by hunters in several parts of the guinea Savannah invariably limits the use of forages in the feeding of rabbits. Moreover the available feeds become relatively expensive for the average farmer. Crop residues and agro-industrial by products must therefore provide alternative sources of feed for rabbits.

Besides the availability of pawpaw all year round in most parts of Nigeria, its wide spread industrial applications (Brewery, Canning, Medicine, Pharmacy and Tanning) would ensure a constant availability of pawpaw peels (as a by-product of pawpaw processing) for the feeding of rabbits.

Even though papain (an active enzyme in pawpaw) has long been implicated in reproductive disorders in some animal species, there still remains a lack of information on the effects of pawpaw peels based diets or even papain

as an enzyme on key aspects of the physiology and reproduction of the male rabbit.

This study therefore proposes to provide preliminary information on the effects of a pawpaw peels based diet on growth, visceral organ weights, endocrine gland weights, testicular morphometry and the hematology of male rabbits.

MATERIALS AND METHODS

Animals and Management:

Nine bucks of mixed breeds (Chinchilla x California x New Zealand White) between the ages of 4 and 5 months weighing between 1.20kg and 1.78kg ($p > 0.05$) were assigned to two dietary treatments. One group of 4 bucks, which served as a control (T1), received a standard concentrate diet while the second group of 5 bucks had pawpaw peels in their diet at a level of 20% (T2). All the animals had been raised on a concentrate diet at the Teaching and Research Farm of the University of Agriculture, Makurdi where the experiment was conducted. The animals were fed *ad libitum* and had cool clean water always for a total of six weeks; one week of acclimatization and five weeks of experimental feeding.

Pawpaw peels:

Pawpaw was obtained from the Agricultural Development Corporation (ADC), Ministry of Agriculture, Makurdi and the Federal Housing Authority, Makurdi. The peels were removed from the pulp immediately after harvest and sun dried for 7 rain free days and thereafter ground.

The bucks were weighed individually weekly. They were all sacrificed at the end of six weeks and the following samples obtained: The visceral organs, the Thyroid and adrenal glands and the reproductive system *in toto*. The testes were dissected free of all adhering fat and connective tissue for morphometric studies. The visceral organs and endocrine glands were also evaluated.

The relative weights of organs and some derivations from testicular morphometry, namely: paired testis weight (%) and paired epididymal weight (%) were obtained by dividing the weight of organs by the final live weights of individual animals.

Whole blood samples were collected at slaughter into clean dry test tubes containing a pinch of an anticoagulant

– Ethylene diamine tetra – acetic acid (E.D.T.A.) for the haematological analyses. All haematological characteristics were determined by conventional laboratory methods (Baker and Silverton, 1978) as follows:

- i. Haemoglobin concentration: 4.00ml. of Drabkin's solution were dispensed in test tubes to which were added 0.02ml. of blood samples. The mixtures were thoroughly mixed and incubated for about 15 minutes at room temperature for colour development, after which the optical density of each sample was read in a colorimeter (green filter) against a blank of Drabkin's solution in a cuvette. The haemoglobin concentration in each sample was then obtained by reference to a readout.
- ii. Packed cell volume (PCV): Haematocrit tubes were filled with blood samples and sealed at one end with cristaseal. These were then centrifuged in a haematocrit centrifuge for 30 min. The heights of the red cells were then read from a haematocrit scale and expressed as a percentage volume of whole blood.
- iii. White blood cell count (WBC): Blood was drawn up to the 0.5 mark in a white blood pipette and diluted in Turk's solution to give a dilution of 1:20. The pipette was thoroughly mixed with the aid of the bead in the bulb using a pipette shaker. The counting of cells was done in the 4 corner square millimetres, and those in the central square millimetre of the ruled area of an improved Neubauer counting chamber under a microscope objective lens of x 10 and the results multiplied by 50.
- iv. Leucocyte differential counts: Smears from freshly collected blood samples were stained with Giemsa stain and the leucocytes estimated using a x100 objective lens. The different leucocytes were identified from their shapes and colour differentiations.

Statistical analysis: The data were then analyzed using the student's 't' test (Steel and Torrie, 1980)

RESULTS AND DISCUSSION

The compositions of the experimental diets and pawpaw peels are presented in Table 1, while Table 2 shows the weight gain in the rabbits during the experimental period. There was an increase in weight gain in the control diet up to the second week, after which there was a little drop to a constant weight gain to the end of the experiment. In diet 2, weight gain increased steadily to the 4th week and remained constant to the end. The diets were however similar with regard to weight gain. The similarity between the diets in weight gain indicates that pawpaw peel meal is a suitable feed for growing rabbits. There is however a need for a proper nutritional experiment in this respect. Results of the effect of treatment on the absolute and relative weights of visceral organs are summarised in Table 3. Whereas there were similarities between the diets in paired kidney, spleen, heart and lung weights, there was a significant difference ($p < 0.05$) between the diets in the weight of the liver. The same trend was observed in the relative weights of the organs. These results indicate that pawpaw peel meal may support organ development in growing rabbits. The lower absolute and relative liver weights in the animals on the pawpaw peels based diet however may not be unconnected with the role of the liver in nutrient metabolism.

The similarities between the diets in both the absolute and relative weights of endocrine glands (Table 4,) supports the use of pawpaw peels as a feed stuff for rabbits and may imply that animals raised on pawpaw peels based diets up to the level in the present study will function normally with respect to metabolism, energy mobilization and maintenance of water and salt balance which are all functions of these organ.

There was no significant difference ($p > 0.05$) between the groups in all morphometric characteristics of the reproductive organs as well as in the derivations from them (Table 5). While these results might confirm pawpaw peels as a good feed stuff for the feeding of rabbits, further experiments are needed to enable us assess the effect of such a diet on aspects of the physiology of reproduction in these animals.

There were no significant differences between the groups in all haematological indices (Table 6), thus indicating probably a normal blood picture in these animals in

Table 1: The Compositions of the experimental diets

Ingredients:	Diet 1 (control)	Diet 2
Maize	58	50
Soyabbeans	30	20
Pawpaw peels	-	20
Rice bran	9	8
Bone meal	2	1
Salt	0.50	0.50
Vit. premix*	0.50	0.50
Total	100.00	100.00

*Each kg. of the vit-min-premix used in this study contains vit A(iu) 4,000,000; vit D(iu) 1,000,000; vit E(iu) 4,8000; vit K(g) 0.8; vit B₁(g) 0.4; vit B₂(g) 1.8; vit B₆(g) 1.2; Nicotinic acid (g) 4.8; Folic acid (g) 0.12; Ascorbic acid (g) 4.8; Choline chloride (g) 4.8; Mn (g) 40.0; Fe (g) 20.0; Zn(g) 0.80; I(g) 0.62; Co(g) 0.09, Se(g) 0.04.

Table 2. The effect of pawpaw peel meal on weight gain in male rabbits

Weight gain (kg)	Diet 1 (control)	Diet 2
Sampling period (weeks)		
1	1.50	1.40
2	1.67	1.43
3	1.55	1.48
4	1.55	1.55
5	1.55	1.55
Mean*	1.57±	1.48±
	0.10*	0.05*

* = ($P > 0.05$)

sem = standard error of mean.

Table 3 The effect of pawpaw peel meal on visceral organ weights (means ± s.e.m.)

Parameter	Diet 1	Diet 2
1. Absolute:		
Paired Kidney (g)	8.35 ± 0.50	6.15 ± 0.60
Spleen (g)	0.29 ± 0.02	0.28 ± 0.02
Liver (g)	39.46 ± 3.91 ^a	27.71 ± 0.90 ^b
Heart	3.99 ± 0.18	3.88 ± 0.20
Lung (g)	7.04 ± 0.29	5.55 ± 0.50
2. Relative:		
Paired kidney (%)	0.53 ± 0.04	0.40 ± 0.03
Spleen (%)	0.02 ± 0.00	0.02 ± 0.00
Liver (%)	2.54 ± 0.20 ^a	1.82 ± 0.04 ^b
Heart (%)	0.25 ± 0.01	0.25 ± 0.01
Lungs (%)	0.37 ± 0.07	0.37 ± 0.03

a, b, value in the same row bearing different superscripts differ significantly ($P < 0.05$).

s. e. m. = standard error of mean.

Table 4: The effect of pawpaw peel meal on testicular morphometry (means^a ± s.e.m)

Parameter	Diets 1 (Control)	Diets 2
Paired testis weight (g)	1.18 ± 0.19	1.07 ± 0.25
Paired tunica albuginea weight(g)	0.51 ± 0.05	0.88 ± 0.16
Paired ductus deferens weight (g)	0.28 ± 0.09	0.23 ± 0.03
Paired epididymal weight(g)	0.86 ± 0.13	0.57 ± 0.05
Testis density(g/ml)	0.95 ± 0.05	0.88 ± 0.04
Paired testis weight (%)	0.08 ± 0.01	0.07 ± 0.02
Paired epididymal weight(g)	0.05 ± 0.01	0.04 ± 0.01
Left to right testis ratio	100.00 ± 0.00	100.00 ± 0.00
	89.67 ± 6.79	81.62 ± 19.28

* = (P> 0.05)

s.e.m. = standard error of mean.

Table 5: The effect of pawpaw peel meal on some endocrine gland weights of rabbits (means^a ± s.e.m)

Parameter	Diets 1	Diets 2
Thyroid gland(g)	0.07 ± 0.01	0.05 ± 0.01
Paired Adrenal gland (g)	0.38 ± 0.05	0.27 ± 0.02
Thyroid gland (%)	0.001 ± 0.00	0.003 ± 0.00
Paired Adrenal gland (%)	0.02 ± 0.00	0.02 ± 0.00

* = (P> 0.05)

s.e.m. = standard error of mean.

Table 6: The effect of pawpaw peel meal on the haematology of male rabbits (means^a ± s.e.m)

Parameter	Diets 1	Diets 2
Haemoglobin (g/100ml)	10.28 ± 1.51	11.11 ± 0.35
Packed cell volume (%)	31.00 ± 4.64	32.80 ± 0.97
White blood cells (counts/mm ³)	6800 ± 92.14	6640 ± 33.06
Leucocyte differential counts:		
Neutrophils	57.00 ± 2.45	55.40 ± 2.23
Eosinophils	3.50 ± 0.65	3.20 ± 0.49
Basophils	0.00 ± 0.00	0.00 ± 0.00
Lymphocytes	39.25 ± 2.69	41.00 ± 2.12
Monocytes	0.00 ± 0.00	0.00 ± 0.00

* = (P> 0.05)

s.e.m. = standard error of mean.

respect of treatment as applicable in this study. It is noteworthy however that both basophils and monocytes were absent in the blood of all animals. The absence of basophils in circulation is in agreement with the report of Dacie and Lewis (1977) who noted that basophils are seldom seen in peripheral blood except in cases of chronic anemia. These results therefore might imply that the animals on both diets were not anemic. The complete absence of monocytes in the blood of all animals in the present study is also understandable from the fact that monocytes though possessing large nuclei are usually present in low numbers. Being phagocytic in nature their absence would indicate that the animals did not suffer from any infection such as malaria, typhoid or paratyphoid fever.

CONCLUSION

It does appear from the results of this study that pawpaw peel meal could be fed to rabbits without deleterious effects on the physiology of the animals. We however recommend further work with graded levels of inclusion of pawpaw peels in the diets of rabbits, using a larger population of animals and actual analysis of the papain contents of such diets. It may also be necessary to investigate the best methods of processing pawpaw peels for the feeding of rabbits like feeding fresh, sun drying and or boiling.

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