

Performance, carcass yield and total protein concentrations in tubal fluids of female rabbits fed pawpaw peel meal

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Abstract

Sixteen grower rabbits were used to evaluate the effect of pawpaw peel meal (PPM) on performance, carcass yield and the total protein concentration in fluids of the reproductive tract. The does were randomly assigned to 4 dietary treatments containing PPM at 0%, 10%, 20% and 30% levels with 4 does to each treatment. After feeding *ad libitum* for 7 weeks, the results showed similarities ($P > 0.05$) in performance carcass characteristics and in the concentration of total protein in the flushings of all the sections of the reproductive tract. These findings demonstrate the suitability of PPM for the feeding of female rabbits from a physiological stand point. The establishment of optimum levels of inclusion of PPM in the diets of female rabbits will however depend on the results of further investigations.

Key words: Pawpaw peel meal, performance, carcass, tubal fluids, Rabbits.

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Introduction

In spite of the awareness of the advantages of rabbits over other classes of livestock in subsistence agriculture in the humid tropics (Cheeke, 1984; Schlolant, 1985; Aduku and Olukosi, 1990; Awosanya et al, 1999), profitable large scale rabbit production in these areas is still hampered by the shortage of conventional feed ingredients. The ability of rabbits to convert forages and agro-by products into meat more efficiently than other classes of livestock has helped to sustain production in most tropical countries, especially Nigeria. The availability of forages in all parts of the Guinea Savannah is however seasonal due to the annual practice of bush burning by local hunters. Multipurpose trees which usually survive the "bush fire" thus become the best sources of nutrients for the feeding of rabbits in the dry season.

Several reports have shown pawpaw parts as rich in nutrients (Oyenuga, 1968; Samson, 1986; Ekpenyong, 1988; Aduku, 1988; Nakasone and Paul, 1998; Egbunike et al. 2000 and Taiwo et al. 2005) and suitable for the feeding of rabbits (Ekpenyong, 1988; Aduku and Olukosi 1990; Bitto and Gemade, 2001 and Taiwo et al., 2005).

The latex that is found in all parts of the pawpaw tree however contains papain-a proteolytic enzyme that has been reported to remove the zone pellucida of mouse eggs (Gwatkin, 1964) and to have anti-implantation activity in rats (Grag et al., 1970). Egbunike et al. (2000) showed that

feeding pawpaw parts based diets to rats depressed sperm production, sperm storage and sperm transit time in the epididymis. Bitto and Gemade (2001) reported significant decreases in the absolute and relative weights of the liver in male rabbits fed pawpaw peel meal even though testicular morphometry and haematology were unaffected.

In spite of the possibility of obtaining pawpaw peels all year round from the industrial applications of papain, there remains a lack of information on the effect of PPM based diets on performance, carcass yield and the biochemistry of tubal fluids in female rabbits. This work was therefore designed to provide information on the effect of PPM based diets on performance, carcass yield and total protein concentration in the flushings of the vagina, cervixes, uterine horns and oviducts of female 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 $7^{\circ}14'N$ and longitude $8^{\circ}21'E$ with an annual rain fall ranging from 1270-1397mm and a temperature range of $21^{\circ}C-42^{\circ}C$.

Animals and management: 16 grower rabbits of mixed breeds (Chinchilla x 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 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 from the pulp immediately after harvest and sun dried for 7 consecutive rain-free days and thereafter ground for incorporation into the test diets as pawpaw peel meal (PPM).

Experimental diets: 4 isocaloric and isonitrogenous 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 does 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 compositions of the experimental diets were determined by the A.O.A.C (1990) method. The bucks 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.

Tubal fluid flushings: The reproductive tract of each doe was obtained *intoto* and trimmed free of fat and adhering tissue. The vagina, cervixes, uterine horns and oviducts were then separately flushed as earlier reported by Egbunike and Adegunle (1980). The flushings were then stored frozen until analyzed for total protein.

Total protein determination: Total protein was determined by the Biuret method of Weichselbaum (1964).

Statistical Analysis: Data were subjected to the one way analysis of

variance (ANOVA) using the completely randomized design according to methods outlined by Steel and Torrie (1980).

Results and discussion

The gross and chemical compositions of the experimental diets are presented in Tables 1 and 2 respectively while Tables 3, 4 and 5 respectively show the effects of PPM on performance, carcass yield and the total protein concentration of tubal fluids. Treatment had no effect ($P>0.05$) on both performance characteristics and carcass yield of the animals. The similarities between the diets in feed intake, weight gain, feed conversion ratio as well as in the characteristics of the carcass indicate that when protein, energy and fibre levels are adequate, PPM up to a level of 30% could support growth and organ development in these animals.

Although there are no available reports in literature with respect to rabbits and PPM with which we could directly compare our results, our results seem to agree with the report of Egbunike *et al.* (2000) in rats (that were fed a combination of pellets and either pawpaw peels, seeds or leaves) and that of Taiwo *et al.* (2005) who reported the highest daily weight gain in rabbits on a pawpaw leaves treatment compared to those on P. Maximum treatment and Tridax procumbens treatment. The reason these workers gave for the superiority of the pawpaw leaves based diet over the other diets in this regard was the high protein content of pawpaw leaves. The high protein content of PPM might therefore account for the comparable data on performance and carcass characteristics obtained in this study.

Dietary treatment similarly had no effect ($P>0.05$) on the total protein concentration of the fluids of the reproductive tract. As the composition of tubal fluids influences the survival of spermatozoa while they are transported along the tract to the site of fertilization (Aitken, 1979); the non effect of diet on the protein concentration of these fluids obtained in this study suggests that the inclusion of PPM up to a level of 30% in the diets of female rabbits would support normal reproductive activities, like fertilization, implantation and probably gestation.

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	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
Ether 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 Pazenga (1985).

Table 3: The effect of pawpaw peel meal on performance of female rabbits*

Parameter	SEM	Diet				
		1(0%)	2(10%)	3(20%)	4(30%)	5(40%)
Initial live weight(g)		783.30	816.70	966.70	900.00	23.37
Final weight(g)		1293	1600	1467	1533	41.73
Daily feed Intake(g)		67.16	62.20	63.32	64.74	0.70
Daily feed Gain(g)		11.10	14.10	11.10	12.20	0.50
Weight Changes(g)		500.00	566.66	500.00	583.00	18.70
Feed Conversion Ration (FCR)		6.05	4.41	5.70	5.30	0.25
Mortality (%)		0.00	0.00	0.00	0.00	0.00

SEM = standard error of mean

* = (P>0.05)

Table 3: The chemical composition of the experimental diets (%)

Parameter	1(0%)	2(10%)	3(20%)	4(30%)	5(40%)
M.E (Kcal/kg)	2850	2850	2850	2850	2850
Ash	12.5	12.5	12.5	12.5	12.5
Crude protein	17.5	17.5	17.5	17.5	17.5
Crude fibre	12.5	12.5	12.5	12.5	12.5
Ether extract	11.5	11.5	11.5	11.5	11.5
Div. matter	48.5	48.5	48.5	48.5	48.5

* Calculated from formula (NRC)

Table 4: The effect of pawpaw peel meal on carcass yield in female rabbits*

Parameter	SEM	Diet				
		1(0%)	2(10%)	3(20%)	4(30%)	
Live weight(g)		1283	1600	1500	1567	14.95
Eviscerated Weight(g)		850	967	883	900	9.28
Singed weight(g)		800	917	833	850	9.28
Dressing percent		66.25	60.43	58.86	57.43	0.54
Heart (g)		2.07	2.98	3.07	3.06	0.08
Heart (%)		0.16	0.18	1.74	1.71	0.005
Liver (g)		28.61	27.99	25.79	24.25	0.29
Liver (%)		2.23	2.23	1.72	1.86	0.03
Spleen (g)		0.45	0.51	0.31	0.57	0.01
Spleen (%)		0.03	0.03	0.02	0.03	0.001
Kidney (g)		7.00	7.02	7.60	8.31	0.05
Kidney (%)		0.54	0.43	0.50	0.53	0.03
Thyroid (g)		0.03	0.04	0.06	0.03	0.001
Thyroid (%)		0.002	0.002	0.004	0.002	0.001
Paired Adrenals (g)		0.24	0.30	0.19	0.28	0.09
Paired Adrenals(%)		0.02	0.02	0.01	0.02	0.001

SEM = standard error of mean

* = P>0.05

Table 5: The effect of paw paw peel meal on total protein concentration (g/100ml.) in tubal fluids of female rabbits (means \pm s.e.m)*

Parameter (Flushings)	Diet			
	1(0%)	2(10%)	3(20%)	4(30%)
Vagina	1.20 \pm 0.40	0.63 \pm 0.22	0.51 \pm 0.23	0.87 \pm 0.36
Cervixes	0.35 \pm 0.06	0.48 \pm 0.01	0.67 \pm 0.01	0.40 \pm 0.06
Uterine horns	1.46 \pm 0.02	0.79 \pm 0.02	0.73 \pm 0.03	0.88 \pm 0.01
Oviducts	1.11 \pm 0.05	0.71 \pm 0.01	0.60 \pm 0.07	0.65 \pm 0.01

s.e.m = standard error of mean

* = P>0.05

Conclusion

It does appear from the results of this study that it might be safe to feed female rabbits PPM up to a level of 30% based on preliminary findings. We however

recommend further work including the histometry of the regions of the reproductive tract especially the ovary and a more comprehensive biochemistry of tubal fluids.

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