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EFFECT OF AGE AND SEX OF RABBIT ON NUTRIENT INTAKE AND DIGESTIBILITY

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Abstract

A total of 24 cross breed rabbits progenies from mating between New Zealand white x California and California x Chinchilla breed were used to study the influence of sex and age of rabbit on nutrient intake and digestibility. Concentrate meal containing 18.8% CP and 2500kalME/kg mixed with groundnut forage meal to make complete diet was used to feed the rabbits. Digestibility study was conducted at15 weeks old and 19 weeks old respectively for male and female rabbits. The result on dry matter, (DM) crude protein (CP) ether extract (EE), crude fiber (CF) and nitrogen free extract (NFE) digestibility showed that the digestibility did not differ at both 15th and 19th weeks of age respectively and with regards to sex of rabbits ($P>0.05$). There were significant differences ($P<0.05$) in body weight and metabolic weight with regards to the sex with the female being heavier than the male. But the fecal output was higher in male ($P<0.05$) than in female.

Key words: Forage meal- Sex- Age-Groundnut- Rabbits- Nigeria.

INTRODUCTION

In the developing country like Nigeria, there is inadequate supply of animal protein sources and as such protein consumption is below the recommend range. An average Nigerian consumes only about a quarter of his minimum daily animal protein requirement[23].This could be attributed to the low level of animal production. Food and Agricultural Organization [9]reported that out of the 44g protein supply per caput, animal products constitute about 2% leading to malnutrition and under untraditional of all age groups in Nigeria. To overcome the animal protein insufficiency, the need to improve on the feeding management and productive performance of livestock in Nigeria becomes imperatives.

The prolific nature of rabbit coupled with its short gestation period ad generation intervals make it the animal device for multiplication. Increased rabbit production could bridge the supply – demand protein gap for subsistence protein production[4]. Domestic rabbit production had also witnessed its problems. Amongst others, the task of producing adequate nutrition has continually militated against the development of this livestock. Compared the meat of other small livestock species, rabbit meat is rich in proteins, certain vitamins and minerals, it contains little fat and higher proportion of essential polysaturated linoleic fatty acid [3] .

The rabbit *oryctalagus cariculus* is herbivorous non ruminant animal, they are not as efficient as ruminants in digesting fiber component of the diet [17].Forages are essential to rabbit for their roughage and vitamin value if commercial pellets and mashes consist of only grains concentrates. In addition, inclusion of forages greatly economized the amount of concentrates feed. Forages are offered to rabbits as fresh, dry (hay) or meal. Studies have shown that whether offered separately or in complete diets as meal, forages elicit growth response in rabbits [12, 13, 14, 15 16, 17, 18].Studies have also shown that performance of rabbit is better in diets containing less than 15% crude fiber than on higher fiberdiets[7, 8].Forages are cheaper than concentrate and are available in plentiful supply in the tropics. It is therefore necessary to investigate their use in feeding rabbits. Some tropical foragehas been evaluated for feeding rabbits and there are wide variations in their intake and digestibility [15]. The present experiment was designed to evaluate the influence of age and sex on nutrients intake and digestibility in rabbits fed with groundnut forages meal at different level of inclusion 0, 10, and 20% to replace concentrate meal in complete diets.

MATERIAL AND METHODS

Study site

The experiment was conducted in the Rabbitry of the National Animal Production Research Institute, Shika, Nigeria (10°11' N and 7°8' E, 650 m above sea level).

Experimental animals

Total of 24 cross bred rabbits, progenies from mating between New Zealand while x California and California x Chinchilla breeds were used for this study.

Experimental diets and feeding

The concentrate meal contained 18.8CP and 2500KcalME/Kg. Groundnut forage meal was used to replace the concentrate meal at 0, 10, and 20% level to form complete diets. The forage (groundnut haulms) was collected at harvest, dried and hand chopped prior to the feeding. Rabbits were offered 150g/rabbit/day of feed every morning at 0.800 hours in flat bottom earthen feeders with *ad lib* water supplied daily.

Experimental procedures

The rabbits were weighed at the start of the trial and then at weekly intervals during the study. The rabbits were housed and fed individually in all meal cages measuring 60cm x 60cm x 50cm. The feed and water were supplied in earthen flat bottom pots with curved tips to reduce feed waste. The feeds were weighed before being fed to the rabbits and the left over feed were equally weighed daily before the morning feeding in order to determine the total intake.

Digestibility study

Digestibility study was conducted at 15 and 19 weeks old for four days on each period. Faecal samples were collected daily and stored at – 20^{o}C in deep freezer immediately after collection. At the end of each collection period, the faecal samples were bulked for each animal for proximate analysis according to AOAC procedures[5]. Composition of the diets and groundnut forage meal were determined according to AOAC [5]. Feed and nutrient intake and digestibility coefficient were determined. Metabolic weight was computed as live weight raised to power 0.75.

Digestible energy intake of rabbits was completed according to Schliemann[27].

DE= (Kcal/kg/DM/d) = [(5.28xDCP) +9.51xDEE)+(4.20xDCF)+(4.20xDNFE)]

Where: DCP = digestible crude protein, DEE = digestible ether extract, DCF = digestible crude fiber, DNFE = digestible nitrogen free extract.

Parameters

The parameters include body weight, feed intake, faecal output, nutrient intake and digestibility.

Table 1: Proximate composition of groundnut forage meal and feed fed to rabbits

Description	%DM	%ASH	%EE	%CF	%CP
Groundnut forage meal	96.82	17.77	8.63	33.18	10.31
0% groundnut forage meal	96.29	6.63	14.86	12.33	18.81
10% groundnut forage meal	96.71	8.03	12.67	14.03	18.63
20% groundnut forage meal	96.71	11.04	11.41	16.48	17.25

RESULTS

Table 2 shows the mean values for the effect of sex of rabbit on feed intake and faecal output. From the table, it can be seen that body weight was significantly higher ($p<0.05$) for female (2.26) compared to that of male (2.02). The mean value obtained on metabolic weight (kg Mwt^{-1}) was also significantly higher ($p<0.05$) for females compared to that of males. There was no significant difference ($p>0.05$) between the two sexes on both feed intake (g/bwt) and feed intake (g/mwt) though the average mean for the result was higher for male compared to that of female. The mean value for both faecal output (g/bwt) and faecal output (g/mwt) were significantly higher ($P<0.05$) for male

rabbits than for females. Although the mean value of faecal dry matter was higher for males than for females, this difference was not statistically significant (p>0.05).

Table 2: Effect of sex of rabbit on feed intake and faecal output

	Sex			
Parameter	Male	Female	SE	P
Body weight (kg)	2.02[b]	2.26[a]	0.07	0.021
Metabolic weight (kg)	1.69[b]	1.85[a]	0.04	0.0234
Feed intake (g/bwt)	35.75	33.29	3.66	0.639
Feed intake (g/Mwt)	42.05	40.60	3.95	0.798
Faecal output (g/bwt)	7.41[a]	5.62[b]	0.50	0.0207
Faecal output (g/Mwt)	8.80[a]	6.89[b]	0.61	0.0368
Faecal dry matter	51.86	44.69	4.17	0.239

[ab]Means bearing different superscript along rows are significantly different (P<0.05)

Table 3. Shows the mean values for the effect of age of rabbit on feed intake and faecal output. The result revealed that there were no significant difference (p>0.05) in body weight at both 15th and 19th week of age. For the body weight at 19 weeks was higher (2.22) than that obtained at the 15th week of age (2.06), this difference was not statistically significant. The result also indicated that the age of rabbit had no significance influence on the metabolic weight (P>0.05) at both ages.The result of this experiment showed that at both 15 and 19 weeks of age, there were no significance differences in feed intake (gDM/bwt) and feed intake (gDM/mwt). Faecal output (g/bwt) and faecal output (g/wmt) were not significantly difference at both ages (15 and 19weeks) although the average mean was higher at 15 weeks of age than those at 19 weeks.
There was significant (P<0.05) difference on faecal dry matter at these ages, as it was higher at 19 week (55.29) than at 15 weeks (41.26) of age, this is indicating that, the faecal dry matter increased with increase in age of rabbit.

Table 3: Effect of age of rabbit on feed intake and faecal output

	Age (weeks)			
Parameter	15	19	SE	P
Metabolic weight (kg Lw$^{0.75}$)	2.06	2.22	0.07	0.132
Feed intake (DM/bwt)	36.74	32.57	3.66	0.450
Feed intake (DM/Mwt)	43.20	39.44	3.95	0.510
Faecal output (g/bwt)	6.81	6.22	0.50	0.423
Faecal output (g/Mwt)	8.09	7.59	0.61	0.560
Faecal dry matter (g)	41.26[b]	55.29[a]	4.17	0.0276

bwt = body weight, Mwt= Metabolic weight , [ab]Means bearing different superscript along rows are significantly different (P<0.05)

Table 4 shows the effect of sex of rabbit on digestible nutrient intake and digestibility. From the table, it can be seen that dry matter (DM) intake (g/day) was not significantly different for both sexes.

Although the result indicated higher mean value for female (73.87) than for male (69.12), this difference is not statistically significant (P>0.05). The results on crude protein (CP) intake, ether extract (EE) intake, crude fiber (CF) and nitrogen free extract (NFE) intake showed no significant differences for both sexes, despite the fact that there were differences in the result obtained for their mean values, these differences were not statically significant (p>0.05). Digestible energy intake (KcalDM/day) was not significantly different (p>0.05) for both male and female rabbits, even though the result indicated higher mean values for female (295.50) than for male (266.35) the value was however not significantly different (p>0.05).

Table 4: Effect of sex of rabbit on digestible nutrient intake

	Sex			
Nutrient intake (g/day)	Male	Female	SE	P
Dry matter	69.12	73.87	5.17	0.523
Crude protein	12.69	13.40	0.95	0.603
Crude fiber	9.68	10.68	0.84	0.414
Ether extract	9.10	9.51	0.74	0.702
Nitrogen free extract	31.95	33.80	2.4	0.580
Digestible energy (kcalDM/day)	266.35	295.50	26.1	0.439

Table 5: indicates the effect age of rabbit on nutrient intake. The result of this experiment indicated that dry matter intake was not affected by the age of rabbit as the result obtained at 15^{th} and 19^{th} week of age showed significant difference (P>0.05). Similarly crude protein intake, crude fiber (CF) intake, ether extract intake and nitrogen free extract (NFE) intake were not significantly different at both ages (15 and 19 weeks old). The age of rabbits also showed no significant difference on digestible energy intake (p>0.05).

Table 5: Effect of age of rabbit on nutrient intake

	Age (weeks)			
Nutrient intake (g/day)	15	19	SE	P
Dry matter	72.52	70.47	5.17	0.782
Crude protein	13.25	12.83	0.95	0.759
Crude fiber	10.29	10.07	0.84	0.855
Ether extract	9.45	9.16	0.74	0.787
Nitrogen free extract	33.39	32.36	2.39	0.763
Digestible energy (kcalDM/day)	286.00	275.86	26.1	0.786

Table 6 shows the digestibility (digestibility coefficient) of rabbits. The means values for the dry matter digestibility for both male and female rabbits showed no significant difference (P>0.05) of sex. The digestibility coefficient of crude protein of both male and female rabbits was not significantly different from one another, although it was higher for female but statistically there is no difference (P>0.05). Similarly crude fiber, ether extract and nitrogen free extract digestibility of male and female rabbits were not significantly different despite that there were differences in those values obtained, however, the differences were not statistically significant (p>0.05). Dry matter digestibility (Table 6) does not have any effect on the ages of rabbits.(p>0.05).The mean digestibility value was similar at these ages. The table also showed that the mean digestibility value of crude fiber (CF) was higher at

19 week (0.573) than at 15 weeks (0.537) old, the value was however not significantly different ($p>0.05$). Similarly no significant difference was observed in the digestibility of ether extract and nitrogen free extract at these ages. Although there were difference in mean digestibility value of both ether extract and nitrogen free extract, but these differences were not significant ($P>0.05$).

Table 6: Digestibility co-efficient by rabbit

Nutrient (g/day)	**Sex**				**Age (weeks)**			
	Male	Female	SE	P	15	19	SE	P
Dry matter	0.763	0.812	0.03	0.267	0.790	0.785	0.03	0.907
Crude protein	0.797	0.835	0.026	0.310	0.8133	0.819	0.026	0.858
Crude fiber	0.513	0.596	0.061	0.348	0.537	0.537	0.061	0.681
Ether extract	0.900	0.923	0.015	0.305	0.908	0.915	0.015	0.729
NFE	0.805	0.851	0.027	0.248	0.840	0.816	0.027	0.537

NFE – Nitrogen Free Extract

DISCUSSION

The result of this study did not show any significant difference in the pattern of feed intake between the male and female rabbits and at both 15 and 19 weeks of age of the rabbits used in this experiment. This result is not in line with the results many researchers in which significant differences were observed in the pattern of feed intake between the two sexes. There was slight effect of gender on productive performance with female showing higher feed intake than the male[22].Female rabbit pattern of intake was higher than in male[14]. Lazzarronialso reported higher feed intake by female carmagnola Grey rabbit than the male[21]. In general feed intake of rabbit was higher when fiber content of the diet was increased. Bawa reported higher feed intake of rabbit on groundnut haulms and cowpea shell based diets [6]. The insignificant differences shown by the rabbits in their pattern of feed intake in this study could be due to low feed digestibility or other factors such as breed of the animals.

The result obtained from the study showed significant differences in both body weight (kg) and metabolic weight which were high in female than in male, however such differences were not observed due to animal age (i.e. at 15 week and 19 week of age of the rabbits). The higher significant differences obtained with respect to body weight of the sexes of rabbit is contrary with what had been reported in which non significance differences in weight gain was observed between male and female rabbits when groundnut forage meal was fed to the animals[18]. Laxmi[20].also reported non-significant effect of sex on body weight of rabbit at age 4, 8, and 16 weeks, so such significant differences obtained in body weight could be attributed to breed of animal and feed differences among other factors.

Wisema[29], also recorded increase in value of fat digestibility of older chickens, the contradiction from the result of this study with those reported by Zelenka and Wiseman [29,30] .could be attributed to difference in species of animals use in the experiments or due to age differences of the animals used in the experiments.

It is concluded from this study that the age and sex of rabbit had no influence on the nutrient intake and digestibility and that the rabbits perform equally well on groundnut forage meal.

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