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Effect of *Mucuna utilis* leaf meal diet on performance and carcass characteristic of rabbits

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ABSTRACT

Aim: The study was aimed to investigate the performance and carcass characteristic of Rabbits fed *Mucuna utilis* leaf meal diet.
Method and Materials: *Mucuna utilis* leaf meal were fed at 0, 5, 10, 15, and 20% levels of inclusion in the experimental diets designated as T_1, T_2, T_3, T_4 and T_5, respectively. Each rabbit in a treatment served as a replicate Feed and water were provided ad libitum. The experiment lasts for 8 weeks during feed intake and weight gain were recorded weekly during the experimental period.
Results: The results revealed that weight gain, feed intake and feed conversion ratio (FCR) were significantly ($P<0.05$) affected by treatments. The highest average feed intake was observed in diet T_5 (20 % *Mucuna utilis*). Feed intake increased differently as the level of *Mucuna utilis* increased across the treatment. Result for carcass characteristics of showed no significant ($P>0.05$) difference in all the dietary treatments except for singed weight. Result for carcass by-products and visceral organs showed weight of liver, lungs, heart, kidney, spleen, gall bladder, oesophagus, stomach and both small and large intestines were no significant ($P>0.05$) difference across the treatment groups.
Conclusion: Rabbits can be fed with diets containing *Mucuna utilis* leaf meal up to 20% in their diets without any detrimental effect on the performance and carcass characteristic of Rabbits.

Keywords: Carcass, Leaf meal diet, *Mucuna utilis*, Performance characteristic, Rabbit.

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Introduction

Small-livestock such as rabbits have advantages of fast growth, large litter size, and short generation interval and good quality consumable and non-consumable animal products, but are faced with the challenge of feedstuff availability and affordability. In Nigeria today, the cost of feeding livestock intensively is over 70% (Oluremi *et al*., 2008). Healthy animals are valuable to livestock farmer, however an animal's feed will determine to a large extent its general performance and productivity. Feed account for as much as 65.7% of the total cost of rabbit production (Ayinde and Aromolaran, 1998). The cost of rabbit feeding is high and also for other Nigerian livestock species (Adeyemi *et al*., 2008). In countries like Nigeria, are facing serious competition between human and livestock (monogastric animals) for available conventional feed stuffs (Teguia and Beynen, 2005).

The increased competition for available conventional feeds and scarcity of food have both encouraged nutritionists, scientists and agriculturists to research into the use of unconventional feedstuffs that are cheap, readily available and are possible substitute for more expensive protein sources (groundnut cake and soybean meal) and energy sources such as maize (Obun and Adeyemi, 2012).

Rabbits have the potential of utilizing such unconventional feedstuffs as Velvet bean (*Mucuna utilis*) leaf meal (Sese *et al*., 2014), Neem (Azadirachta indica) leaf meal (Ogbuewu *et al*., 2008), Pigeon pea (Cajanus cajan) seed meal (Amaefule et al., 2005) and other diverse plant materials. Mucuna utilis (velvet bean), a tropics legume, is little known and has a low human preference as an energy/protein source but high preferences in livestock feed (Emenalom and Nwachukwu, 2006). It is comparable to soya bean in terms of amino acid and mineral profile (Iyayi and Taiwo, 2003). Based on their findings, unconventional feed stuffs could play a vital role in

alleviating this enormous challenge posed by intensive feeding in livestock production, because they are mostly cost-free and are readily available. Therefore, this experiment was designed to assess the performance and carcass characteristics of rabbits Fed Diets containing *Mucuna utilis* leaf meal.

Materials and Methods

The study was conducted at the Rabbitry House of the Livestock Research Farm, Bayero University Kano, Kano State. Kano lies between latitude 11.9836^{0}N of the equator and longitude 8.4753^{0}E of the Greenwich meridian. Kano State is characterized by tropical wet and dry climates. Kano receives an average of 690 mm of precipitation per year, the bulk of which falls from June to September. The temperature both on diurnal and annual range is slightly above 30^{o}C (K-SEEDS, 2004). Thirty (30) healthy cross bred weaned rabbits of mixed sexes were purchased from a reputable rabbitry in Makurdi, Benue State and conveyed to Kano for the study. Prior to the commencement of the experiment, the rabbits were prophylactically treated against internal and external parasites by subcutaneous injection of Ivomec (0.2 ml/rabbit). A broad spectrum antibiotics (Oxytetracycline L.A) was given intramuscularly at the rate of 0.2 ml/rabbit. Rabbits were randomly allotted to five (5) dietary treatments with six rabbits per treatment. Each rabbit in a treatment served as a replicate. *Mucuna utilis* leaf meal were fed at 0, 5, 10, 15, and 20% levels of inclusion in the experimental diets designated as T_1, T_2, T_3, T_4 and T_5, respectively (Table 1) .A total of 80 g feed was supplied to each rabbit per day at the rate of 40 g in the morning (8:00 am) and 40 g in the evening (5 pm) to reduce wastage. Clean drinking water was also given *ad-libitum* throughout the experimental period which lasted for eight weeks. Feed intake and weight gain were recorded weekly during the experimental period. At the end of the week 8 experimental period, 3 rabbits per treatment were randomly selected slaughtered and carcass prepared according to the norms. Weights measurements were carried out using a sensitive electronic kitchen scale. Body weight (g) of each rabbit was taken at the beginning of the experiment (day 0). Subsequently, the measurement was carried out weekly. Feed intake was recorded daily by subtracting the left over from the quantity of feed offered to the animals the previous day. Average daily gain (ADG) was calculated from weight gain and a total number of days of the experimental period. Feed intake (g/rabbit) =Feed offered (g) - Leftover (g) Average daily gain (ADG) = (final body weight – initial body weight) / total days of the experiment. The feed conversion ratio was determined as the ratio of feed consumed (g) to weight gain (g). Three rabbits from each treatment were randomly selected. Before slaughter, the rabbits fasted for 12 hours to avoid error due to gut fill. All the rabbits were weighed before and after slaughter. After slaughtering, the tail close to the base was first removed so also the head, feet and the pelt. During evisceration, the internal organs and the gut contents were removed and weighed. The skinless carcass was weighed and expressed as a percentage of live weight. The organs weights were expressed as a percentage of dressed weight. Data obtained from the study were subjected to One – way Analysis of variance (ANOVA) using the Minitab 14 (2004) Statistical Software and where significant differences occurred, means were separated using the Duncan's Multiple Range Test (DMRT) (Steel and Torrie, 1990).

Table 1: Gross composition of experimental diets (kg/100kg)

Ingredient	**T_1**	**T_2**	**T_3**	**T_4**	**T_5**
Maize	35.50	30.50	25.50	20.50	15.50
MULM	0.00	5.00	10.00	15.00	20.00
BDG	20.00	20.00	20.00	20.00	20.00
Rice bran	20.00	20.00	20.00	20.00	20.00
SBM	10.00	10.00	10.00	10.00	10.00
PKC	11.50	11.50	11.50	11.50	11.50
Bone ash	2.50	2.50	2.50	2.50	2.50
Min./vit. Premix	0.25	0.25	0.25	0.25	0.25
Common salt	0.25	0.25	0.25	0.25	0.25
TOTAL	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

MULM: *Mucuna utilis* leaf meal, BDG: Brewers' Dried Grains, SBM: Soybean Meal
PKC: Palm Kernel Cake, ME: Metabolizable Energy

Results and Discussion

Results of weight gain, feed intake and feed conversion ratio (FCR) presented (Table 2). The

effect of dietary treatment on feed intake was significantly (P<0.05) affected by treatments. The highest average feed intake was observed in diet T_5 (20 % *Mucuna utilis*).

Feed intake increased differently as the level of *Mucuna utilis* increased across the treatment. Significant (P<0.05) differences were observed in the average weight gain of rabbits. Diet T_5 giving the highest weight gain of 20.85 g/day. There were (P<0.05) reduction in body weight gain in T_2, T_3 and T_4 with decreased in the level of *Mucuna utilis* meal in the diets. T_2 gave the least average weight gain of 18.44 g/day.

The feed conversion ratio was not significantly (P>0.05) affected by dietary treatments. The average daily feed intake of the rabbits was significantly affected (P<0.05) by dietary treatments. Rabbits fed 20 % *Mucuna utilis* leaf meal had the highest average total feed intake (1248.26 g/rabbit) for T_5 while the lowest was observed in T_1 (1114.59 g/rabbit). Average daily weight gain values obtained in this study had a direct relationship with intake of *Mucuna utilis* leaf meal. In general, the weight gain improved with *Mucuna utilis* intake as against the animals on diet T_1 (control). This pattern of body weight gain (BWG) could be attributed to the relatively better nutrient density, digestibility, and availability to the rabbits in the following dietary order of T_5, T_4, T_3, T_2 and T_1. Devendra and Burns (1993) reported that plane of nutrition markedly affect body weight gain (BWG).

The superior body weight of animals in T_5, T_4, T_3, and T2 to T_1 could be caused by diets providing the best balance of nutrients for growth and development. Feed conversion ratio did not showed any significant difference (P>0.05) among the treatment groups, it also numerically favoured animals in T_5 (1.16), which makes it comparatively a better diet than the rest, since lower value of feed conversion ratio indicates superiority of the diet (Ogbonna *et al.,* 2002). However, the range of FCR (1.16 – 1.20) in this study was lower than 2.5 – 3.5 reported by Oyawole (1989) as the average feed conversion ratio for weaned rabbits. Result for carcass characteristics of rabbits fed diets containing *Mucuna utilis* leaf meal was presented (Table 3).

The result showed no significant (P>0.05) difference in all the dietary treatments except for singed weight. Dressed weight ranged from 734.11 (T_1) to 944.41 g (T_5). The values obtained for bled weight were 79.64, 81.18, 87.42, 94.51 and 97.10 % of dressed weight for T_1, T_2, T_3, T_4 and T_5, respectively. Values obtained for head ranged from 5.87 (T_2) to 7.31 % dressed weight (DW) (T_5). Rack weight values were 6.62, 7.08, 7.84, 7.24 and 8.02 % (DW) for T_1, T_2, T_3, T_4 and T_5, respectively.

The values obtained for carcass characteristics showed nonsignificant difference (P>0.05) across dietary treatments except for singed weight. The dressed weight was similar to 722.67 – 966.21g/rabbit reported by Ugwene (2003) for Chinchilla rabbits. Igwue buike *et al.* (2001) reported 831.64 – 1053g/rabbit for New- Zealand rabbits fed graded levels of sorghum wastes. The bled weight as percentage live weight was not statistically (P>0.05) difference. The bled weight which is the measures of the weight of the animal after bleeding had values in the control treatment lower than other treatment groups. Hassan and Idris (2002) reported that dressing percentage is influenced by age, sex, feed, weight and breed. The variation in the dressing percentage in the report of various researchers might be as a result of nutrition, breed difference and slaughter techniques (Fasae *et al.,* 2007). The results obtained for head, rack, loin, fore and hind-limbs in this study showed that the animals on diets containing 20% *Mucuna utilis* leaf meal better utilized feed for meat production. T_5 which was statistically higher than all the other treatments was an indication that better feed utilization for muscles built up was conferred by the diet with the highest *Mucuna utilis* leaf meal.

Result for carcass by-products and visceral organs of rabbits fed diets containing *Mucuna utilis* leaf meal were presented (Table 4). The results of weight of liver, lungs, heart, kidney, spleen, gall bladder, oesophagus, stomach and both small and large intestines showed no significant (P>0.05) difference across the treatment groups. However, since there were no significant differences among the internal organs, it then implies that the diets were safe for animal feeding.

Non- significant variation between the values of heart is an indication that blood circulation among all the dietary groups was normal. The kidney on the other hand is anexcretory organ, non-significance in the values obtained is an indication that kidney was not burdened by the inclusion of *Mucuna utilis* leaf in the diets; thus, its excretory function was not impaired (Hassan and Idris, 2002).

Table 2: Growth performance of Rabbits fed experimental diets

Performance indices	T_1	T_2	T_3	T_4	T_5	P-Value
AIW (g/rabbit)	259.67	264.33	270.00	256.67	252.67	0.99
AFW (g/rabbit)	1614.67^{b}	1681.33^{b}	1709.00^{b}	1848.67^{a}	1878.00^{a}	0.01
AWG (g/rabbit)	1355.00^{c}	1417.00^{bc}	1439.00^{b}	1592.00^{a}	1625.33^{a}	0.21
AWG/d (g/rabbit)	17.68^{c}	18.44^{bc}	18.74^{b}	20.48^{a}	20.85^{a}	0.11
AFI (g/rabbit)	1114.59^{b}	1152.62^{ab}	1169.65^{ab}	1234.26^{a}	1248.26^{a}	0.03
AFI/d (g/rabbit)	21.13^{c}	22.11^{bc}	22.38^{b}	24.05^{a}	24.85^{a}	1.04
FCR	1.20	1.20	1.19	1.18	1.16	0.97

^{a,b,c}Means within each row with different superscripts are significantly different (P< 0.05). ns: not significantly different (P>0.05); * significantly different (P<0.05),AIW: Average Initial Weight
AFW: Average Final Weight, AWG: Average Weight Gain, AWG/d: Average Daily Weight Gain, AFI: Average Feed Intake, AFI/d: Average Daily Feed Intake

Table 3: Carcass characteristics of rabbits fed diets containing *Mucuna utilis* leaf meal

Parameter (% of dressed weight)	T_1	T_2	T_3	T_4	T_5	SEM
Dressed weight	734.11	825.62	833.77	926.50	944.41	1.22^{ns}
Bled weight	79.64	81.18	87.42	94.51	97.10	0.85^{ns}
Singed weight	56.80^{bc}	49.13^{c}	68.70^{a}	63.23^{ab}	68.60^{a}	0.01*
Dressing percentage	40.18	41.37	41.62	44.23	44.88	1.51^{ns}
Head	5.90	5.87	5.99	6.95	7.31	0.11^{ns}
Rack	6.62	7.08	7.84	7.24	8.02	0.07^{ns}
Loin	10.15	10.58	11.33	11.34	12.02	1.83^{ns}
Fore limb	5.21	4.74	5.59	6.04	6.52	1.14^{ns}
Hind limb	9.06	9.11	1.23	11.01	11.72	0.21^{ns}

$^{a, b,c}$Means within each row with different superscripts are significantly different (P< 0.05).

Table 4: Carcass by–products and Visceral Organ Weight of Rabbits fed *Mucuna utilis* leaf meal diet

Parameter (expressed as % of Fasted Live Weight)	T1	T2	T3	T4	T5	SEM
Fasted live weight	1454.22	1472.14	1528.71	1632.19	1703.36	1.29^{ns}
Liver	2.78	2.97	3.18	3.58	3.21	0.14^{ns}
Lungs	0.68	0.70	0.67	0.65	0.81	0.01^{ns}
Heart	0.27	0.31	0.29	0.43	0.36	0.03^{ns}
Kidney	0.64	0.73	0.75	0.67	0.91	0.01^{ns}
Spleen	0.04	0.05	0.07	0.06	0.08	0.01^{ns}
Gall bladder	0.02	0.03	0.04	0.05	0.06	0.02^{ns}
Oesophagus	0.12	0.13	0.14	0.14	0.15	0.01^{ns}
Stomach	1.72	1.42	1.70	1.63	1.89	0.31^{ns}
Small intestine	2.10	2.83	2.63	2.73	2.71	1.22^{ns}
Large intestine	1.53	1.52	1.89	1.59	1.81	1.02^{ns}

Means within each row are not significantly different (P> 0.05)

Conclusions

The results of the study concluded that rabbits can be fed with diets containing *Mucuna utilis* leaf meal up to 20% in their diets without any detrimental effect on the performance and carcass characteristic of Rabbits. *Mucuna utilis* leaf meal could therefore be recommended for Rabbit production for enhanced performance and carcass characteristic.

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