Effect of Irish potato peel and yam peel meals on the performance and nutrient digestibility of weaner rabbits

* Yaqoob, R., Omaye, J. J. and Ahmad, Y.

Department of Animal Science, Faculty of Agriculture,
Ahmadu Bello University, Zaria

*Corresponding author: ummnusaybah29@gmail.com; 07033587008

Abstract

A study was conducted to evaluate the nutritive value of Irish potato peel meal (IPPM) and yam peel meal (YPM) on the performance of weaner rabbits. Twenty-five weaner rabbits were assigned to five dietary treatments of five rabbits each, and were individually caged in a completely randomized design. The rabbits were fed the dietary treatments, where treatment one (T1) was the control with no IPPM and YPM, treatment two (T2) and treatment three (T3) with 20% and 30% IPPM, respectively while treatment four (T4) and five (T5) had 20% each and 30% each of the combination of IPPM and YPM, respectively. The parameters measured were initial weight, final weight, average feed intake, average weight gain, feed to gain ratio, water intake, feed cost/Kg gain, proximate composition and feed digestibility of the feed materials. The result showed that average daily feed intake was significantly higher ($P<0.05$) in the rabbits fed with the control diet (T1) compared to the other treatments. The feed to gain ratio were similar in all the treatments. The feed cost per kg gain was significantly different ($P<0.05$) across the treatments. Crude protein, crude fibre and ash digestibility were significantly higher in T1 (control) compared to T2, T3 and T5, but was similar to T4. Ether extract and NFE digestibility were significantly higher ($P<0.05$) in T1 compared to all other treatments. It is concluded that, Irish potato peel and yam peel meals can be used to replace maize in the conventional rabbit feed without any adverse effect on their growth performance and nutrient digestibility.

Keywords: potato peel, yam peel, rabbit, performance

Introduction

Primary feed ingredients such as grains, oil seeds and their by-products are used to feed monogastric animals. This puts monogastric animal in direct competition with man for basic food materials which in turn limits animal production (Aduku, 2004). This has led to the current rise in price in animal products and making them out of reach to the average Nigerian. This problem can be tackled by directing efforts at the production of animals that are highly prolific with short generation intervals and also has high feed to gain ratio (Akinmutimi and Onwukwe, 2002). One of such animals is the rabbit, with high fecundity and short gestation period (Aduku and Olukosi, 1990; Fielding, 1991). They are fast growing and can convert forage and

kitchen waste (e.g. cabbage, yam peels, potato peels, plantain peels etc.) into meat with high efficiency as they have high feed conversion efficiency (Nworgu and Ogbosuka, 2003). The most important aspect of animal production is in the nutrition (Ewa *et al.*, 2001). Feed constitute about 70-75% of the total cost of animal production (Aduku, 2004). This has been attributed to the competition among human beings, industries and monogastric for conventional feed stuff. This therefore calls for the replacement of the expensive conventional feed-stuff with cheaper available alternative feed stuffs. A lot of agricultural by-products and kitchen waste have already been investigated such as use of yam peels (Ayoola and Akinbani, 2011); ripe plantain and yam peels (Akinmutimi et

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al, 2006) etc. However, there was scanty information on the utilization of combination of Yam peels and Irish Potato peels in rabbit nutrition. Hence the aim of this study was to evaluate the effect of including yam peels and Irish potato peels on the performance of weaner rabbits.

Materials and methods

Experimental site

The study was carried out at the rabbitary unit of the Department of Animal Science farm Faculty of Agriculture, Ahmadu Bello University, Zaria, at 11° 11' North and 7° 38' East, altitude 686m above the sea level. The rabbits were housed in a long three tier wire cage consisting of 12 hutches, three hutches in the column and four across the row. Each row has collection tray under it for the collection of faeces and urine. Each hutch has a feeding and water trough. The floor of the rabbitary house was made of a hard concrete for easy and proper cleaning.

Sources of experimental feed ingredients

The Irish potato peels and yam peels of

different varieties were collected from households and restaurants in Zaria, Kaduna state and were sundried for 5 days on a cemented floor. The peels were sun-dried and milled before incorporation into the experimental diets. The dried peels were ground separately using a hammer milling machine. They were later packed in the sack and were stored at room temperature until required. Other feed ingredients were purchased from the market.

Experimental diets

Five experimental diets were formulated and were designated as T1, T2, T3, T4, and T5. T1 was the control which had no IPPM or YPM, T2 and T3 contained IPPM only at 20 and 30% inclusion rate respectively, T4 contains a combination of 20% IPPM and 20% YPM and T5 contains a combination of 30% IPPM and 30% YPM. The diets were formulated to meet the requirement for rabbits (i.e. ME= 2884 and CP=18%). The composition of the diet is shown in Table 1.

Table 1: Composition of experimental diets

Ingredients	Treatments				
	T1	T2	T3	T4	T5
Maize	35.75	24.56	18.97	14.81	4.36
Maize offal	35.75	24.56	18.97	14.81	4.36
IPPM	0.00	20.00	30.00	20.00	30.00
YPM	0.00	0.00	0.00	20.00	30.00
Full fat SBM	12.30	13.49	14.08	13.24	13.69
GNC	12.30	13.49	14.08	13.24	13.69
Bone meal	2.50	2.50	2.50	2.50	2.50
Lime stone	0.50	0.50	0.50	0.50	0.50
Methionine	0.20	0.20	0.20	0.20	0.20
Lysine	0.15	0.15	0.15	0.15	0.15
Common Salt	0.30	0.30	0.30	0.30	0.30
Vitamin premix	0.25	0.25	0.25	0.25	0.25
TOTAL	100.00	100.00	100.00	100.00	100.00
CALCULATED ANALYSIS					
ME (Kcal/kg)	2890.58	2950.02	2979.76	2939.35	2963.79
Crude protein	17.65	17.65	17.65	17.65	17.65
Crud fibre	5.80	4.90	4.45	5.49	5.33
Ether extract	5.38	5.14	5.01	4.75	4.43
Ash	1.31	2.39	2.59	4.06	5.17
Lysine	1.60	1.62	1.37	1.65	1.58
Methionine	1.20	1.18	1.44	1.19	1.14
NFE	69.51	69.57	69.95	67.60	67.07
Feed cost/kg(N)	70.14	60.73	55.79	58.49	52.45

Biomix broilers supplied the following per kg diet. Vit A, 1000IU; vit D3, 2000IU; vit. E, 25 mg; vit K, 2mg; vit B6, 1.8mg; vit B2, 0.015mg; Niacin, 27.5mg; pantothenic acid, 7.5mg; folic acid, 0.075; biotin, 0.06mg; choline chloride, 300mg; cobalt, 0.2mg; copper, 3.0mg; iodine, 1 mg; iron, 20mg; manganese, 40mg; selenium, 0.2mg; zinc, 30mg; anti oxidant, 1.25mg. IPPM=irish potato peel meal, YPM= yam peel meal, NFE= nitrogen free extract, SBM= soya bean meal, GNC= groundnut cake, ME= Metabolizable Energy.

Experimental animals

A total of 25 weaner rabbits of mixed sexes and breed were used. The rabbits were purchased from a credible source. The rabbit's house was cleaned and was disinfected prior to the arrival of the rabbits. On arrival, the rabbits were given prophylactic treatment. Anti-bacterial and Ivomec was administered and were fed with the control diet so as to condition them to the experimental diet for 48 hours before assigning them to their experimental treatment. Each treatment was replicated five times in a completely randomized design with five rabbits per treatment.

Parameters monitored

The parameter recorded includes the initial weight of the rabbits and they were subsequently weighed weekly. The percentage mortality was calculated using number of dead rabbits divided by overall number of rabbits x 100. At the end of each week, feed intake was measured by measuring the leftover and deducted from the total weight of feed supplied. Water intake was measured by measuring the volume of the left over water which is deducted from the amount of water supplied in the previous day. The same volume of water supplied was kept in an empty cage to determine the water loss through evaporation. The rabbits were weighed weekly to determine their weight gain. Feed conversion ratio and feed cost per kilogram weight gain (N) were also calculated. The rabbits were weighed at the end of the experiment to get the final weight. The trial lasted for eight weeks.

Digestibility

Nutrient digestibility studies were carried out on three rabbits from each treatment on the 7th week. The rabbit was caged individually for fecal and urine collection. A known weight of the experimental diet was supplied daily and water was given *ad libitum*. Daily faecal droppings and urine

was collected for seven days. The fecal samples were weighed and sundried over a period of seven days. The dried fecal samples were reweighed and analyzed for their nutrient content and the percent digestibility calculated using the formula below.

$$\% \text{ digestibility} = \frac{\text{nutrient intake} - \text{nutrient in faeces}}{\text{Nutrient intake}} \times 100$$

The nitrogen content of the urine was also determined for crude protein digestibility

Data analysis

The data on growth performance, digestibility, and carcass parameters were subjected to analysis of variance using the general linear model of SAS software (SAS, 2004). Significant difference among treatment means were separated using the Duncan multiple range test in the SAS package

Results

Proximate composition of diet

The proximate composition of the experimental diets is presented in the Table 2. The results showed that diets 2, 3, 4, and 5 were numerically higher than diet 1, in terms of their crude protein, crude fibre, and ash. The diets however, were similar in terms of the dry matter and ether extract. The nitrogen free extract of all the experimental diet are similar and ranged from 60.97% in T4 (I.e. 30% Irish potato and yam peel meal) to 63.84% in T1 (control).

Performances of the rabbits

The effect of a mixture of Irish potato peel and yam peel meal is presented in Table 3. The result showed that average daily feed intake was significantly higher ($P < 0.05$) in the rabbits fed with the control diet (T1) compared to the other treatments. The rabbits fed with Irish potato peel meal alone or in combination with yam peel meal had similar feed intake. The feed to gain ratio

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were also similar in all the treatments. The feed cost per kg gain was significantly higher ($P<0.05$) in the control diet (T1) compared to the other treatments. The lowest values of N45.54 and N61.26 were observed in treatment T3 and T5, respectively. There were no significant differences in the final weight gain, the average weight gain and water intake across the treatments.

Nutrient digestibility

The effect of Irish potato peel and yam peel

meal on the nutrient digestibility by weaner rabbits is presented in the Table 4. There were significant differences ($P<0.05$) in the crude protein, crude fibre, ether extract and ash digestibility across the treatments. crude protein, crude fibre and ash digestibility were significantly higher in T1 (control) compared to T2, T3 and T5, but was similar to T4. ether extract and NFE digestibility were significantly higher ($P<0.05$) in T1 compared to all other treatments.

Table 2: Proximate composition of the experimental diets (%)

Parameters	Treatments				
	T 1	T 2	T 3	T 4	T 5
Dry matter	94.78	93.79	94.66	94.38	94.17
Crude protein	16.88	17.50	17.50	17.56	17.75
Crude fibre	8.13	9.09	8.91	9.00	9.67
Ether extract	4.76	4.39	4.56	4.91	4.38
Ash	6.39	7.66	7.23	7.56	6.91
NFE	63.84	61.36	61.57	60.97	61.29

NFE= Nitrogen Free Extract

Table 3: Performance of weaner rabbits fed a mixture of irish potato peel and yam peel meal

Parameters	T1	T2	T3	T4	T5	SEM	LOS
Initial body wt (kg)	0.70	0.73	0.65	0.70	0.66	0.08	NS
Final body wt	0.93	1.17	1.00	1.07	0.96	0.09	NS
AFI.(g)	80 ^a	70 ^{ab}	50 ^b	70 ^{ab}	60 ^{ab}	0.008	*
AWG (g)	10	10	10	10	20	0.002	NS
Feed to gain ratio	1.90 ^a	1.74 ^b	0.89 ^c	1.28 ^{ab}	1.17 ^{ab}	0.33	*
Water intake ml/kg	149.77	266.37	199.55	259.75	204.00	51.92	NS
FC/kg gain(₦)	133.03 ^a	105.82 ^b	49.54 ^c	74.87 ^{abc}	61.26 ^{bc}	19.17	*
Mortality (%)	40.00	40.00	0.00	20.00	0.00	-	-

a b c = mean within the same row with different superscripts differ significantly ($P<0.05$). LOS = levels of significance, SEM= standard error mean, NS = Not significant, * = significantly different ($p<0.05$). T1 = Treatment one, T2 = Treatment two, T3 = Treatment three, T4 = Treatment four, T5 = Treatment five, AFI=average feed intake, AWG= average weight gain, FC=feed cost

Table 4: Effect of Irish potato peel and yam peel meals on nutrient digestibility in weaner rabbits

Parameters	T 1	T 2	T 3	T 4	T 5	SEM	LOS
Crude protein	91.52 ^a	75.93 ^b	77.17 ^{bc}	86.53 ^{ab}	72.87 ^c	3.37	*
Crude fibre	92.94 ^a	86.12 ^b	86.78 ^b	88.63 ^b	88.65 ^b	1.39	*
Ether extract	97.05	92.17	92.03	93.81	92.89	6.99	NS
Ash	92.05 ^a	80.82 ^b	80.77 ^b	88.31 ^a	84.27 ^b	2.22	*
NFE	94.16 ^a	85.82 ^b	85.08 ^b	88.54 ^b	87.37 ^b	1.69	*

a b c = mean within the same row with different superscripts differ significantly ($P<0.05$). SEM = Standard error of the mean. LOS = levels of significance, NFE=

Discussion

The effect of including Irish potato peel alone or in combination with yam peel meal on the carcass characteristics presented in

Table 5 showed significant difference ($P<0.05$) which is not in agreement with the result obtained by Ayoola and Akinbani (2011) for rabbits fed with graded level of

yam peel. This may be attributed to the combination with Irish potato peel meal, the variety of yam and the method of processing used. In Table 3, T1 had a higher feed intake than the other treatments. This is in agreement with Ayoola and Akinbani (2011) who said it may be due to the high crude protein content in yam peel meal. The feed cost per kilogram weight gain was reduced with increase in Irish potato peels and yam peels. T3 (30% Irish potato peel meal) showed the best cost per kilogram gain. The feed to gain ratio was higher in T3 and T5 compared to the other treatments

Conclusion

The study indicated that Irish potato peel and yam peel meals which are cheaper and available can be used to replace maize in the conventional rabbit feed without any adverse effect on their growth performance and carcass characteristics. It may be economical to feed rabbits with Irish potato alone or in combination with yam peel at 30% level of inclusion each for optimum performance.

References

- A. O. A. C. Association of Official Analytical Chemists, 2000.** 17th revised edition official and methods of analysis, Washington DC pp.210-240.
- Aduku, A. O. and Olukosi, J. O. 1990.** Rabbit management in the tropics living book series, G.U. Publication Abuja, FCT, Nigeria.
- Akinmutimi, A. H., Odoemelam, V. U. and Obasienkong, S. F. 2006.** Effect of replacing maize ripe plantain and yam peels in the diet of weaner rabbit *Medwell Online Journal of Animal and Veterinary Advances*, 5(9) 737-740.
- Akinmutimi, A. H. and Anakabe, O. C. 2008.** Performance of weaner

Rabbits fed graded levels of yam and sweet potato peel meal in place of maize based diet. *Pakistan Journal of Nutrition*, 7(5) 700-704.

Fielding, D. 1991, Rabbit in tropical agricultural series. C.T. A./Macmillan education Ltd. London

S. A. S. 2004. Statistical Analytical System. SAS user's guide statistical release 6.12 Educations. SAS institute, Cary, NC, USA.

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