



UTILIZATION OF SWEET POTATO PEEL MEAL (*Ipomoea batatas*) IN THE DIETS OF RABBITS

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ABSTRACT

The experiment was carried out at the Teaching and Research Farm of Abubakar Tafawa Balewa University (ATBU), Bauchi to evaluate the utilization of sweet potato peel meal (SPPM) as an energy source in the diets of growing rabbits. Twenty-four (24) growing rabbits with a mean initial weight ranging from 710.53 to 711.12 g were used for the eight (8) week study. The rabbits were randomly assigned to four treatments of six rabbits each, replicated three times in a completely randomized design (CRD). The experimental diets contained SPPM at levels of 0, 25, 50, and 75%, designated as Diets 1, 2, 3, and 4, respectively. Data were analyzed using one-way ANOVA, and means were separated using Tukey's test at $P < 0.05$. The results showed a significant differences ($P < 0.05$) in final body weight, total weight gain (TWG), and daily weight gain (DWG), while feed intake and feed conversion ratio (FCR) were not significantly affected ($P > 0.05$). Final body weight ranged from 1311.28 g (75% SPPM) to 1320.24 g (0% SPPM), TWG from 599.54 g (75% SPPM) to 609.13 g (0% SPPM), and DWG from 10.71 g (75% SPPM) to 10.87 g (0–25% SPPM). Daily feed intake ranged from 73.95 g to 76.83 g, total feed intake from 4141.06 g to 4302.90 g, and FCR from 6.80 to 7.06. Result of the carcass evaluation revealed a significant difference in carcass weight and dressing percentage. Carcass weights declined from 663.37 g (0% SPPM) to 652.68 g (75% SPPM), while dressing percentage dropped slightly from 50.24% to 49.77%. Hind limb and heart percentages also showed significant difference, whereas most other organ weights including liver, kidney, spleen, lungs, cecum, stomach, and intestines remained statistically similar across treatments ($P > 0.05$). In conclusion, SPPM can be safely included in rabbit diets up to 50% for optimal growth performance, carcass yield, and organ development. It is recommended to incorporate SPPM at moderate levels as a sustainable and economical alternative energy source in rabbit production.

Keywords: Potato, Peel, Meal, Rabbit Nutrition, Growth.

INTRODUCTION

The high cost of conventional feed ingredients, particularly maize, continues to limit profitable rabbit production in many tropical regions. This challenge has intensified interest in low-cost, non-conventional energy sources such as root and tuber by-products, which are abundant and readily available in local farming systems (Ibrahim & Olaniyi, 2020; Tamburawa *et al.*, 2024). Among these by-products, sweet potato peel meal (SPPM) has gained attention due to its moderate energy content and potential to replace maize when properly processed. Previous studies have demonstrated that sweet potato-derived ingredients can support acceptable growth performance in rabbits. Ibrahim and Olaniyi (2020) reported that SPPM can substitute maize without impairing weight gain or feed utilization at moderate inclusion levels. Similarly, Orunmiyi *et al.* (2021) and Ekwe *et al.* (2020) found that sun-dried sweet potato tuber and peel meals maintained satisfactory growth in weaner rabbits, although very high inclusion levels may affect performance due to increased fibre. Recent work incorporating sweet potato peel–cassava leaf mixtures also showed favourable carcass traits and economic benefits when applied within optimal ranges (Oluwafemi *et al.*, 2025). Evidence from studies on related by-products such as yam peel and cassava peel further supports the potential of peel meals as alternative energy sources in rabbit nutrition (Tamburawa *et al.*, 2024; Eboh *et al.*, 2025). However, variation in processing methods and diet formulation means that optimal inclusion levels remain uncertain.



This study therefore evaluates the growth performance, carcass characteristics, and organ yield of rabbits fed diets containing graded levels of sweet potato peel meal (0–75%), with the aim of establishing safe and effective inclusion thresholds for sustainable rabbit production.

MATERIALS AND METHODS

Experimental Site

The experiment was conducted at the Teaching and Research Farm, Abubakar. Tafawa Balewa University, Bauchi. The area is located within the Southern Guinea Savannah on latitude 10° 18'37.2 N and longitude 9° 50'38.0 E, characterized by two well-defined seasons; Rainy season (May - October) and dry season (November - April). The average annual rainfall of Bauchi is about 1009 mm, highest relative humidity 94% (August) and the lowest 35% (February). Temperatures are between 13 – 17°C (December – February) and 36 – 37°C (March – April) (World Atlas, 2015).

Source and Processing of Sweet Potato Peel

Sweet potato peels were sourced from fast food restaurants in Bauchi metropolis, Bauchi State, during the dry season. The peels were sun-dried after which it was winnowed to remove any foreign materials. A sample of the winnowed sweet potato peel was then milled, and used for chemical analysis.

Experimental Rabbits and their Management

A total of twenty four (24) Rabbits of mixed breeds, between 6-7 weeks old were used for the study which lasted for eight weeks (8). The animals were allowed a week adjustment for period for acclimatization and were given prophylactic medication before they were randomly allotted to the five treatments; each treatment was replicated three times with two rabbits per replicate in a completely randomized design (CRD). The rabbits were housed in a well-constructed cage with provision of feeding trough and drinkers. Feed and water were provided *ad-libitum*. Routine sanitary operations were also carried out.

Experimental Diets

Four (4) experimental diets (16 CP%) were formulated to contained varying levels of Roselle seed cake at 0, 25, 50 and 75%, designated as diets 1, 2, 3 and 4 respectively. Samples of experimental diets were analyzed for proximate composition at Abubakar Tatari Ali Polytechnic Laboratory. Ingredients and percentage composition of dietary levels of sweet potato peel meal fed to weaner rabbits is shown in Table 1.

Table 1: Composition of Experimental Diets Containing Varying Levels of Sweet Potato Peel as 75% Replacement for Maize

Ingredient	Diet 1 (0%)	Diet 2 (25%)	Diet 3 (50%)	Diet 4 (75%)
Maize	49.65	37.24	24.83	12.41
Soybean Meal	15.00	15.00	15.00	15.00
Sweet Potato Peel Meal	0.00	12.41	24.83	37.23
Toasted Roselle Seed Cake Meal	7.00	7.00	7.00	7.00
G/Hay	10.00	10.00	10.00	10.00
Wheat Offal	15.00	15.00	15.00	15.00
Bone Meal	2.50	2.50	2.50	2.50
Salt	0.50	0.50	0.50	0.50
Lysine	0.10	0.10	0.10	0.10
Premix	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated Analysis				
Crude Protein (%)	16.00	16.00	15.64	15.00
Metabolizable Energy (kcal/kg)	2790.47	2743.70	2697.23	2649.82
Crude Fiber (%)	7.21	7.50	8.01	9.22

Data Collection

The following data were collected



Daily feed intake (g)

Feed were served in the morning and evening using a balance weighing scale.

Daily Feed intake: The total quantity of feed given per day minus the leftover and then divided by the number of rabbits per pen as shown below.

Daily feed intake = *feed given* – *Leftover*

Daily weight gain (g)

This is the weight obtained multiply by 1000g and divided by the number of rabbits per pen x days (7) as shown below.

Daily weight gain = *Final weight* – *Initial weight*

Feed conversion ratio

Feed conversion ratio was obtained mathematically.

Feed Conversion Ratio = $\frac{\text{Quantity of feed consumed}}{\text{Weight gain}}$

Carcass evaluation

At the end of the eight (8) weeks, three (3) Rabbits from each treatment were randomly selected, individually weighed, slaughtered, skinned and eviscerated. Weight of carcass and organs were also measured. Dressing percentage (DP) was obtained by weighing the carcass relative to the live weight of each rabbits and expressed in percentage (%) as shown below.

DP = $\frac{\text{Carcass weight}}{\text{Live Weight}} \times 100$

The rabbits were starved overnight before slaughtered. Starving helps to improve accuracy of estimation of real live weight and to reduce the volume of the gut contents and thereby reduce contamination of the carcass during dressing. Each rabbit was slaughtered by cutting the jugular vein with a sharp knife and eviscerated and weighed. The visceral organs were also removed carefully and weighed. The weights of the individual organ was weighed and expressed as percentages of live weight.

Statistical Analysis

Data collected were subjected to one way analysis of variance (ANOVA) using the general linear model of statistical package for social science (SPSS) version 23. The means were compared using Tukey Test at 5% level of significance (P<0.05) (Morgan, 2011).

RESULTS AND DISCUSSION

Growth Performance of Rabbits Fed Graded Levels of Sweet Potato Peel Meal (SPPM)

The results as presented in Table 2 showed that, increasing SPPM inclusion up to 75% led to significant ($p < 0.05$) reductions in final weight gain, daily weight gain, and total weight gain, whereas feed intake and feed conversion ratio (FCR) remained statistically similar across treatments. These findings suggest that although the rabbits consumed comparable quantities of feed, the efficiency of nutrient utilization declined with higher SPPM levels.

The significant decline in weight gain at higher inclusion levels aligns with earlier studies indicating that sweet potato-based by-products may have limitations when incorporated at high proportions in rabbit diets. For example, Orunmiyi *et al.* (2021) observed that weaner rabbits fed sun-dried sweet potato tuber meal exhibited generally poorer performance than those on the control diet, despite the absence of significant statistical differences. Similarly, Ekwe *et al.* (2020) reported reduced average daily weight gain and feed intake in rabbits fed sundried sweet potato meal compared to whole-meal diets, attributing the performance decline to the lower nutrient density and higher fibre content of sweet potato residues.

The reduced performance observed at the 50–75% SPPM levels in the current study is consistent with the conclusion of Oluwafemi *et al.* (2025), who found that replacing maize with sweet potato peel–cassava leaf composite meal beyond moderate inclusion led to reductions in weight gain and feed efficiency. Their findings emphasized that the crude protein content of sweet potato peel–based ingredients is relatively low and may be insufficient to sustain optimal growth at high substitution levels. Likewise, Ibrahim and Olaniyi (2020) noted that SPPM could be used up to 15% in rabbit diets without adverse effects, but higher inclusion levels may compromise performance due to the high fibre and low protein nature of the peel meal.

Beyond sweet potato-based ingredients, similar patterns have been reported for other root and tuber by-products. Akindele *et al.* (2025) observed that increasing sundried cassava peel levels depressed growth performance in growing rabbits, while Tamburawa *et al.* (2024) found reduced weight gain in rabbits fed high levels of yam-peel meal. These results reinforce the general trend that high inclusion levels of fibrous tuber by-products may limit nutrient digestibility and energy availability. Moreover, Eboh *et al.* (2025) demonstrated that cassava peel meal requires nutrient enhancement such as mineral or amino acid supplementation to improve growth responses, suggesting that SPPM may similarly require nutritional balancing when included at elevated levels.

Overall, the findings from this study corroborate previous reports indicating that sweet potato peel meal can serve as a partial replacement for maize in rabbit diets but should be restricted to moderate inclusion levels to avoid compromised weight gain. The consistent declines in performance metrics at higher inclusion levels highlight the need for careful diet formulation, particularly with respect to protein content, fibre level, and potential supplementation strategies.

Table 2: Growth Performance of Rabbits Fed Varying Levels of Sweet Potato Peel Meal

Parameters	0% SPPM	25% SPPM	50% SPPM	75% SPPM	SEM	Sig
Initial weight (g)	711.10	711.12	710.53	710.74	0.49	0.55
Final weight gain (g)	1320.24 ^a	1319.80 ^a	1314.13 ^{ab}	1311.28 ^b	2.07	0.01*
Daily weight gain (g)	10.87 ^a	10.87 ^a	10.76 ^{ab}	10.71 ^b	0.03	0.01*
Total weight gain (g)	609.13 ^a	608.68 ^a	602.89 ^{ab}	599.54 ^b	1.97	0.01*
Daily feed intake (g)	76.83	73.95	75.43	74.17	1.42	0.21*
Total feed intake (g)	4302.90	4141.06	4224.50	4153.52	79.77	0.21*
FCR	7.06	6.80	7.01	6.93	0.13	0.29ns

a,b,c = Means on the same row with different superscripts were significantly ($p < 0.05$), SEM: standard error of means, significance level, FCR: feed conversion ratio

Carcass Characteristics and Organs Yield of Rabbits Fed Varying Levels of Sweet Potato Peel Meal

The results as presented in Table 3 showed that, increasing levels of Sweet Potato Peel Meal (SPPM) in rabbit diets significantly influenced several carcass characteristics. Live weight, bled weight, and carcass weight declined progressively as SPPM inclusion increased, with the 75% inclusion group having the lowest values. A similar trend was observed in dressing percentage, which was significantly lower at 75% inclusion compared to the control and 25% levels. These reductions suggest that high inclusion levels of SPPM limit nutrient availability, thereby reducing carcass deposition.

These findings agree with those of Oluwafemi *et al.* (2025), who reported that high inclusion levels of sweet potato peel-cassava leaf mix meal led to reductions in live weight and carcass yield due to the lower nutrient density and higher fibre content of the mixture. A similar decline in carcass yield at high inclusion of fibrous unconventional feed ingredients was observed by Mafimidiwo *et al.* (2022) when urea-molasses treated maize cob replaced wheat offal, noting that excessive fibre intake compromises digestible energy and reduces muscle accretion.

Contrary to the decline observed at higher SPPM inclusion in the present study, Gbenge *et al.* (2022) reported no significant changes in carcass characteristics when yam-cassava peel composite meal replaced maize up to 100%. Similarly, Ate *et al.* (2024) found no adverse effects on carcass yield of rabbit does fed yam peel meal. These discrepancies may be attributed to compositional differences among peel sources, processing methods, and the balancing of dietary protein and energy, as sweet potato peels typically contain lower protein than yam or cassava peels.

Most organ yields such as liver, kidney, spleen, lungs, and digestive tract proportions did not differ significantly across treatments in the present study, indicating that SPPM did not impair normal organ development. This is in line with findings by Igila *et al.* (2024) using dried cabbage leaf meal,



Taiwo *et al.* (2024) with *Ageratum conyzoides* leaf meal, and Lalabe *et al.* (2024) with cassava leaf meal, all of whom reported no significant influence of fibrous leaf- or peel-based ingredients on visceral organ weights. The stability of organ proportions suggests that SPPM did not exert toxic or pathological effects but may have limited nutrient availability for muscle deposition, explaining the reduced carcass weight at higher inclusion.

The significant increase in hind limb percentage observed at 50% and 75% SPPM may reflect compensatory allocation of available nutrients to structural tissues, a phenomenon also noted by Salisu *et al.* (2025) in rabbits fed rumen-content/blood meal mixtures. Meanwhile, heart percentage, though statistically different, remained within normal physiological ranges, consistent with observations by Mustapha *et al.* (2024) using *Senna occidentalis* seed meal.

Furthermore, the depressive effect of high inclusion of sweet potato peel in carcass traits supports earlier observations by Ibrahim & Olaniyi (2020), who reported reduced carcass yield at higher replacement of maize with sweet potato peel meal due to its lower crude protein and digestible energy. Similar findings were reported by Oyewole *et al.* (2025) in cassava peels fermented for various durations, where high inclusion reduced carcass indices.

Overall, the carcass characteristics from this study demonstrate that while SPPM can be incorporated into rabbit diets, inclusion levels beyond 25–50% reduce carcass yield, likely due to increased fibre and reduced nutrient density. This aligns with broader evidence that agro-industrial by-products require moderated inclusion levels and proper nutrient balancing to maintain optimal carcass quality.

Table 3: Carcass Characteristics and Organs Yield of Rabbits Fed Varying Levels of Sweet Potato Peel Meal

Parameters	0% SPPM	25% SPPM	50% SPPM	75% SPPM	SEM	P. Value
Live weight (g)	1320.24	1319.80 ^a	1314.13 ^b	1311.28 ^b	2.07	0.01*
Bled Weight (g)	1259.94	1259.50 ^a	1253.83 ^b	1250.98 ^b	2.07	0.01*
Carcass weight (g)	663.37 ^a	661.15 ^{ab}	658.07 ^b	652.68 ^c	2.13	0.01*
Dressing %	50.24 ^a	50.09 ^a	50.07 ^a	49.77 ^b	0.11	0.01*
Head %	9.09	9.19	9.04	9.34	0.48	0.93ns
Pelt %	7.85	7.39	8.28	7.05	1.02	0.66ns
Fore limb %	0.76	0.76	0.76	0.76	0.00	1.00ns
Hind limb %	1.04 ^b	1.04 ^b	1.23 ^a	1.42 ^a	0.17	0.01*
Tail %	0.38	0.38	0.38	0.38	0.00	1.00ns
Lungs %	0.67	0.66	0.63	0.65	0.14	0.87ns
Liver %	2.55	2.84	2.56	2.86	0.21	0.34ns
Kidney %	0.76	0.76	0.75	0.76	0.00	1.00ns
Spleen %	0.06	0.06	0.06	0.06	0.03	0.64ns
Cecum %	6.53	7.29	7.13	6.86	0.86	0.83ns
Stomach %	6.34	6.25	7.04	6.00	0.86	0.69ns
Small intestine %	3.93	4.20	4.02	3.84	0.52	0.91ns
Large intestine %	2.46	2.94	3.42	3.43	0.48	0.19ns
Fat %	0.52	0.56	0.56	0.50	0.36	0.30ns
Heart %	0.40 ^{ab}	0.42 ^a	0.41 ^{ab}	0.38 ^b	0.01	0.01*

^{a,b,c} = Means on the same row with different superscripts were significantly ($p < 0.05$), SEM: standard error of means, significance level



CONCLUSION AND RECOMMENDATION

The findings of this study shows that sweet potato peel meal (SPPM) can be effectively utilized as an alternative energy source in the diets of growing rabbits without compromising growth or health. Most organ weights were unaffected, indicating no adverse physiological effects. Based on these results, SPPM can be safely incorporated up to 50% in rabbit diets to support good growth performance, carcass yield, and overall organ development. Therefore, the study recommends the use of SPPM at moderate levels as a sustainable, cost-effective ingredient for rabbit production.

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