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IMPACT OF CASSAVA PEELS AND PALM KERNEL CAKE MEAL ON THE HEMATO-BIOCHEMICAL PARAMETERS, PERFORMANCE, AND ECONOMICS OF FINISHER PIGS

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ABSTRACT

To determine the impact of a mixture of palm kernel cake (PKC) meal and cassava peels on the hematology, serum biochemistry, performance, and economic aspects of finisher pigs, a 12-week feeding study was conducted. The mixture comprised an equal amount of palm kernel cake and cassava peels. At 1(0), 2(10), 3(20), 4(30), and 5(40%), the combinations replaced maize (control). Fifty large white finishing pigs of both sexes were randomly assigned to five diets, duplicated twice (2x5), with ten pigs per treatment group and five pigs per replicate, using a completely randomized design (CRD). Water and feed were provided as needed. There was a significant (P<0.05) difference in the total final weight gain between 0% having the largest perceived gain (43.15kg), followed by 10 (43.00kg), 20 (41.05kg), 30 (39.35kg), and 40% (39.61kg). The total ultimate weight gain varied considerably amongst the diets (P<0.05). Similarly, the average weekly weight gain rises from 0, 10, 20, 30, and 40%. In comparison to the other of (0: 2.38; 20: 2.25; 30: 2.42; 40%: 2.47), the feed conversion ratio was better (P<0.05) in 10% (2.09), and the feed intake was highest in the control group (47.50kg/day). While 0% and 30% displayed comparable values (2.46). 10% protein efficiency ratio (PER) (2.80) fared better than 20% (2.61) and 30% (2.43). According to the efficiency and economics analysis of finisher pigs fed PKC and cassava peel diets, 10% ($14.10) produced the highest projected profit per total live weight gain. According to hematological and serum biochemical markers, the finisher pigs' general health and nutritional status were improved by the cassava peel/PKC meals. Since the animals on 10% outperformed the control and other treatment groups in terms of economic performance, it is advised that 10% consist of maize substituted with cassava peels/PKC meal.

Keywords: Biochemical, Blood parameters, Diet mixture, Swine, Weight gain

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1. INTRODUCTION

A pig enterprise plays a momentous role in enhancing the livings of poor and vulnerable moderate farmers in various ways. Pork and other pig-derived products offer valuable sources of animal protein, characterized by ease of dressing and superior curing and storage qualities (Isidahomen and Moseri 2024). Moreover, farmers generate additional income through the rummage sale of piglets and related products. The relatively low startup costs and minimal investments needed for infrastructure and equipment can be recouped swiftly, as pigs can be ready for slaughter within approximately five to nine months from birth, depending on dynamics such as breed and feed availability. Pig production represents a form of livestock management that does not necessarily rely on access to agricultural land, thus gaining prominence within the growing sector of peri-urban and city modest livestock keeping. This accessibility makes it particularly appealing to farmers in these settings (Omoikhoje 2023). Maize is a prime source of energy and about 70-80 percent of maize assembly is used as a feed ingredient in the sphere (Egbune et al. 2021; Ojo et al. 2022). Feeding expenses represent the largest cost component, accounting for approximately 70% of pig rearing costs, significantly impacting pig performance and the overall sustainability of the sector (Aladi et al. 2021). The swine business faces a substantial challenge, with over 60% deficiency in concentrating feed sources, directly competing with human consumption of grains (Moseri et al. 2023a). The scarcity and high rate of conventional feed sources, exacerbated by competition between humans and livestock for these resources (CAST 2013), coupled with inadequate emphasis on production, have goaded the consideration of

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different and cost-effective agro-industrial products as feed sources (Makkar 2018; Amaza et al. 2021; Egbune et al. 2022a). This shift has steered to a decline in human nutrition standards in Nigeria, falling below the recommended intake of 35g apiece capita per day of animal protein. Consequently, most of the Nigerian populace suffers from malnutrition (Moseri et al. 2023b). The exorbitant production further compounds this situation, challenges posed by climate change, an unstable political environment, and insecurity stemming from ethnic conflicts. As the prices of grains and oil cakes continue to rise, feed manufacturers and livestock producers are encountering challenges. Consequently, researchers continually explore uncommon feed resources to substitute conventional ingredients hand-me-down in animal production (Iwegbu et al. 2023; Othman et al. 2024; Falola et al. 2024). To address the disparity between feed requirements and availability, there is a growing need to incorporate non-conventional feeds such as cassava by-products, rice by-products, and industrial waste (Egbune et al. 2022b; Arief et al. 2023; Onabanjo et al. 2024). The study examined the impact of cassava peels and palm kernel cake (PKC) meal on the hematology, serum biochemistry, performance, and economics of finisher pigs.

2. MATERIALS AND METHODS

2.1. Experimental Site

The study was carried out in the piggery division of Ambrose Alli University's Faculty of Agriculture's teaching and research farm in Ekpoma. This farm is located in the Edo State, Nigeria, Esan West Local Government Area Council, which receives 1500–2000mm of rainfall annually. The average temperature in the region is about 32°C, and the relative humidity is 75%.

2.2. Sources of Ingredients and Processing Techniques

Reputable animal feed vendors in Benin City and the surrounding areas provided the study's test ingredients. Cassava peels were purchased from reputable fufu vendors and garri processors in Agbor town. To create cassava peels/PKC meal, these peels were first sun-dried on concrete floors before being hammer-milled through a 2mm screen. The pulverized peels were meticulously sieved to guarantee consistency before being added to the test diets.

2.3. Experimental Animals and Design

The twelve-week study and experiment used fifty large white finishing pigs with average weight (21.90 to 24.20kg). Five groups of ten pigs each were created from these alienated piglets. After this separation, a fully randomized design (CRD) was used to assign each group of finisher pigs to one of five treatment diets. There were two replicates in each group comprised of five pigs/replicates for each treatment group. During the trial, the pigs were fed twice daily and given unlimited water access. Calc cassava peels or PKC were added to the treatment meals to replace the maize. In particular, the replacement levels were set at 0, 10, 20, 30, and 40%, respectively. By utilizing a physical scale to weigh equal amounts (kg) of the two test components, the 1:1 fraction of cassava peels and palm kernel cake was obtained. As shown in Table 1, every diet was meticulously designed to guarantee that it was iso-nitrogenous and iso-caloric AOAC (2000). In particular, the replacement levels were set at 0, 10, 20, 30 and 40%, respectively.

2.4. Data Collection

A known amount of feed was supplied, and the equivalent leftover was retrieved and measured. The study also gathered data on feed consumption and weight gain. The daily feed intake is calculated by dividing the difference between what was provided and what was left over by the time interval. The body weight of the pigs in each group was measured at the start and then every week after that. Weight increase is the difference between the starting and ending body weights. The ratio of feed intake to weight increase is known as the feed conversion ratio. The ratio of weight increase to protein intake is known as the protein.

2.5. Economics of Production

Based on current market values, the rate of feed components was established during the experiment. This made it possible to estimate a number of production prices, such as the cost of production overall, the price of feed/kg ($), and the price of feed per unit weight gain ($). The price of the pigs ($), feed, labor, housing, and medicine were all included in the total cost of production. Furthermore, the entire money made was computed and expressed as revenue per pig ($). Lastly, the total revenue per pig was subtracted from the total cost of production per pig to calculate the gross margin.

2.6. Hematological Studies

The animals were fasted for twelve hours before blood samples were taken from each pig at the end of the ten-

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week feeding trial. A sterile disposable syringe and needle were used to draw blood samples from each pig's ear vein. To lower the risk of infection or blood sample adulteration, a cotton swab soaked in 70% ethanol was used to widen the ear vein before the blood collection procedure (Hambakodu et al. 2024). After that, 5.0mL of blood was drawn from each pig and placed in sterile, labeled universal vials that contained the anticoagulant ethylene-diamine-tetra-acetic acid (EDTA). Numerous hematological parameters, including total red blood cells (RBC), hemoglobin (Hb), packed cell volume (PCV), and white blood cell count (WBC), were measured using these samples. A further 5.0mL of blood was also drawn and placed in sterile, anticoagulant-free sample bottles with labels. These samples measured serum cholesterol, albumin, globulin, total protein, and other biochemical components AOAC (2000).

Table 1: Composition of finisher pigs fed cassava peel/PKC diets (g/100kg)

Ingredients	0%	10%	20%	30%	40%
Maize	40.00	36.00	32.00	28.00	24.00
Cassava peels/PKC	-	04.00	08.00	12.00	16.00
Ground Nut Cake	15.87	17.00	18.13	19.26	20.39
Wheat Offal	38.18	36.05	34.72	33.39	32.06
Bone Meal	1.50	1.50	1.50	1.50	1.50
Limestone	2.00	2.00	2.00	2.00	2.00
Palm Oil	1.00	2.00	2.20	2.40	2.60
Salt	0.35	0.35	0.35	0.35	0.35
Probiotic(Animix pig*)	0.45	0.45	0.45	0.45	0.45
Lysine	0.65	0.65	0.65	0.65	0.65
Total	100.00	100.00	100.00	100.00	100.00
Calculated Analysis					
Crude Protein (%)	16.92	16.54	16.36	16.69	16.87
ME(Kcal/Kg)	2770.86	2774.00	2734.92	2758.48	2737.44
Fat (%)	4.58	6.20	7.8	9.44	11.09
Fiber (%)	5.03	6.66	8.28	9.98	11.51
Ash (%)	5.91	9.01	12.11	15.3	18.53
Calcium (%)	0.80	0.80	0.80	0.80	0.80
Starch (%)	41.00	37.79	34.58	31.34	28.08

*Animix pig probiotic/kg diet.CPM=Cassava peelmeal, PKC=Palmkernelcake, ME=Metabolizable energy.

2.7. Statistical Analysis

The SAS (2003) program was used to analyze the gathered data. In accordance with Obi's (2002) recommendations, Duncan's New multiple-range test was then used to evaluate differences between treatment means. Given the useful insights into how various experimental settings affect the observed results, this statistical method made it possible to compare and differentiate the means across the different treatment groups.

3. RESULTS

Table 2 provides a summary of the performance traits of the finisher pigs fed diets containing cassava peel and PKC. The average final weight gain for 0, 10, 20, 30, and 40% was 43.15, 43.00, 41.50, 39.35, and 39.60kg, respectively, indicating significant differences ($P<0.05$). Additionally, the average total weight gain varied significantly ($P<0.05$), ranging from 15.10 kg in 40% to 19.90kg in 0%. A similar pattern was seen in the average weekly weight gain values, with 0% recording the highest value (2.84kg), followed by 10, 20, 30, and 40% (2.82, 2.54, 2.30, and 2.16kg), respectively. These results demonstrate the disparate effects of the various diets on the finisher pigs' development and productivity. 10% (2.09) clearly had a higher feed conversion ratio than 0 (2.38), 20 (2.25), 30(2.42), and 40% (2.47). In contrast, 10% had the highest protein efficiency ratio (2.80), while 30% had the lowest (2.43). The effectiveness of feed utilization and protein conversion across the various dietary treatments is clarified by these measurements, which also highlight the possible advantages of particular formulations in improving pig performance.

Table 3 displays the cost and efficiency metrics for finisher pig fed diets including cassava peel and PKC. 0, 10, 20, 30, and 40% had the highest feed prices per kilogram, with reported values of 0.32, 0.31, 0.30, 0.29, and $0.28, respectively. Additionally, 0% had the highest average cost of total feed eaten per pig, followed by 10%, 20, 30, and 40%, with values of 15.16, 12.95, 12.07, 11.31, and $10,40, respectively. Animals on the control diet had the highest total revenue per total live weight rise per pig, followed by those on treatments 10, 20, 30, and 40, which had values of 27.05, 27,26, 24.38, 22.05, and $20,68, respectively. These results offer insight into the financial viability of various dietary interventions, emphasizing prospective cost reductions and income-generating prospects.

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Table 2: Performance characteristics of finisher pigs fed cassava peel/PKC diets

Parameters	Levels of Inclusion (%)					SEM (±)
	0 (1)	10 (2)	20 (3)	30 (4)	40 (5)	
Average initial weight (kg)	23.25	23.25	23.25	23.25	24.50	0.12
Average final weight gain (kg)	43.15a	43.00b	41.05c	39.35d	39.60e	0.15
Average total weight gain (kg)	19.90a	19.75b	17.80c	16.10d	15.10e	0.07
Average weekly weight gain (kg)	2.84a	2.82a	2.54b	2.30c	2.16d	0.02
Feed intake (kg)	47.50a	41.23b	40.10bc	39.00c	37.30d	0.69
Feed conversion ratio (FCR)	2.38c	2.09e	2.25d	2.42b	2.47a	0.02
Protein efficiency ratio (PER)	2.46c	2.80a	2.61b	2.43c	2.46c	0.05
Mortality (%)	-	-	-	-	-	-

Mean values bearing different alphabets in a row differ significantly (P<0.05). Values in parentheses indicate the treatment number.

Table 3: Economics and efficiency of finisher pigs fed cassava peel/PKC diets

Parameters	Levels of Inclusion (%)				
	0 (1)	10 (2)	20 (3)	30 (4)	40 (5)
Average Initial weight (kg)	24.20	23.25	22.60	22.20	21.90
Average Final weight (kg)	44.10	43.00	40.40	38.30	37.00
Average Total weight gain (kg)	19.90	19.75	17.80	16.10	15.10
Feed cost ($/kg)	0.32	0.31	0.30	0.29	0.28
Feed consumed (kg)	47.50	41.23	40.10	39.00	37.30
Total cost of feed consumed/pig (kg) live weight gain	15.16	12.95	12.07	11.31	10.40
Revenue/total live weight gain/pig ($)	27.26	27.05	24.38	22.05	20.68
Gross profit/pig ($)	12.10	14.10	12.30	10.74	10.29

Values in parentheses indicate the treatment number.

Hematological characteristics of finisher pigs fed diets, including cassava peel and PKC, are shown in Table 4. Packed cell volume (PCV) values for diet groups varied significantly (P<0.05); for treatments 0, 10, 20, 30, and 40%, the corresponding values were 38.70, 47.00, 47.00, 42.80, and 34.60%. Significant variations were also observed in red blood cell (RBC) counts; for treatments 0, 10, 20, 30, and 40%, were $6.66x10^6$/mL, $8.06x10^6$/mL, $8.33x10^6$/mL, $7.56x10^6$/mL, and $6.87x10^6$/mL, respectively. Across the diet groups, white blood cell (WBC) counts varied; for 0, 10, 20, 30, and 40%, the corresponding values were $29x10^3$/mL, $18.10x10^3$/mL, $26.10x10^3$/mL, $19.20x10^3$/mL, and $13.60x10^3$/mL. 0% had the lowest hemoglobin (Hb) values (11.70g/dL), while 20% had the highest levels (14.50g/dL). Treatments 0 and 10% had comparable mean corpuscular volume (MCV) values (58.10g/dL and 58.30g/dL, respectively), but 20 and 30% had comparable MCV values (56.60g/dL) but differed considerably from 40% (50.30g/dL). Significant variations were also seen in mean corpuscular hemoglobin (MCH) values between treatments, with 40% showing the lowest value, except for 0 and 10%, which displayed comparable values, the mean corpuscular hemoglobin concentration (MCHC) values differed considerably among the treatment groups.

Table 4: Hematological parameters of finisher pigs fed cassava peel/PKC diets

Parameters	Units	Levels of Inclusion (%)					SEM (±)
		0 (1)	10 (2)	20 (3)	30 (4)	40 (5)	
PCV	%	38.70c	47.00a	47.00a	42.80b	34.60d	0.18
RBC	$x 10^{-6}$/mL	6.66e	8.06b	8.33a	7.56c	6.87d	0.01
WBC	$x10^{-3}$/mL	14.29d	18.102c	26.10a	19.20b	13.60e	0.06
Hb	g/dL	11.70c	14.25ab	14.50a	13.90b	10.80d	0.24
MCV	g/dL	58.10a	58.30a	56.40b	56.60b	50.30c	0.13
MCH	pg	17.50c	17.60b	17.40d	17.70a	15.70e	0.03
MCHC	%	30.22d	30.20d	30.80c	31.30a	31.20b	0.02

Mean values alongside the same row with dissimilar superscripts differ significantly (P<0.05). Values in parentheses indicate the treatment number. RBC: Red blood cells, WBC: white blood cells, Hb: hemoglobin, MCH: mean corpuscular hemoglobin, MCV: Mean corpuscular volume, MCHC: mean corpuscular hemoglobin concentration.

Blood biochemical characteristics of finisher pigs fed diets containing cassava peel and PKC shown in Table 5. For some measures, there were significant differences (P<0.05) between the diet groups. The total protein levels for 0, 10, 20, 30, and 40% were 5.81, 8.92, 6.54, 7.53, and 7.86g/dL, respectively. These results showed statistical differences between the diet groups. There were also notable variations in albumin, globulin, creatinine, urea,

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cholesterol, and glucose levels between the dietary groups. In particular, 10 and 30% had comparable albumin levels, but 0, 20, and 40% had significantly different albumin levels (P<0.05). 0, 30, and 40% had comparable creatinine levels. However, 10 and 20% had considerably different levels (P<0.05). In 0%, urea levels were 35.15mg/dL, but 30%, was 54.76mg/dL. The blood glucose levels in each diet ranged from 46.17mg/dL in 20% to 87.42mg/dL 40%, indicating a significant difference (P<0.05).

Table 5: Serum biochemical parameters of finisher pigs fed cassava peel/PKC diets

Parameters	Units	Levels of Inclusion (%)					SEM (±)
		0 (1)	10 (2)	20 (3)	30 (4)	40 (5)	
Total protein	g/dL	5.81e	8.92a	6.54d	7.53c	7.86b	0.02
Albumin	g/dL	3.44ab	3.30ab	2.64c	3.46a	3.25b	0.08
Globulin	g/dL	2.37e	5.62a	3.90d	4.07c	4.61b	0.02
Creatinine	mg/dL	1.15c	1.91a	1.53b	1.15c	1.15c	0.02
Urea	mg/dL	35.15c	47.32b	24.87e	54.76a	28.29d	0,02
Cholesterol	mg/dL	102.64e	161.85b	199.50a	123.16d	149.31c	0.07
Glucose	mg/dL	59.22c	64.85c	46.17e	74.02b	87.42a	0.01

Mean values alongside the same row with dissimilar superscripts are significantly (P<0.05) different. Values in parentheses indicate the treatment number.

4. DISCUSSION

Average final weight gain, average total weight gain, and weekly weight gain values consistently decreased as the amount of cassava peel/PKC mixture in the diet increased, according to the performance characteristics of finisher pigs fed these diets (David et al. 2022). This pattern might be explained by the diet's increased fiber content, which may limit feed intake and impair palatability. The nutritional makeup of the food may have changed as the amount of cassava peel/PKC mixture grew, resulting in reduced digestibility and nutrient absorption, ultimately affecting the pigs' growth performance (Egbune et al. 2021b; Ojo et al. 2022; Mirnawati et al. 2024). Furthermore, higher fiber content may result in more gastrointestinal fullness, which may restrict the pigs' capacity to eat enough feed. Overall, these results highlight how crucial it is to balance dietary components in order to maximize pig performance properly. They also highlight the necessity of considering factors like digestibility, palatability and nutrient availability when creating diets that contain a blend of cassava peel and PKC (Egbune et al. 2022a; Emmanuel et al. 2024). These findings are consistent with earlier research by Jiang (2011), Shon et al. (2005) and Alexoppoulos et al. (2004), which similarly found notable variations in the growth performance of finisher pigs fed probiotic-supplemented diets.

The results of this study also corroborate those of Choi et al. (2011), who noted notable variations in the growth performance of pigs fed probiotic-supplemented diets. The fiber level in diet 2 being within suggested limits may be the reason for the enhanced feed conversion ratio and protein efficiency ratio when compared to the other diets. These findings demonstrate the nutritional value of fiber and how it affects pig performance. Overall, the results of this study add to the body of knowledge already available on how probiotic-based diets affect pig growth performance, highlighting the significance of dietary supplementation in maximizing pig productivity and health in finisher pigs fed probiotic-supplemented diets.

Animals on 20, 0, 30, and 40% (12.30, 12.10, 10.74, and $10,29) had the best estimated profit per total live weight gain, according to the economics and efficiency analysis of finisher pigs given cassava peel/PKC diets. Interestingly, 10% ($14.10) performed better than diets 20, 30 and 40% in terms of maize replacement (Ndego et al. 2022). These results are in line with those of Ekenyem (2007), who evaluated the performance of pigs fed palm kernel cakes at inclusion levels of 0, 10 and 20%. Similar to the cost-saving advantages seen in the current study with cassava peel/PKC diets, their investigation demonstrated a drop in the cost of a kilogram of feed with an increased level of dietary palm kernel cake. Additionally, the findings support Oboh (2016) viewpoint, which highlighted the value of using cheap cassava peels, particularly in areas where maize is expensive and in short supply. This strategy promotes sustainable development in livestock operations and lowers the overall cost of production. Overall, these results emphasize the potential for cost savings and increased profitability in pig farming operations by emphasizing the sustainability and economic benefits of implementing cassava peel/PKC diets in pig feeding programs (Jumare et al. 2024).

Packing cell volume (PCV), white blood cell (WBC), red blood cell (RBC), hemoglobin (Hb), mean corpuscular volume (MCV), mean corpuscular hemoglobin concentration (MCHC), and mean corpuscular hemoglobin (MCH) were among the hematological values of finisher pigs fed cassava peel/PKC diets that were found to be within the recommended ranges (Iwegbu et al. 2023). This suggests that there were no negative effects during the trial period and that the diets including cassava peel and PKC were similar to the diet containing maize. According to Togun and Oseni (2007), the results are in line with the normal range values. Additionally, finisher

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pigs fed cassava peel/PKC diets exhibit markers of protein reserves in serum biochemical parameters such as total protein, albumin, globulin, creatinine, urea, and cholesterol. Muscle waste may be indicated by changes in creatinine and urea levels (Adesehinwa et al. 2011; Moseri et al. 2018).

Nonetheless, the study's readings were comparable across the groups and within the permitted range, indicating that the animals' efficient use of their food led to significant tissue deposition rather than muscle waste Togun and Oseni (2007). These results are consistent with the group-wide observations made by Isaac et al. (2013). These results demonstrate the impact of PKC/cassava peel diets on finisher pigs' blood biochemical profiles, underscoring the significance of dietary content in determining metabolic parameters.

5. CONCLUSION

According to hematological and serum biochemical markers, the finisher pigs' general health and nutritional status were improved by the cassava peel/PKC meals. Compared to other diets, 10% ($14.10) produced the highest estimated profit per total live weight gain, according to an economic and efficiency analysis of finisher pigs fed cassava peel/PKC diets. This suggests that 10% was the most cost-effective choice among the dietary therapies considered in this investigation. Additionally, finisher pigs fed diets with cassava peel, and PKC showed hematological values and serum biochemical markers that were within the normal range and competitive with the maize diet. This implies that the pigs' health and physiological status were unaffected by the cassava peel/PKC diets, which also supplied sufficient nutrients, results demonstrate the possible financial advantages and nutritional sufficiency of adding cassava peel/PKC diets to finisher pigs' diets.

Extension Implications

Based on the study, it is clear that cassava peel/PKC diets were not harmful to the finisher pigs at diet 2 (10% inclusion). This implies that there is an urgent need for extension intervention. The extension workers should inform pig farmers about using palm kernel cake (PKC) meals and cassava peels as pig feed ingredients. Because these nutrients are readily available and reasonably priced compared to traditional feed ingredients, they can be utilized as substitutes for traditional protein and energy sources in pig diets.

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REFERENCES

Adesehinwa AOK, Obi OO, Makanjuola BA, Oluwole OO and Adesina MA, 2011. Growing Pigs Fed Cassava Peel Based Diet supplemented with orwithoutFarmazyme 3000 Proenx: Effect on Growth, Carcass and Blood. African Journal Biotechnology 10(14): 2791-2796. https://doi.org/10.5897/AJB10.967

Aladi NO, Okpaliko FC, Ikpamezie LC, Omede AA, Emenadom OO, Okoli IC, and Okeudo NJ, 2021. Solid state fermentation improves the nutritive value of grated cassava roots and palm kernel cake mix growing pigs. Nigerian Journal of Animal Production 48(6): 106-120. https://doi.org/10.51791/njap.vi.5351

Alexoppoulos C, Georgoulakis IE, Tzivara A, Kyriakis CS, Govaris A and Kyriakis SC, 2004. Field evaluation of the effect of a probiotic-containing Bacillus licheniformis and Bacillus subtilis spores on the health status, performance, and carcass quality of grower and finisher pigs, Journal of Veterinary Medicine Series A 51: 306-312. https://doi.org/10.1111/j.1439-0442.2004.00637.x

Amaza IB, Maidala A and Moseri H, 2021. Evaluation of yam peels as replacement of maize on the growth performance, carcass characteristic and cost benefits of growing rabbits. IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS) 14(4): 44-48.

AOAC, 2000. Association of Official Analytical Chemist. Official Methods of Analysis 17th Ed. Washington DC, USA.

Arief, Pazla R, Jamarun N and Rizqan, 2023. Production performance, feed intake and nutrient digestibility of Etawa crossbreed dairy goats fed tithonia (Tithonia diversifolia), cassava leaves and palm kernel cake concentrate. International Journal of Veterinary Science 12(3): 428-435. https://doi.org/10.47278/journal.ijvs/2022.211

Choi JY, Shinde PL, Ingale SL, Kim JS, Kim YW, Kim KH, Kwon IK and Chae BJ, 2011. Evaluation of multi-microbe probiotics prepared by submerged liquid or solid substrate fermentation and antibiotics in weaning pigs. Livestock Science 138: 144-151. https://doi:10.1016/j.livsci.2010.12.015

Council for Agricultural Science and Technology (CAST), 2013. Animal feed vs. human food: challenges and opportunities. In: Sustaining Animal Agriculture Toward 2050. Ames (IA): CAST. https://ideas.repec.org/p/isu/genres/37409.html

David TF, Alberto Sánchez D and Luján Ferreira M, 2022. Production of plant proteases and new biotechnological applications: an updated review. Chemistry Open 11(3): e202200017. https://doi.org/10.1002/open.202200017

Egbune EO, Avwioroko OJ, Anigboro AA, Aganbi E, Amata A and Tonukari NJ, 2022b. Characterization of a surfactant-stable α-amylase produced by solid-state fermentation of cassava (Manihot esculenta Crantz) tubers using Rhizopus oligosporus: Kinetics, thermal inactivation thermodynamics and potential application in laundry industries. Biocatalysis and Agricultural Biotechnology 39: 102290. https://doi.org/10.1016/j.bcab.2022.102290

Egbune EO, Ezedom T and Tonukari NJ, 2021. Inclusion of a locally produced animal performance supplement in broilers' ration. Nigerian Journal of Science and Environment 19(2): 128-134.
Egbune EO, Ezedom T, Anigboro AA, Aganbi E, Amata AI and Tonukari NJ, 2022a. Antioxidants and antigenotoxic properties of Rhizopus oligosporus fermented cassava (Manihot esculenta Crantz). African Journal of Biochemistry Research 16(3): 39-46. https://doi.org/10.5897/AJBR2022.1153
Ekenyem BU, 2007. The Growth responses of weaner pigs fed varying levels of palm kernel cake. Proceedings 27th Annual Conference, Nigerian Society Animal Production (NSAP), March 17-21, Federal University of Technology, Akure, Nigeria, pp: 156-159.
Emmanuel SS, Odunlade TA and Zubair JI, 2024. Nutritive value of fermented cassava peel meal on growth performance and nutrient digestibility of broiler chickens. International Journal of Multidisciplinary Research and Growth Evaluation 5(3): 839-843.
Falola OO, Fasuan TO and Lawal AT, 2024. Growth Performance of Broiler Finishers Fed Processed Cassava Peels in a Mixed Diets. Proceedings of 49th Conference, Nigerian Society for Animal Production, 24-27 March, 2024, University of Ibadan, Nigeria, pp: 1350-1353.
Hambakodu M, Kiha AF and Ina YT, 2024. Effects of multi-nutrient block supplement on the blood hematology grazing female Kacang goats. Agrobiological Records 18: 54-60. https://doi.org/10.47278/journal.abr/2024.037
Isaac LJ, Abah G, Akpan B and Ekaette IU, 2013. Haematological Properties of Different Breeds and Sexes of rabbits. Proceeding of the 18th Annual Conference of Animal Science Association of Nigeria, pp: 30-33.
Isidahomen CE and Moseri H, 2024. Comparative assessment of growth, haematology and serum-biochemicals in different breeds of matured rabbits. Ghanaian Journal of Animal Science 15(1): 25-31. https://dx.doi.org/10.4314/gjansci.v15i1.3
Iwegbu A, Moemeke AM and Moseri H, 2023. Effect of replacing soybean with velvet (mucuna pruriens) leaf meal on the growth performance and nutrient retention of turkey poults. Journal of Agriculture and Life Science 6(1): 1-7.
Jiang J, 2011. Effect of ASTA on weight gain and meat quality on finishing pigs. Hunan Feed 5: 40-43. https://doi.org/10.5851/kosfa.2018.38.2.403
Jumare FI, Salleh MM, Ihsan N and Hussain H, 2024. Cassava waste as an animal feed treatment: past and future. Review in Environmental Science and Bio/Technology 23: 839–868. https://doi.org/10.1007/s11157-024-09701-7
Makkar HPS 2018. Feed demand landscape and implications of food-not feed strategy for food security and climate change. Animal 12(8): 1744-1754. https://doi.org/10.1017/S175173111700324X
Mirnawati, Ciptaan G, Martaguri I, Ferawati and Srifani A, 2024. The role of *Lactobacillus fermentum* in increasing the quality and nutritional value of palm kernel cake. International Journal of Veterinary Science 13(4): 484-489. https://doi.org/10.47278/journal.ijvs/2023.121
Moseri H, Oboh SO and Okosun SE, 2018. Influence of Dietary levels of Cassava Peels and Palm Kernel Cake on the Performance and Cost Benefits of Weaner Pigs. Journal of Agriculture and Food Environment 5(4): 62-69.
Moseri H, Umeri C, Belonwu EN and Okoh JJ, 2023b. Nutrient Digestibility and Reproductive Performance of Pregnant Gilts Fed Cassava Peel and Palm Kernel Cake Meal Based Diet. Journal of Agriculture and Environment 19(1): 117-124.
Moseri H, Umeri C, Onyemekonwu RC and Belonwu EN, 2023a. Assessment of Cassava Peel/Palm Kernel Cake Meal (PKM) on Growth Performance and Blood Parameters of Lactating Sows (Agricultural Extension Implication). International Journal of Agriculture and Biosciences 12(1): 66-70. http://dx.doi.org/10.47278/journal.ijab/2023.045
Ndego A, Ezedom T, Egbune EO and Tonukari N, 2022. Biochemical characterization of solid state fermented maize cob (Zea mays) using Rhizopus oligosporus and its application in poultry feed production. International Journal of Recycling Organic Waste in Agriculture 12(2): 235-246. https://doi.org/10.30486/ijrowa.2022.1939020.1323
Obi IU, 2002. Statistical Methods of Detecting Differences Between Treatment Means and Research Methodology Issues in Laboratory and Field experiments, AP Express Publishing Company, Limited, pp:13-19.
Oboh SO, 2016. Nutritionist view of waste wealth and endless search for animal feed raw materials. 54th inaugural lecture, Ambrose Alli University, Epkoma, Edo State, Nigeria, pp: 9-15.
Ojo I, Apiamu A, Egbune EO and Tonukari NJ, 2022. Biochemical Characterization of Solid-State Fermented Cassava Stem (Manihot esculenta Crantz-MEC) and Its Application in Poultry Feed Formulation. Applied Biochemistry and Biotechnology 194(6): 2620-2631. https://doi.org/10.1007/s12010-022-03871-2
Omoikhoje SO, 2023. Future of food security in Nigeria: harnessing the potentials of unconventional feed resources to improve animal agriculture. 102th Inaugural lecture, Ambrose Alli University, Epkoma, Edo State, Nigeria, pp: 9-15.
Onabanjo RS, Adedokun OO, Akinsola KL, Ojewola GS, Udorji FI, Nwadiuto C and Njku QC, 2024. Performance of broiler chickens fed diets containing high-quality cassava peel. Journal of Sustainable Veterinary & Allied Sciences 6(1): 27. https://doi.org/10.54328/covm.josvas.2024.160
Othman MF, Chung AYK, Halim RM, Kalil MS, Bakar NA and Aziz AA, 2024. Valorization and optimization of protein in fermented palm kernel cake: influence on broiler chicks growth. International Journal of Agriculture and Biosciences 13(4): 744-752. https://doi.org/10.47278/journal.ijab/2024.180
Shon KS, Hong JW, Kwon OS, Min BJ, Lee WB, Kim IH, Park YH and Lee IS, 2005. Effects of Lactobacillus reuteri based direct-fed microbial supplementation for growing-finishing pigs. Asian-Australian Journal of Animal Science 18: 370-374. https://doi.org/10.5713/ajas.2005.370
Statistic, 2003. Statistics for windows manual. Copyright 1985-2003. Analytical software. Version 8.0
Togun VA, and Oseni BSA, 2007. Effect of low level inclusion of biscuit dust in broiler finisher diet apparently healthy Red Sokoto Goats. Proceedings of the International Journal Advanced Research of Biological Science 3(6): 198-208.

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