



Carcass and Organ Characteristics of Broiler Chicken Fed Diets containing Fermented Mango Kernel Composite Meal

¹Abang, F. B. P., ¹Archibong, E. E., ¹Izuki, E. D., ²Antyev, M., ³Ate-bia, M

¹Department of Animal Science, Faculty of Agriculture, University of Calabar, Calabar, Nigeria

²Department of Animal Production Technology, Taraba State College of Agriculture, Science and Technology Jalingo, Taraba State, Nigeria

³Department of Animal Production, College of Animal Science, Federal University of Agriculture Makurdi, Benue State, Nigeria

ABSTRACT

This study aimed to investigate the effects of incorporating fermented mango kernel composite meal (FMKCM) in the diets of broiler chickens on carcass and organ characteristics. A total of 96 broiler chickens with similar weights were randomly assigned to four dietary treatments, with 24 birds per treatment. The diets consisted of 0% (control), 10%, 15%, and 20% fermented sun-dried mango kernel composite meal as a replacement for maize. The birds were fed these diets for a period of five weeks, and their feed intake and body weights were measured regularly. The study found that broilers fed the control diet showed similar results to those fed a diet with 20% replacement of FMKCM in terms of weekly feed intake, body weight, weight gain, feed conversion ratio, and feed efficiency. Furthermore, there were no significant differences observed in meat yield and meat distributions among carcass cut-off parts across the different dietary treatments. However, significant differences were observed in the weights of organs such as the heart, liver, kidney, spleen, and gizzard. These differences did not follow a regular pattern, suggesting that they were unlikely to be influenced solely by the dietary treatments. Based on the findings, it can be concluded that 48-hour fermented mango kernel composite meal can be included in broiler chicken diets up to a 20% level without adversely affecting carcass and organ weights.

ARTICLE INFO

Article History

Received: January, 2023

Received in revised form: March, 2023

Accepted: May, 2023

Published online: June, 2023

KEYWORDS

Maize, fermented mango kernel, carcass and organ indices, Finisher broiler chickens.

INTRODUCTION

One of the greatest challenges facing the livestock industry in the developing countries is the provision of nutritionally balanced and cost effective rations, since feed constitutes about 65 – 75% of the total cost of production (Abang *et al.*, 2013; Ogana *et al.*, 2021). The situation has necessitated the need to source for an alternative or partial replacement of one of the most highly competitive feed ingredients such as maize, which contributes about 60 – 80% of most formulated diets (Abdulrashid *et al.*, 2007; Abang *et al.*, 2023^a). Some of the unconventional feed resources that have been experimented include

African locust bean meal (*Parkia filicoidea welw*), baobab seed meal (*Adansonia Digitata*), iron tree seed meal (*Prosopis africana*), coffee pulp meal (*Coffea arabica*), and mango seed kernel meal (*Mangifera indica*) (Gyang *et al.*, 2021; Adeyi *et al.*, 2021; Abang *et al.*, 2018). However, most of these feeds contain anti-nutrients and toxic components such as saponins, lectins, tannins, trypsin inhibitors and cyanogenic glycosides which make them unsafe as protein and carbohydrate sources in livestock production (Abang *et al.*, 2023^b). These anti-nutrients chelate divalent ions like Ca²⁺, Mg²⁺, Fe²⁺, and Zn²⁺ also react with the charged groups of protein

Corresponding author: Abang, F. B. P.

✉ abang.favour2@gmail.com

Department of Animal Science, Faculty of Agriculture, University of Calabar, Calabar, Nigeria.

© 2023. Faculty of Tech. Education, ATBU Bauchi. All rights reserved



and polysaccharides thereby forming indigestible complexes while the toxic substances interfere with nutrient bioavailability and utilization (Osagie, 1998; Abang *et al.*, 2023). Porter (2011) reported that mango kernel has a gross energy of 3527.34Kcal/Kg. This value was higher than that of maize (3390 Kcal/Kg) reported by Tuleun *et al.* (2005). The protein content is lower than that of the white maize (7.0%). Diarra *et al.* (2008) reported depressed growth in broiler chick fed 5 – 10% inclusion levels of mango kernel meal. Mango is rich in tannins; tannins interfere with the bioavailability of protein / efficiency of feed utilization. Processing methods such as; fermentation, sun-drying soaking, boiling, autoclaving etc. results in reducing these anti-nutrients to a more tolerable level (Abang *et al.*, 2013; Diarra and Usman, 2008). The study seeks to evaluate the effect of fermented mango kernel composite meal (FMKCM) on the carcass and organ characteristics of finisher broiler chickens.

MATERIALS AND METHODS

Study area

The study was carried out at the poultry unit of the Federal University of Agriculture Livestock Teaching and Research Farm, Makurdi

campus. Many cultivars of both indigenous and improved mango are produced in large quantities in the area with the peak production in April to May. During this period, mango seed poses a serious environmental problem because it has no food, feed or industrial value in the area.

Source and Processing of Mango Kernel

Mango seeds were collected within and outside Makurdi metropolis. The seeds were broken to get the kernel. The fresh kernels were soaked in water and allowed to ferment for a period of 2 days which were rinsed thoroughly with clean water and sun-dried continuously to reduce moisture content of the kernel and to ensure proper drying and prevention of microbial build-up on the kernel. The dry heat treated mango kernel was milled in a hammer mill and used in the formulation of the experimental diet.

Experimental Diet

Four diets in which mango kernel replaced maize at 0, 10, 15, and 20%, respectively were formulated for the experimental birds. Mango kernel and diets proximate composition were analyzed by method of AOAC (2006) (Table 1).

Table 1: Composition of feed with fermented mango kernel composite meal (FMKCM) for finisher broiler chickens

Ingredients	Replacement level of mango kernel meal for maize (%)			
	0%	10%	15%	20%
Maize	50.88	45.79	43.25	40.70
FMKM	-	5.09	7.63	10.18
Soya bean	32.52	32.52	32.52	32.52
BDG	5.50	5.50	5.50	5.50
Rice bran	4.10	4.10	4.10	4.10
Bone ash	2.50	2.50	2.50	2.50
Palm oil	3.00	3.00	3.00	3.00
Salt	0.30	0.30	0.30	0.30
Lysine	0.50	0.50	0.50	0.50
Methionine	0.40	0.40	0.40	0.40
Vita/Min premix	0.30	0.30	0.30	0.30
Total	100.00	100.00	100.00	100.00
Analyzed nutrients:	2965.19	2790.49	2703.32	2615.80
ME (Kcal/kg)	20.42	19.95	19.72	19.49
CP (%)	4.72	4.62	4.57	4.52

Corresponding author: Abang, F. B. P.

✉ abang.favour2@gmail.com

Department of Animal Science, Faculty of Agriculture, University of Calabar, Calabar, Nigeria.

© 2023. Faculty of Tech. Education, ATBU Bauchi. All rights reserved



CF (%)	7.04	6.84	6.74	6.63
Ether extract	1.32	1.32	1.31	1.32
Lysine (%)	0.61	0.61	0.60	0.62
Methionine (%)	1.40	1.48	1.48	1.43
Ca ²⁺ (%)	0.80	0.82	0.82	0.80
P (%)				

Experimental Birds and Management

Ninety six (96) Anak broiler chickens were raised together on compounded finisher mash which lasted for 5 weeks. At the beginning of growing phase, birds were individually weighed and randomly allotted to four treatments of three replicates (8 birds per replicate). Birds in each replicate were raised in a deep litter house with wood shavings as litter material. The experimental diets in Table 1 and clean water were given *ad-libitum* for 5 weeks of the study.

Lighting

To attain maximum productivity of meat yield, supplementary lighting was provided to enable the birds feed properly (*ad-libitum*).

Drug Administration and Vaccination:

The birds upon arrival were given vialyte and glucose to revive them from stress after the long journey. Coccidiostats were later administered. Vaccination was not carried out since the birds proved to be strong and healthy from physical observations.

Feeding

Experimental diets were administered immediately upon arrival of the birds with clean water *ad-libitum*.

Routine Operations

The routine operations carried out under the growing phase were the daily cleaning; sweeping and washing of the experimental pen floor with IZAL and the daily administration of feeds and daily feed intake measurement, provision of clean water and the weekly weighing of the birds.

DATA ANALYSIS

The fermented composite mango kernel meals and the diets were analyzed for proximate composition. The metabolizable energy (ME) content was calculated accordingly as $ME \text{ (kcal/kg)} = 432 + 27.91 (CP + NFE + 2.25 \times EE)$. Data collected on carcass parameters were analyzed for variance using the statistical package of SAS (1999).

Carcass Analysis

Two birds with weights close to the mean for their groups were selected for carcass evaluation from each replicate. The birds were fasted for 24 hours, weighed individually, stunned, bled and dressed. The dressed carcasses were weighed and the weights expressed as percentages of the live weights. The cut-up parts thighs, shanks, legs, head, wings, back and breast muscle (all intact) were also weighed and expressed as percentage of their respective live weights.

The visceral organs (Liver, kidneys, gizzard, bile, heart, lungs, spleen and pancreas) were excised, cleaned of the blood and tissues and then weighed on an electronic weighing scale. The weights of each organ were also expressed as percentages of the live weights of the birds. Slaughtered birds were scalded in hot water (about 50°C) for one (1) minute, plucked and eviscerated manually. The eviscerated chicken was dressed by removing the neck and the shanks and the dressed chicken (carcass) was weighed and carcass yield calculated by expressing the weight of the dressed chicken by the weight of the living bird before slaughter and multiplying by 100 as shown in the Table below.

$$\text{Carcass yield (\%)} = \frac{\text{weight of dressed chicken (g)}}{\text{weight of live chicken (g)}} \times 100$$

Statistical Analysis

Corresponding author: Abang, F. B. P.

✉ abang.favour2@gmail.com

Department of Animal Science, Faculty of Agriculture, University of Calabar, Calabar, Nigeria.

© 2023. Faculty of Tech. Education, ATBU Bauchi. All rights reserved



The data obtained on all the parameters studied were subjected to one-way analysis of variance (ANOVA) and least significant method (LSD) was used to separate means that differed significantly (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

The result for the proximate composition of Fermented Mango Kernel Composite Meal (FMKCM) is presented in Table 3. The ash, crude fibre, crude protein and nitrogen free extract (0.86%, 1.49%, 11.38% and 61.46% respectively) in FMKCM were lower than that of Boiled Mango Kernel Meal BMKM of the Kanbiri mango variety (6.15%, 3.08% and 77.38% for ash, crude fibre, crude protein and nitrogen free extract respectively) as reported by Abdullahi Idris (2012). Ash is not digestible by animals. High ash content of feed may dilute the amount of nutrients available to the animal (Kumar and Singh, 2010). Similarly, Kayode and Sani (2008) also reported high values of ash content up to 2.63%. High moisture content reduces the nutrient density in the feed and may also decrease the keeping quality of a feed. NFE is higher in BMKM than FMKCM because it is

primarily made up of readily available carbohydrates, such as sugars and starches which are activated by boiling. The crude protein and ether extracts (fat) were higher in FMKCM (11.38% and 16.17% respectively) than BMKM (7.38% and 4.01% respectively) as reported by Abdullahi Idris (2012). The increase in crude protein in FMKCM may be as a result of fermentation where proteins are natured at low temperatures which could be attributed to the addition of mycoprotein (single cell protein) which may be due to the addition of non-protein nitrogen from amide and nucleic acid synthesis by fungal cells. The high fat value in FMKCM suggests that the feed will be less prone to lipid-related forms of deterioration. Kayode and Sani (2008) also reported low values of fat in FMKCM. Crude fiber is the poorly digested component of a feed. It is made up of plant structural carbohydrates such as cellulose and hemicellulose; it also contains some lignin (Kayode and Sani, 2008). The crude fibre in FMKCM (1.49%) is lower than that of BMKM (3.08%) of the Abdullahi Idris (2012) Kanbiri Mango research work. This could be as a result of the different varieties of mangoes used.

Table 2: Proximate composition of fermented mango kernel composite meal and boiled mango kernel meal of Kanbiri variety

Ingredient	Percentage Composition	
	BMKM*	FMKCM
Crude Protein (CP)	7.38	11.38
Ether Extracts (EE)	4.01	16.17
Ash	6.15	0.86
Moisture	11.33	8.64
Crude Fibre (CF)	3.08	1.49
NFE	77.38	61.46

BMKM*: Adapted from Abdullahi Idris (2012).

Results for carcass and organ weights of finished broiler fed fermented kernel composite meal are presented in Tables 4 and 5 respectively. The results revealed that the mean values for live weight ranged from 1783.3 to 1883.3g, slaughtered weight from 1613.3 to 1701.3g, de-feathered weight from 1537.8 to 1629g, eviscerated weight from 1275.8

to 1350.5g, dressed weight from 1159.3 to 1221.2g, breast weight from 345.67- 358.17g, drumstick from 185.83 to 197.83g, thigh weight from 178.83 to 182.50g, back weight from 169.50 to 190.50g, neck weight from 97.83 to 107.83g, head weight from 39.50 to 44.67g, shank weight from 72.00 to 83.33g and wings weight from 137.17 to 143.17g. All the treatments showed no

Corresponding author: Abang, F. B. P.

✉ abang.favour2@gmail.com

Department of Animal Science, Faculty of Agriculture, University of Calabar, Calabar, Nigeria.

© 2023. Faculty of Tech. Education, ATBU Bauchi. All rights reserved



significant ($P < 0.05$) differences on the carcass and cut off parts. This result agrees with the work of Diarra *et al.* (2010) and Gbanwuan (2011) who reported no significant ($P < 0.05$) differences in the parameters measured when Fermented Mango Kernel Meal (FMKCM), Boiled Mango Kernel Meal (BMKM) and Boiled Mango Kernel Composite Meal (BMKCM) was replaced with maize in broiler finisher diets.

The results for the present study contradicts the findings of Abang *et al.* (2017) who observed significant ($P < 0.05$) differences in the drum stick weights, head weights, breast weights, back weights and shank weights across treatment groups with quails fed control diet having the highest mean weights and those placed on 50% least weights in all the aforementioned parameters when quails were fed sun-dried mango kernel meal. It appears that the weights of these various cuts- off parts reduced with increased supplementation of SMKM across treatments. Mango kernel is a rich source of tannin; tannins are known to interfere with protein digestibility and thereby rendering it unavailable, sun- drying process may not have efficiently reduced this anti-nutrient to a more tolerable level and this may have accounted for the better results recorded with birds fed FMKCM. Similar low weights of cut- off parts were also recorded across treatments by Amao and Sinyanbola (2013) and Rafiu *et al.* (2014) when broilers were fed Heat Treated Mango Kernel Meal (HMKM) and Sun- Dried Mango Kernel Meal (SMKM) respectively. The mean values for heart ranged from 7.17- 9.67g, liver ranged from 32.67- 41.50g, kidney from 10.00- 14.00g, spleen from 1.00- 2.17g, lungs from 10.67- 12.00g, gizzard from 47.00- 56.67g and intestine from 121.50- 134.17g. There were no significant differences ($P < 0.05$) across the treatments for lungs and intestine weights, however, significant differences were recorded across the treatment groups for heart, liver, kidney, spleen and gizzard weights. This result

agrees partially with the findings of Abang *et al.* (2017) who found no significant difference across the treatments for the Liver, gizzard and intestine weights while significant ($P < 0.05$) differences were recorded on heart, lungs and kidney weights. Amao and Sinyanbola (2013) reported significant ($p < 0.05$) differences in internal organs of broilers fed SMKM on all the parameters measured with the control experiment having the highest weights which may be due to the processing methods employed. Fermenting for 48hours or more is a better way of reducing anti- nutrients like tannins, phytates, etc. when compared with sun- drying. Birds placed on 0% inclusion (control) were found to record the highest values for heart, liver, kidney, spleen, gizzard weights exception of lungs weights and intestine weights that were statistically not different. This result agrees with that of Abang *et al.* (2017) who recorded the highest weights in quails fed control diet. Similarly, Amao and Sinyanbola (2013) also reported highest mean values in the control diet. Birds placed on 10% inclusion level of FMKCM were found to record least values for heart, kidney, spleen and gizzard weights with exception of liver whose least weight was found with birds fed 20% FMKCM. There was no sign of abnormal increase (inflammation) of the organs measured in all the treatments. The differences observed in the treatments may be physiological as the results did not follow a regular pattern. The pancreas is the site for production of many of the digestive enzymes. There was no significant difference in percent pancreas weight among the treatments groups and digestion especially in the small intestine was not apparently obstructed in any form as a result of the replacement of maize with FMKCM. This is also an indication of nutritional adequacy of all the diets since like blood; carcass measurements are responsive to nutrition. Replacement of maize with FMKCM up to 20% had no effect on carcass and organ weights.

Table 4: Effect of 48hours Fermented Mango Kernel Composite Meal (FMKCM) on Carcass Cut-off Parts of Finishing Broilers

Parameters	Treatments	P-
------------	------------	----

Corresponding author: Abang, F. B. P.

✉ abang.favour2@gmail.com

Department of Animal Science, Faculty of Agriculture, University of Calabar, Calabar, Nigeria.

© 2023. Faculty of Tech. Education, ATBU Bauchi. All rights reserved



	0%	10%	15%	20%	values
Live Weight	1883.3±318.90	1783.3±116.90	1808.3±241.70	1816.7±231.70	0.900
Slaughtered Weight	1701.3±330.40	1613.3±107.90	1665.2±235.60	1656.0±224.50	0.936
De feathered Weight	1629.5±311.00	1537.8±101.60	1588.0±214.80	1586.5±215.50	0.916
Eviscerated Weight	1350.5±226.50	1275.8±124.30	1305.3±185.10	1332.8±203.90	0.927
Dressed Weight	1221.2±267.10	1159.3±123.90	1192.7±177.60	1204.3±185.40	0.955
Breast	358.17±99.92	345.67±42.94	358.17±76.39	356.83±61.23	0.989
Drumsticks	195.00±34.08	190.67±21.18	185.83±22.76	197.83±29.78	0.882
Thighs	182.50±36.89	178.83±23.35	179.67±28.42	181.83±34.29	0.996
Back	190.50±51.47	169.50±23.36	184.67±29.36	180.33±25.45	0.753
Neck	107.83±19.56	97.83±10.70	106.00±16.49	103.00±16.24	0.724
Head	44.67±6.06	39.50±2.07	40.17±4.83	44.67±5.57	0.150
Shanks	82.50±15.83	76.33±11.72	72.00±9.94	83.33±15.27	0.431
Wings	143.17±27.53	137.17±9.45	140.33±17.05	143.17±18.15	0.939

Mean values are presented as mean ± standard deviation. Means with different superscript in the same row shows that there is significant difference at $P < 0.05$. T1= Control diet; T2-T4= diet containing the meal of composite mango kernel soaked in water for 48 hours

Table 5: Effect of 48hours Fermented Mango Kernel Composite Meal (FMKCM) on Internal Organs of Finishing Broilers

Parameters	Treatments				P- values
	0%	10%	15%	20%	
Heart	9.67±2.58 ^a	7.17±0.98 ^b	9.00±1.41 ^{ab}	8.67±1.97 ^{ab}	0.148
Liver	41.50±5.54 ^a	33.83±3.55 ^b	37.17±5.53 ^{ab}	32.67±3.45 ^b	0.016
Kidney	14.00±2.83 ^a	10.00±1.27 ^b	13.17±2.79 ^a	11.67±1.21 ^{ab}	0.023
Spleen	2.17±0.98 ^a	1.00±0.00 ^b	1.50±0.55 ^{ab}	1.83±0.41 ^a	0.019
Lungs	11.67±2.88	10.67±2.16	12.00±3.46	10.83±1.72	0.785
Gizzard (Intact)	56.67±10.46 ^a	47.00±5.33 ^b	50.67±7.37 ^{ab}	50.83±4.45 ^{ab}	0.178
Intestine(Intact)	134.17±22.17	129.17±30.56	127.33±21.32	121.50±8.19	0.799

Mean values are presented as mean ± standard deviation. Means with different superscript in the same row shows that there is significant difference at $P < 0.05$. T1= Control diet; T2-T4= diet containing the meal of composite mango kernel soaked in water for 48 hours.

CONCLUSION

It was concluded that 48hours fermented mango kernel composite meal could replace maize up to 20% in finisher broiler diets without affecting the carcass and organ weights.

growing Japanese quails (*Coturnix coturnix japonica*) Fed 48hours Fermented Taro Cocoyam (*Colocasia esculenta var esculenta*) as a replacement for maize. *Indian Journal of Research (PARIPEX)*, 8(3): 34 - 36. ISSN-2250-1991

Abang, F. B. P., Ayuk, A. A., & Okon, B. I. (2013^b). Carcass and Organ Characteristics of Growing Japanese Quails (*Coturnix Coturnix Japonica*)

REFERENCES

Abang, F. B. P., Ayuk, A. A. and Okon, B. I. (2013^a). Growth performance of

Corresponding author: Abang, F. B. P.

✉ abang.favour2@gmail.com

Department of Animal Science, Faculty of Agriculture, University of Calabar, Calabar, Nigeria.

© 2023. Faculty of Tech. Education, ATBU Bauchi. All rights reserved



- Fed Boiled Taro Cocoyam Meal as a Replacement for Maize. *Indian Journal of Research (PARIPEX)*.
- Abang, F.B., Oko, O.K. and Yelwa, J.T. (2017). Carcass and Organ Characteristics of Growing Japanese Quails (*Coturnixcoturnix japonica*) Fed Sun-dried Mango (*Mangiferasp*) Kernel Meal as a Replacement for Maize. *Annual Research and Review in Biology*. 20(6): 1-7.
- Abang, F. B. P., Egahi, J. O. and Gbakoron, D. (2018). Carcass and organ characteristics of broiler chicken fed boiled mango kernel composite meal. *International Journal of Applied Science*, 1(2): 1-5.
- Abang, F.B.P, NSA, E.E., Thaddeus, N.K., Archibong, E.E. and Yerima, S. K. (2023^a). Performance and nutrient digestibility by growing Japanese quail fed fermented mango kernel. *Journal of Hunan University (Natural Science)*, 50(3): 181-189.
- Abang, F. B. P, Kperun, T. N., Odunlade T. A., Attach, S and Terwase, E. J. (2023^b). Cost effectiveness of broiler chicks served boiled mango (*Mangifera spp*) kernel composite meal as a replacement for maize. *Journal of New Zealand studies*, 773-779. <https://doi.org/10.5281/zenodo.7805538>
- Adeyi, M. O., Abang, F. B. P., and Attah, S. (2021). Effect of *Prosopis africana* Seed Coat Meal Treated with Multi-Enzymes on the Growth Performance of Broiler Chickens. *Journal of Science Technology and Education*, ISSN: 2277 - 0011: Journal homepage: www.atbufejoste.com. 9(1): 206 - 210.
- Gyang, I. Y., Abang FBP, and Shaahu DT (2021). Growth Performance and Digestibility of Starter Broiler Chicks Fed Diets Containing Different Duration of Fermented Baobab (*Adansonia Digitata*) Seed Meal. *European Journal of Agriculture and Food Science*, 3(4) 38-42.
- Amao, E. A. and Siyanbola M. F. (2013). Carcass and physiological response of broilers fed dry heat treated mango (*Mangiferaindica*) kernel based diet. *International Journal of Livestock Production*. 4(3):30-34.
- A.O.A.C. (Association of Official Analytical Chemist) (2006). *Official Methods of Analysis*. 19th Ed. Washington D.C.
- Abdullahi I. Idris (2012). Nutritive Value of differently processed mango seed kernel (Local variety (Kanbiri) and mixed samples) meal in broiler diets. Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria.
- Abdulrashid, M., Agwunobi, L. N., Jonathan, G. E., Abdul, S.B. (2007). Carcass quality characteristics of broiler finisher fed taro (*Colocasia esculanta*) cocoyam meal. In: *Book of Abstract of the 32nd Annual Conference Nigerian Society of Animal Production (NSAP)*, held at the University of Calabar, Calabar, Nigeria, 32: 457 – 60.
- Diarra, S. S. and Usman, B. A. (2008). Growth performance and some blood variables of broiler chickens fed raw or boiled mango kernel meal. *International Journal of Poultry Science*, 7 (4): 315-318.
- Diarra, S. S., Usman, B. A. and Igwebuikie, J. U. (2010). "Replacement value of boiled Mango kernel meal for maize in broiler finisher diets". *ARPJ Journal of Agricultural and Biological Science*, 5(1):47-52.
- Diarra, S. S., Saleh, B., Kwari, I. D. and Igwebuikie, J.U. (2011), "Evaluation of Boiled Mango Kernel Meal as Energy Source by Broiler Chickens in the Semi-Arid Zone of Nigeria", *International Journal of Security and Networks (I.J.S.N)*, 2(2): 270- 274
- Gbawuan, D. (2011). Effect of Soaked Mango Kernel Composite Meal as a Replacement for Maize in broiler diet. A Project Report to the Department of

Corresponding author: Abang, F. B. P.

✉ abang.favour2@gmail.com

Department of Animal Science, Faculty of Agriculture, University of Calabar, Calabar, Nigeria.

© 2023. Faculty of Tech. Education, ATBU Bauchi. All rights reserved



- Animal Science, Faculty of Agriculture, Kogi State University, Anyigba, Kogi State, Nigeria.
- Gyang, I. Y., Abang FBP, and Shaahu DT (2021). Growth Performance and Digestibility of Starter Broiler Chicks Fed Diets Containing Different Duration of Fermented Baobab (*Adansonia Digitata*) Seed Meal. *European Journal of Agriculture and Food Science*, 3(4) 38-42.
- Kayode, R. M. O. and Sani, A. (2008). Physicochemical and proximate composition of mango kernel cake fermented with mono-culture of fungal isolates. *Life Science Journal*. 5(4): 55-63.
- Kperegbeji, J. I. and Onwumere, O. S. (2007) Effect of raw and toasted bambara groundnut (*Vigna subterranean* (L.) verdcourt) on performance of growing cockerels. In: *Book of Abstract of the 32nd Annual conference of the Nigerian Society for Animal Production (NSAP) held at the University of Calabar, Calabar, Nigeria*. 32: 188-91.
- Kumar, D. Chandramoni and Singh, P.K. (2010). Effects of feeding mango seed kernel on performance, carcass characteristics and cost of feeding in broiler starter. *Indian Journal of Poultry Science*. 45(1): 46-49.
- Osagie, A. U. (1998). Anti-nutritional factors. In: Osagie A. U and Eka O. U (Eds). *Nutritional Quality of Plant Foods*. Published by the Post Harvest Research Unit Dept of Biochemistry Uniben, Benin City, Nigeria.
- Porter, L. (2011). *Nutritional data for dried mango official partner of the living strong foundation*, 55:50-55.
- Steel, R.G.D. and Torrie, J. H. (1980). *Principles and Procedures of Statistics, A biometrical Approach*. 2nd Ed. McGraw Hills Book Co., New York, U.S.A.
- Tuleun, C. D., Njike, M. C., Ikurior, S. A., and Ehiobu, N. G., (2005). Laying Performance and egg quality of hen fed cassava root meat/brewer's yeast slurry based diet. *Production Agricultural Technology*, 1: 146-152.

Corresponding author: Abang, F. B. P.

✉ abang.favour2@gmail.com

Department of Animal Science, Faculty of Agriculture, University of Calabar, Calabar, Nigeria.

© 2023. Faculty of Tech. Education, ATBU Bauchi. All rights reserved