SERUM AND HAEMATOLOGICAL INDICES OF BROILER CHICKENS FED ROASTED OR SOAKED NON-DECORTICATED BAOBAB (Adansonia digitata) SEED BASED DIETS

1Bello, Zainab Olajumoke, 1Adeyemi, Saheed Abimbade, 2Zubair, Kadiri Olasunkanmi
1Animal Science Department, Al-Hikmah University, Ilorin, Kwara State.
2Agric. Economics and Extension Department, Al-Hikmah University, Ilorin, Kwara State.
Corresponding author: **zyolami@gmail.com**; 08064336389

ABSTRACT
Baobab (Adansonia digitata) seed, a by-product of baobab fruit processing, has been identified as a potential feed ingredient due to its high protein and energy content. However, its use in poultry diets is limited by the presence of anti-nutritional factors (ANFs). This study investigated the effects of feeding broiler chickens with processed (roasted and soaked) non-decorticated baobab (Adansonia digitata) seed-based diets on their serum and haematological indices. A total of 196 one-day-old Ross 308 broiler chicks were randomly assigned to seven dietary treatments over six weeks. The inclusion levels of roasted and soaked baobab seed meal ranged from 0% to 15%. Blood samples were collected to assess biochemical and haematological parameters post-experiment. Results indicated that serum biochemical indices, including total protein and albumin, showed no significant (p>0.05) differences among treatments, suggesting effective nutrient utilization. However, significant (p>0.05) variations were observed in white blood cell counts, indicative of immune status. The study highlighted the positive correlation between processing methods and the nutritional value of baobab seeds, supporting their viability as alternative feed ingredients in poultry diets. The findings suggest that processed baobab seeds can enhance dietary quality without adverse effects on the health of broilers. Further research can adopt other processing methods aside roasting and soaking to mitigate the effects of antinutritional factors present in Adansonia digitata seed meal to improve its utilization in broiler diets.
Keywords: Broiler chickens, Baobab seeds, Serum indices, Haematological parameters, Poultry nutrition

INTRODUCTION

Poultry nutrition plays a vital role in sustainable animal agriculture, particularly in optimizing broiler health and productivity. Feed costs account for 60%–80% of total poultry production expenses (Adegbola, 2004), driven by competition for feed resources and rising livestock demand (Robinson & Singh, 2001). This challenge has reduced profit margins and limited industry expansion.

To address this, alternative, cost-effective feed ingredients are gaining interest (Olugbemi *et al.,* 2010). Baobab (*Adansonia digitata*) seed, a by-product of fruit processing, offers high protein and energy content (Osman, 2004). However, its use is restricted by anti-nutritional factors (ANFs) like tannins, phytates, and oxalates, which impair nutrient digestibility (Glew *et al.,* 1997).

Processing methods such as roasting and soaking can enhance baobab seed's nutritional value by reducing ANFs (*Kabore et al.,* 2011; Ezeagu, 2005). While previous studies have analysed its proximate composition, limited research has examined its effects on broiler serum biochemical and haematological indices. These parameters indicate metabolic health, nutrient utilization (Akinmutimi & Okwu, 2006), and immune competence (Isaac *et al.,* 2013), making them essential for evaluating baobab seed's dietary potential.

This study, therefore, evaluated the serum and haematological indices of broiler chickens fed diets containing roasted or soaked non-decorticated baobab seeds.

MATERIALS AND METHODS

Site of Experiment

The experiment was carried out at the Teaching and Research Farm of Al-Hikmah University, Ilorin, Kwara State.

Processing of *Adansonia digitata* seed

Adansonia digitata seeds were sourced from Ogbomosho, Oyo State, Nigeria. The fruits were harvested, and seeds manually separated, washed, and cleaned. A portion (125 kg) was soaked in water for 48 hours, sun-dried for 96 hours, then hammer-milled for inclusion at 10, 12.5, and 15%. Another portion (125 kg) was roasted at 60°C for 1 hour, with turning every 5 minutes, then cooled and hammer-milled for the same inclusion levels. These processed seeds were used in broiler diets.

Experimental Diets, Animals and Feeding Experiment

The study used a completely randomized design with 196 one-day-old Ross 308 broiler chicks. They were assigned to seven dietary treatments, each with four replicates of seven birds. A single-formulated diet served as both starter and finisher. Feed and water were provided ad libitum for six weeks.

- T1 -control (0% ADSM)

- T2 - 10% roasted *Adansonia digitata* seed meal (RADSM)
- T3 - 12.5% roasted *Adansonia digitata* seed meal (RADSM)
- T4 - 15% roasted *Adansonia digitata* seed meal (RADSM)
- T5 - 10% soaked *Adansonia digitata* seed meal (SADSM)
- T6 - 12.5% soaked *Adansonia digitata* seed meal (SADSM)
- T7 - 15% soaked *Adansonia digitata* seed meal (SADSM)

Blood sampling and analysis

At the end of the six-week feeding trial, blood samples were collected via brachial venipuncture into EDTA and plain bottles. Serum was obtained after centrifuging (3000g, 10 C, 15 min) the blood samples in the plain bottles. Haematology and serum biochemical indices were assessed as described by *Adeyemi et al.,* (2020).

All data obtained were subjected to analysis of variance using the model for a completely randomised design of SAS package (2012). Significant means were analysed used the same package.

RESULTS AND DISCUSSIONS

Serum Biochemical Indices of Broilers Fed Processed (Roasted and Soaked) UADSM

The biochemical indices of broilers fed roasted and soaked UADSM are presented in Table 1. No significant differences ($p>0.05$) were observed in most parameters except for uric acid and albumin. ALP, globulin, and total protein values decreased as the inclusion level increased, though not significantly. However, serum total protein showed a slight increase with higher inclusion levels, aligning with findings by Sola-Ojo and Ibiwoye (2016) for birds fed decorticated, undefatted roasted baobab seed meal.

Serum total protein reflects protein quality, and a decrease may indicate impaired protein metabolism, affecting liver function. Glucose values remained within the control range and showed no significant differences ($p>0.05$). ALP levels declined as processed UADSM inclusion increased but remained statistically similar across treatments. Uric acid levels ranged from 3.53 to 5.44, exceeding the 0.45–0.53 Mmol/L reported by Sola-Ojo and Ibiwoye (2016) for birds fed DURBSM. This aligns with their findings of increased uric acid levels with higher dietary inclusion. Overall, the lack of significant differences in most biochemical parameters is consistent with reports by Abdulazeez *et al.,* (2016) for broilers fed baobab seed meal and Ezeagu (2005) on baobab seed protein utilization in young albino rats.

Table 1: Serum biochemistry parameters of broiler chickens fed processed (roasted and soaked) non-decorticated *Adansonia digitata* seed meal

Parameters	T1	T2	T3	T4	T5	T6	T7	SEM
Glucose (mM/l)	111.48	105.25	112.23	104.78	104.45	116.88	96.55	2.58
Alkaline phosphatase (IU/L)	139.00	141.35	140.50	137.98	140.75	139.78	138.75	1.19
Albumin (mg/dl)	5.15^{a}	4.95^{ab}	4.80^{b}	4.79^{b}	4.90^{ab}	4.72^{b}	4.95^{ab}	0.04
Creatinine (mg/ml)	0.68	0.57	0.39	0.74	0.81	0.60	0.76	0.05
Urea (mM/l)	17.87	10.99	12.68	14.73	14.02	14.48	12.32	1.19
Uric acid	5.22^{a}	5.44^{a}	5.06^{a}	4.02^{b}	3.91^{b}	3.53^{b}	3.82^{b}	0.09
Total protein (mg/dl)	11.72	11.27	11.32	11.79	11.38	12.08	12.12	0.43
Globulin (mg/dl)	6.57	5.97	6.47	6.99	6.48	7.17	7.37	0.45
Albumin-Globulin ratio	0.89	0.86	0.76	0.74	0.78	0.67	0.71	0.05

*^{a,b,c} means bearing different superscripts along the same row are significantly different ($p<0.05$); SEM: standard error of mean

Haematological Indices of Broilers Fed Processed (Roasted and Soaked) UADSM

The haematological parameters of broilers fed processed (roasted and soaked) UADSM are shown in Table 2. Among all parameters, only white blood cell (WBC) and platelet (PLT) values were significantly different ($p<0.05$). Haemoglobin (HGB) and packed cell volume (PCV) increased with higher inclusion levels of RUADSM and SADSM, though not significantly. Since PCV and HGB are influenced by protein and energy intake, lower levels may indicate anemia (Abdulazeez et al., 2016). The PCV range (26.88–45.38) aligns with 27.25–39.00 reported by Sola-Ojo and Ibiwoye (2016).

Red blood cell (RBC) values ranged from 2.15 (T6) to 8.98 (T7), remaining statistically similar to the control. WBC values, though significantly different, were within the control range. Since higher WBC counts enhance immunity (Soetan *et al.,* 2013), birds fed processed UADSM likely maintained a similar immune status to the control group.

CONCLUSION

The inclusion of processed *Adansonia digitata* seed meal (up to 15%) had no adverse effects on the serum and haematological indices of broilers. Roasting and soaking improved its utilization, making it a viable feed ingredient. Roasted *A. digitata* seed meal at 15% can be safely included in broiler diets. Further research should explore additional processing methods to reduce antinutritional factors and enhance its nutritional value for broilers. Processed baobab seeds can improve dietary quality without compromising broiler health.

Table 2: Haematological parameters of broiler chickens fed processed (roasted and soaked) non-decorticated *Adansonia digitata* seed meal.

Parameters	T1	T2	T3	T4	T5	T6	T7	SEM
WBC ($x10^9$/L)	89.13^{ab}	55.78^{b}	81.80^{ab}	112.98^{a}	101.08^{a}	95.58^{ab}	100.70^{a}	4.73
LYM %	54.23	50.90	36.15	69.40	76.83	66.18	66.15	5.86
MID %	14.08	11.83	16.98	18.23	14.48	12.18	12.40	1.38
GRAN %	25.83	37.28	46.88	12.38	15.00	21.65	34.95	5.56
RBC ($x10^{12}$/L)	2.53	2.55	2.95	2.83	5.80	2.15	8.98	1.38
HGB (g/dl)	9.83	9.78	11.93	12.45	7.38	9.00	11.00	0.66
PCV %	39.70	38.45	43.58	45.38	26.88	34.10	38.58	18.03
MCV (fl)	151.18	151.20	148.65	153.03	144.03	158.23	154.88	2.06
MCH (pg)	38.93	38.50	40.43	43.98	39.40	42.03	43.13	0.86
MCHC (g/dl)	248.25	255.25	272.25	288.25	273.50	266.00	268.25	4.74
PLT ($x10^9$/L)	96.25^{ab}	100.25^{ab}	102.00^{ab}	20.25^{ab}	48.25^{ab}	75.75^{ab}	151.00^{a}	11.25
PCT %	0.083	0.290	0.080	0.030	0.048	0.130	0.133	0.04

^{a,b,c} means bearing different superscripts along the same row are significantly different ($p<0.05$); SEM: standard error of mean; WBC: white blood cell, LYM: lymphocyte, GRAN: granulocyte, RBC: red blood cell, HGB: haemoglobin, PCV: packed cell volume, MCV: mean corpuscular volume. MCH: mean corpuscular haemoglobin, MCHC: mean corpuscular haemoglobin concentration, PLT: platelet, PCT: platelet crit.

REFERENCES

Abdulazeez, H., Adamu, S. B., Igwebuike, J. U., Gwayo, G. J., & Muhammad, A. I. (2016). Haematology and Serum Biochemistry of Broiler Chickens Fed Graded Levels of Baobab (*Adansonia digitata* L.) Seed Meal. *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)*, *9*, 48-53.

Adegbola, T.A., (2004). Utilizing proven alternative feed ingredients in the livestock industry. Proceedings of the 27th Annual Conference of the Nigerian Society for Animal Production held at Usmanu Dan Fodiyo University, Sokoto , Pp: 431-436.

Adeyemi KD, Abdulrahman A, Ibrahim SO, Zubair MF, Atolani O, Badmos AA. 2020. Dietary supplementation of Tetracarpidium conophorum (African Walnut) seed enhances muscle n-3 fatty acids in broiler chickens. Eur J Lipid Sci Technol. 122(6):1900418.

Akinmutimi, A. H., & Okwu, N. D. (2006). Effect of quantitative substitution of cooked Mucuna utilis seed meal for soybean meal in broiler finisher diets. *International Journal of Poultry Science, 5*(5), 477-481.

Ezeagu, I. E. (2005). Baobab (*Adansonia digitata* L.) seed protein utilization in young albino rats I: biochemical ingredients and performance characteristics. *Animal Research International*, *2*(1), 240-245.

Ezeagu, I. E. (2005). Baobab (*Adansonia digitata*) seed protein utilization in young albino rats. *Plant Foods for Human Nutrition, 60*(4), 151-156.

Glew, R. H., Vanderjagt, D. J., Lockett, C., Grivetti, L. E., Smith, G. C., Pastuszyn, A., & Millson, M. (1997). Amino acid, fatty acid, and mineral composition of 24 indigenous plants of Burkina Faso. *Journal of Food Composition and Analysis, 10*(3), 205-217.

Isaac, L. J., Abah, G., Akpan, B., & Ekaette, I. U. (2013). Haematological properties of different breeds and sexes of rabbits. *Proceedings of the 18th Annual Conference of Animal Science Association of Nigeria (ASAN)*, 24-27.

Olugbemi, T. S., Mutayoba, S. K., & Lekule, F. P. (2010). Effect of Moringa (*Moringa oleifera)* inclusion in cassava-based diets fed to broiler chickens. *International Journal of Poultry Science, 9*(4), 363-367.

Osman, M. A. (2004). Chemical and nutrient analysis of baobab (*Adansonia digitata*) fruit and seed protein solubility. *Plant Foods for Human Nutrition, 59*(1), 29-33.

Robinson, D. & Singh D. N., (2001): Alternative protein sources for laying hens. A report for the Rural Industries Research and Development Corporation Publication, 144: 1p.

SAS. (2012). In: JMP/STAT guide to personal computers, version 11.0.0, Statistical Analysis System Institute Inc, Cary, NC.

Soetan K.O., Akinrinde A.S. & Ajibade T.O. (2013). Preliminary studies on the haematological parameters of cockerels fed raw and processed guinea corn (*Sorghum bicolour*), *Proc of 38th Annual Conference of Nigerian Society for Animal Production,* 2013, 49-52.

Sola-Ojo, F. E., & Ibiwoye D. (2016). Response of finishing broiler chickens to dietary decorticated undefatted roasted baobab seed meal.