

Animal Health

Journal
(AHJ)



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Journals

EVALUATION OF BLOOD AND HISTOLOGICAL INDICES OF BROILER BIRDS FED DIET CONTAINING MANGO KERNEL, WATERMELON AND PARKIA SEEDS FERMENTED USING *LACTOBACILLUS PLANTARUM*

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Abstract

The work evaluated blood and histological indices of broiler birds fed diets containing mango, watermelon and parkia seeds fermented using *Lactobacillus plantarum*. The experiment was carried out under the supervision of Microbiology department of Kaduna State University with the 4 set of diet containing; no fruits seed inclusion (T₁) mango inclusion (T₂) watermelon inclusion (T₃) and parkia inclusion (T₄). 96 birds were used for the experiment which was laid in Randomized Block Design (RBD) having 3 replicates with 12 birds per replicate and fed for 6 weeks after which blood sample was taken for analysis and birds slaughtered for internal organs evaluation. Result obtained showed blood parameter of broiler birds fed diet T₃ had highest levels of PVC (78.3%), and Haemoglobin (26%) with impressive Lymphocytes (189%), Platelets ($162.6 \times 10^9/l$) & Heterophil (13.66%) compared to birds fed the other experimental diets and also the internal organs such as lungs, heart, intestine, spleen, gizzard & kidney of the bird fed T₃ diet were all Normal compared to birds fed the others diet. It is therefore concluded that the use of *Lactobacillus plantarum* in fermentation of watermelon lowered anti nutritional factors and gave broiler birds overall good health. It is therefore recommended that further research be carried out to ascertain the appropriate inclusion level of watermelon seeds that would give the best result.

Keywords: Blood, histological indices, broiler birds, mango, watermelon, parkia & *Lactobacillus plantarum*.

INTRODUCTION:

Lactobacillus plantarum are amongst the diversified lactic acid bacteria (LAB) species which are being utilized abundantly in the food industry. Numerous *L. plantarum* strains have been reported to produce several antimicrobial compounds. According to Muhammad, Ramzan, Abdelazeez, Amjad, Afzaal, Zhang and Pan (2019) due to the probiotic characteristics of *Lactobacillus plantarum* it is considered as the most important species of *Lactobacilli* as it is able to biosynthesize substrates to produce bioactive peptides, enzymes, organic acids, exopolysaccharides and vitamins. The probiotic properties and antagonistic features of the *L. plantarum* strains are the unique characteristics which enable them to be utilized as bio-control agents against potentially dangerous microbes during processing and storage of the food as it also elongates the shelf-life and safety of the fermented food products. The presence of these probiotic

strains in fermented food systems can possibly contribute to the reduction of chemical compounds and can increase the health and wellbeing to consumers. The *L. plantarum* strains have been found to possess the best probiotic properties like acid and bile salt tolerance, the ability to adhere Caco2 cells, the surface hydro-phobicity properties which lead to significant hypo-cholesterolemic and antioxidant activities.

Mango kernel (*Mangifera indica*), watermelon (*Citrullus lanatus*) and parkia (*Parkia biglobosa*) seeds contain significant amount of anti nutritional factors namely; tannins, phytate, cyanide, antitrypsin, oxalate and saponins which limit their utilization if not first processed through various methods in order to make them usable. Various proximate analysis has shown that these seeds contain good amount of protein, carbohydrate, crude fibre and important mineral components which are required in animal diets (Diarra, 2014; Shazili, El-Zubeir, & Abdelhadi, 2013; Yahaya, Adamu, Salau and Sambo, 2018). Through fermentation processes these anti nutritional factors could therefore be eliminated and the substrates from these seeds become usable in livestock feed formulation thereby lowering the dependence on highly priced grains consumed by humans. According to Gro-intelligence (2018), forecast for Sub Sahara Africa protein chart looks alarming, as the region's net protein availability seem to be sharply on the declines as its livestock industry grows. This is worrisome considering that efforts have been made to grow the livestock industry for over the decade owing to previous report on protein deficiency and malnutrition (Hettie & Nicolette, 2012). The need to work towards meeting the nutritional deficient gap in humans gave rise to various researches geared toward producing livestock at lower cost prompting the search for cheaper feed ingredients. However, the continuous increase in cost of conventional feeds ingredients such maize (carbohydrate), soybean (protein), groundnut and other materials has posed a serious challenge to the industry making it imperative to search for feed ingredients of lower cost which are not necessarily competed for by man and livestock. This forms the basis for this research the possibility of bio-utilization of mango kernel, watermelon and parkia seeds to produce broiler birds.

METHODOLOGY:

The experiment was carried out under Microbiology Department of Kaduna State University, Nigeria. Cultures of isolates (*Lactobacillus plantarum*) were obtained prepared and sterilize by autoclaving at 121⁰C for 15minutes. Aseptically the pure cultures of both isolates were separately incubated at 37⁰C for 48hours, they were sub-cultured repeatedly on a fresh media of De Man Rogosa and Sharpe (MRS) medium.

The prepared mango, watermelon and parkia seeds powder were inoculated with the isolate and mixed then allowed to ferment for 5 days after which the mixture was oven dried at 60⁰c for 45 minutes. The dried powder for each seed was used to prepare different broiler diet with T₁ (control with no inclusion), T₂ (Mango inclusion), T₃ (Watermelon inclusion) and T₄ (Parkia inclusion).

A total of 96 broiler birds were obtained from a reputable hatchery brooded and divided into 4 groups and replicated 3 times. Birds were fed with 4 different diets containing control feed (T₁), fermented mango seeds (T₂), fermented water melon seeds (T₃) and fermented Parkia seeds (T₄).

At 6 weeks the birds were selected from each cage, blood sample was taken for analysis and slaughtering done for evaluation of the internal organs and the following result was obtained.

RESULT:

The result of table 1 below shows that poultry birds fed diets containing Control diet (T₁) had highest Heterophil (29%) and Monocytes (6%) while those fed with diets containing Mango (T₂) had highest Red Blood Cell (12.2), Platelets ($172.66 \times 10^9/l$), Total protein (10.2) and Lymphocytes (195.66) with those fed diet containing Watermelon (T₃) having highest PCV (78.3%) and Haemoglobin (26 g/d). Least PCV, Haemoglobin, RBC, Platelets and Lymphocytes was observed in birds fed diets containing Parkia (T₄) with figures of 29%, 9.2 g/d, 4.76 and 84.3 % respectively while those fed diet T₁ had lowest platelets ($158.66 \times 10^9/l$), T₄ had lowest Total protein (4.2), T₂ had lowest heterophils (11.66%) and both T₂ & T₃ had lowest Monocytes (3%) each. The result implies that diets containing Watermelon (T₃) gave the birds higher volume of blood and oxygen carrying capacity.

Table 1: Blood Parameter of Birds across Treatments

PARAMETERS	T ₁	T ₂	T ₃	T ₄
Packed Cell Volume (PVC) %	66.3	76.6	78.3	29
Haemoglobin (g/d)	22.1	25.5	26	9.6
Red Blood Cell ($10^6/ul$)	11.20	12.2	5.4	4.76
Platelets (%)	$158.66 \times 10^9/l$	$172.66 \times 10^9/l$	$162.6 \times 10^9/l$	$369 \times 10^9/l$
Total protein (mg/dl)	9.53	10.2	4.2	4.8
Heterophil (%)	29	11.66	13.66	12.3
Lymphocytes (%)	195.3	195.66	189	84.3
Monocytes (%)	6	3	3	3.33

Source: **2019 Experimental Work**

The result of table 2 below shows that broiler birds fed diets T₃ and T₄ had normal lungs while those fed with diet T₁ had enlarged lungs while those fed diet T₂ had congested lungs. All birds fed diets T₁, T₃ and T₄ had normal heart while those fed diet T₂ had INF. Birds fed diets T₃ and T₄ had normal intestine while those fed diet T₁ had necrosis intestine and those fed diet T₂ had INF. Birds fed diets T₁, T₂ and T₃ had normal spleen while those fed diet T₄ had congested spleen. Birds fed diets T₁, T₂ and T₃ all had congested liver with only those fed diet T₄ having normal liver. Birds fed across all diets had normal gizzard. Birds fed diets T₁, T₃ and T₄ all had normal kidney while only those fed diet T₄ had INF. The overall result indicates that birds fed diets containing watermelon (T₃) and Parkia (T₄) had better indices of internal organs implying that watermelon and parkia diets have no adverse effect on broiler bird's internal organs.

Table 2: Histological indices of Broiler Birds across different Treatments

Treatment	Lungs	Heart	Intestine	Spleen	Liver	Gizzard	Kidney
T ₁	Enlarged	N	Necrosis	N	Congested	N	N
T ₂	Congested	INF	INF	N	Congested	N	INF
T ₃	N	N	N	N	Congested	N	N
T ₄	N	N	N	Congested	N	N	N

Source: **2019 Experimental Work**

DISCUSSION:

The blood parameter shows the highest Heterophil and Monocytes were obtained with birds fed the control diet (T₁), the highest Red Blood Cell, Platelets, Total protein and Lymphocytes were obtained with birds fed Mango diet (T₂), the highest PCV and Haemoglobin were obtained with birds fed watermelon diet (T₃) while the least PCV, Haemoglobin, RBC, Platelets and Lymphocytes were observed in birds fed diets containing Parkia (T₄). This result is consistent with findings of Lawan, *et al.*, (2018) in terms of blood parameters of birds fed diet T₂. The result however contradicted findings of Aderemi *et al.*, (2016) on blood parameter obtained from birds fed parkia diet. This contrast may be due to difference in methods used in processing parkia seeds which were roasted by the researchers whereas in this research parkia seeds were boiled. The result obtained from birds fed T₃ diet (watermelon) which showed higher levels of PCV and Haemoglobin is an indication that the feed gave the birds higher blood volume and oxygen carrying capacity which would naturally make these birds show good physical appearance and strength. This result agrees with findings of Bou, Sola-Ojo, Olorunsanya & Adekola (2011) on efficacy of watermelon seeds as a valuable feed component in enhancing blood parameter of broiler birds.

On histological indices of birds the result shows birds fed diets containing watermelon (T₃) and Parkia (T₄) had more impressive indices of internal organs which is consistent with findings of Lawan *et al.*, (2018) and Aderemi *et al.*, (2016) implying that watermelon and parkia diets have no severe negative effect on the birds internal organs. It is also an indication that watermelon and parkia seeds utilization in livestock feed would give impressive health of farm animals. Interestingly the proximate analysis of both seeds shows high amount of protein meaning these seeds when well processed could easily replace soybean in livestock feed formulation.

CONCLUSION AND RECOMMENDATION:

The quest to increase animal protein consumption and reduce malnutrition in Sub Sahara Africa in line with WHO recommendation would be achieved when focus is placed on utilizing cheap materials that are in abundant within African but considered as waste such as mango kernel, watermelon and parkia seeds as feed materials to produce livestock. Through fermentation process

the anti nutritional factors of these seeds can be eliminated hence making them good replacement for highly priced soybean or other protein sources thereby reducing the competition with human food materials in producing livestock.

It is therefore important that more research be carried out to determine the right levels of watermelon and parkia that can be included in broiler birds feed to obtain the best result and eliminate any possible adverse effects in their utilization as livestock feed materials.

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