International Journal of Agriculture Innovations and Research
Volume 10, Issue 5, ISSN (Online) 2319-1473
Manuscript Processing Details (dd/mm/yyyy):
Received: 22/02/2022 | Accepted on: 25/03/2022 | Published: 10/04/2022

Response of Broiler Finisher Chicken to Pineapple Waste-Rice Bran Mixture Based Diets

Tunji Babatunde Olayeni[1], Tirimisiyu Adewale Rafiu[1*] and Temitope Peter Akilapa[2]
[1]Department of Animal Production and Health, Ladoke Akintola University of Technology, P.M.B. 4000, Ogbomoso, Nigeria.
[2]Department of Agricultural Education, School of Vocational and Technical, Osun State College of Education, Lla-orangun, Nigeria.
*Corresponding author email id: tarafiu@lautech.edu.ng

Abstract **– Four weeks feeding trial was conducted to evaluate the performance characteristics, carcass and haematological parameters of broiler finisher chicken fed pineapple waste-rice bran (PW/RB) mixture based diets. Fresh pineapple waste was mixed with rice bran in ratio 1.1 (W/W) to obtain pineapple waste-rice bran mixture. Five diets were formulated where 0, 10, 12.5, 15 and 17.5% of wheat offal was replaced with pineapple waste-rice bran mixture. Two hundred, four weeks old Marshal broiler chicken were randomly allotted to five dietary treatments. Data were collected on feed intake, weight gain, feed gain ratio, carcass characteristics, organ weights and blood parameters. Birds fed with 12.5% wheat bran replacement level with PW/RB utilized their feed more efficiently (P<0.05) than other treatments as reflected in their daily weight gain and final live weight. There were significant differences (P<0.05) across the treatments in the bled weight, defeathered weight, carcass weight, drumstick, heart, kidney, and gizzard with 12.5% PW/RB having the highest value when compared with the control diet (0% PW/RB). All haematological parameters were significantly affected (P<0.05) except white blood cells counts and mean corpuscular heamoglobin (P>0.05). It was concluded that wheat bran in broiler diets could be partially replaced with pineapple waste-rice bran mixture at all levels studied but best result could be actualized when 12.5% replacement level is considered.**

Keywords **– Performance, Pineapple Waste, Rice Bran, Broiler Finisher, Carcass, Organ, Haematology.**

I. INTRODUCTION

The rate of expansion of poultry industry has been greatly affected by high cost of livestock feed in the developing nations. Therefore, the search for alternative livestock feeding especially non-ruminants has continued to attract the attention of researchers in different part of the World.

Pineapple waste (PW) occurs as pineapple peel and core, making about 40-50% of the fresh fruit (Buckle, 1987) and contains majorly sucrose, fructose, glucose and other nutrients (Krueger *et al.*, 1992). FAO (2004) ranked Nigeria among the leading pineapple producing countries with about 800,000 metric tons since 2001. The abundant availability over the years and its perishability nature initiated transformation of bulk of the produce to fruit juice which left the industries with enormous by-product that eventually constitute a pollution to the environment, therefore efforts at finding better use of the pineapple waste generated from such huge quantities may be important in order to allay the environmental pollution and transform the by-product to a potential animal feed resource. Lamidi *et al.*, (2005) found that broiler chicken can tolerate up to 10% PW in the diets without deleterious effect. Olosunde (2010) reported that WAD sheep could tolerate up to 45% PW but 30% was superior even against 0% PW when substituted for corn bran, indicating that it's a potential feed resource when processed. This work therefore attempted to investigate the potential of its mixture with rice brand and replacement of wheat offal with such mixture.

II. MATERIALS AND METHODS

Experimental Site and Preparation of Test Ingredient:

The experiment was conducted at the poultry unit of Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria. Fresh pineapple waste was collected from the Lafia canning factory of Fumman Agricultural Products Nigeria Ltd, Moore Plantation, Ibadan, Nigeria.

Experimental Diets and their Composition:

The procured pineapple waste was mixed with rice bran in ratio 1:1 (W/W). The mixture was sundried over a period of time till constant weight was attained, and was milled using hammer milling machine. This was therefore analyzed for proximate composition (Table 1) and used to formulate experimental diets (Table 2). Five experimental diets were prepared and the gross composition is as shown in Table 2 below.

Experimental Birds and Management:

A total of 200, four weeks old Marshal Broiler chicken was fed with experimental diets for a period of four weeks. The birds were randomly and equally (weight balanced) to the five dietary treatments in a completely randomized design experiment. Each treatment was replicated four times with ten birds per replicate. The birds were managed under the same environmental conditions on an intensive care system throughout the experimental period. Initial body weights of the birds were taken on replicate basis at the start of the study and thereafter on weekly basis. Weekly feed intake was also recorded. The mean daily weight gain, daily feed intake and feed to gain ratio were thus calculated from the data obtained during the experimental period.

Carcass and Blood Analysis:

Twenty birds were randomly selected from the treatments at an equal amount of 4 birds per replicate for carcass cuts and organ examination at the expiration of the experiment, having withdrawn feed for 12hours in the presence of abundant water for fasting process. Weight of organs and various cut parts were taken and expressed as percentage of carcass weight of the birds. Blood samples meant for haematological analysis were drawn from the wing veins of the selected experimental birds and collected in Ethylene Diamine Tetra-Acetate (EDTA) bottles. Packed cell volume (PCV), Haemoglobin concentration (Hb), Red Blood Cell (RBC) were determined using Wintrobes Microhaematocrit, colorimetric cyanomethaemoglobin method and improved Neubauer haemocytometer respectively (Lamb, 1991) while differential count of WBC (leucocytes, neutrophil and lymphocytes) were analyzed as described by Jain (1986).

Chemical and Statistical Analysis

Proximate composition of the diets and test ingredient were determined by standard method of A.O.A.C. (2000). Data collected were subjected to analysis of variance (ANOVA) using SPSS 13.0 computer software package. The Duncan's Multiple Range Tests of same computer software package was used to separate means with significant differences, as described by Duncan, (1955).

Table 1. Analyzed Proximate Composition of Pineapple Waste/Rice Bran Mixture.

Parameters	Percentage
Crude Protein	12.56

Parameters	Percentage
Crude Fibre	15.37
Crude Fat	2.97
Ash	16.29
Nitrogen Free Extract	42.66

Source: Labouratory work of this research.

Table 2. Pineapple waste-rice bran based experimental diets and their gross composition.

Ingredients (%)	Control (%)	10% PW/RB	12.5% PW/RB	15% PW/RB	17.5% PW/RB
Fixed ingredients	83.00	83.00	83.00	83.00	83.00
Wheat offal	17.00	15.30	14.87	14.45	14.03
PW/RB	0.00	1.70	2.13	2.55	2.97
Determined nutrient (%)					
Dry matter	90.86	89.83	89.89	89.75	89.79
Moisture	9.14	10.17	10.11	10.25	10.21
Crude protein	19.67	19.21	19.36	18.57	19.69
Crude fat	3.78	3.92	3.62	3.78	3.69
Crude fiber	5.38	5.98	4.58	4.69	4.47
Ash	6.89	7.11	5.92	6.05	6.11
Nitrogen fee Extract	55.14	53.61	55.91	56.66	55.83
Metabolizable Energy (Kca/kg)	2939.65	2881.90	2959.65	2954.35	2956.85

Fixed ingredients %, Maize 50.00, Fish meal 2.50, soybean meal 15.70, Groundnut cake 10.00, Bone meal 2.50, Oyster shell 1.50, Lysine 0.20, Methonine 0.10, salt 0.25, Premix 0.25.

Source: Laouratory activities of this work.

III. Results and Discussion

Results

The proximate composition of test ingredient and experimental diets was presented above in table 1 and 2 respectively, 17.5% PW/RB based diets had the highest crude protein while the highest value of crude fat, crude fibre and Ash were found in diet with 10% PW/RB. The growth performance of broiler chicken fed PW/RB mixture diets was presented in Table 3. There were significant differences ($P<0.05$) across the treatment groups of final live weight, weight gain, daily feed intake and feed to gain ratio. It was observed that birds on diets containing 12.5% PW/RB has the highest value in almost all the growth parameters; final live weight (2327.50), daily weight gain (46.86g) and feed to gain ratio (2.65) at the least value of daily feed intake (124.17g).

Carcass and organ characteristic of broiler finisher chicken fed PW/RB mixture diets were presented in table 4. There were significant differences ($P<0.05$) across the treatment groups in the values obtained for bled weight, defeatehred weight and carcass weight among the carcass yield but does not followed a definite trend,

however utilization of PW/RB up to 12.5% gave better yield than the control. The relative cut-up parts proportion had only breast muscle and drumstick that were significant difference (P<0.05) while back, thigh, neck, wings, and abdominal fat had no significant difference (P<0.05). Only proportion of Heart, kidney and gizzard had significance difference (P<0.05) among the dietary treatment groups.

The result of haematological parameters was shown in Table 5. There were significance differences (P<0.05) across the dietary treatment group of PCV, Hb, RBC, Platelet, Heterophil, Lymphocyte, Monocyte, Eosinophil MCV and MCHC while WBC and MCH were not significantly different (P>0.05).

Table 3. Growth indices of broiler finisher chicken fed pineapple waste-rice bran mixture based diets.

Parameters	**T_1(0%) PW/RB**	**T_2(10%) PW/RB**	**T_3(12.5%) PW/RB**	**T_4(15%) PW/RB**	**T_5(17.5%) PW/RB**	**S.E.M ±**
Initial weight (g)	1015.65	1015.50	1015.50	1015.55	1015.55	7.239
Final live weight (g)	2307.75^{a}	2290.00^{a}	2327.50^{a}	1930.00^{b}	2212.50^{ab}	52.215
Daily weight gain (g)	46.08^{a}	45.84^{a}	46.86^{a}	32.66^{b}	42.75^{ab}	1.902
Daily feed intake (g)	128.17^{b}	147.00^{a}	124.17^{b}	125.00^{b}	125.50^{b}	2.711
Feed gain ratio	2.89^{ab}	3.32^{ab}	2.65^{a}	3.93^{a}	3.21^{ab}	0.171

^{a,b}Means in the same row with different superscript are significantly different (P<0.05).

S.E.M = standard error of mean.

Table 4. Carcass and organ characteristics of broiler finisher chicken fed pineapple waste-rice bran mixture diets.

Parameters	**T_1 (0% PW/RB)**	**T_2 (10% PW/RB)**	**T_3 (12.5% PW/RB)**	**T_4 (15% PW/RB)**	**T_5 (17.5% PW/RB)**	**S.E.M +**
Carcass yield						
Bled weight (g)	2214.50^{a}	2219.75^{a}	2240.00^{a}	1859.00^{b}	2133.00^{a}	48.717
Defeathered weight (g)	2032.25^{ab}	2102.25^{a}	2126.25^{a}	1755.75^{b}	2042.50^{ab}	48.211
Eviscerated weight (g)	1739.00	1735.00	1631.75	1411.00	1677.00	49.475
Carcass weight (g)	1557.75^{a}	1572.00^{a}	1607.75^{a}	1269.75^{b}	1523.25^{a}	38.075
Dressing percentage	67.57	68.37	63.23	65.81	68.27	1.071
Gut length (cm)	216.50^{a}	225.25^{ab}	227.00^{a}	208.75^{b}	223.75^{ab}	2.569
Relative cut-up parts (% of carcass weight)						
Breast	23.33^{b}	29.68^{a}	29.91^{a}	29.01^{a}	30.87^{a}	0.993
Back	20.76	18.71	20.23	17.75	18.79	0.446
Thigh	16.29	16.99	18.38	17.23	16.66	0.474
Drumstick	15.59^{ab}	15.06^{b}	17.80^{a}	15.72^{ab}	14.89^{b}	0.400
Neck	7.60	7.93	8.35	8.11	6.99	0.238
Wings	12.05	11.62	13.91	11.89	11.62	6.352
Abdominal fat	0.83	1.02	3.25	2.35	4.09	0.536

Parameters	T_1 (0% PW/RB)	T_2 (10% PW/RB)	T_3 (12.5% PW/RB)	T_4 (15% PW/RB)	T_5 (17.5% PW/RB)	S.E.M +
Relative organ weight (% of carcass weight)						
Heart	0.45^{b}	0.48^{ab}	0.56^{a}	0.51^{ab}	0.49^{ab}	0.161
Lungs	0.72	0.80	1.14	0.88	1.01	0.703
Kidney	0.84^{a}	1.01^{ab}	1.15^{a}	1.12^{a}	1.07^{a}	0.039
Liver	2.72	2.7	2.57	3.37	2.81	0.113
Spleen	0.14	0.10	0.08	0.14	0.11	0.102
Gizzard	5.37^{ab}	4.07^{b}	5.64^{a}	4.97^{ab}	4.44^{ab}	0.227
Proventriculus	0.47	0.48	0.65	0.69	0.62	0.035

^{a,b}Means in the same row with different superscript are significantly different (P<0.05).

S.E.M = standard error of mean.

Table 5. Haematological parameters of broiler finisher chicken fed pineapple waste-rice bran mixture diets.

Parameters	T_1 (0%PW/RB)	T_2 (10%PW/RB)	T_3 (12.5%Pw/RB)	T_4 (15% PW/RB)	T_5 (17.5%PW/RB)	S.E.M ±
PCV (%)	28.00^{b}	27.00^{b}	25.00^{c}	28.50^{a}	29.00^{a}	0.37
Hb (mg)	9.33^{b}	8.99^{b}	8.33^{c}	9.50^{a}	9.66^{a}	0.12
RBC (x 10^6 µl)	4.31^{ab}	3.97^{cd}	4.56^{a}	4.18^{bc}	3.67^{d}	0.82
Platelet (x 10^3/µl)	106.50^{b}	134.00^{a}	155.00^{a}	106.00^{b}	132.00^{a}	5.30
WBC (x 10^3/µl)	17.90	19.13	18.38	20.48	18.40	0.62
Heterophil (%)	29.50^{ab}	25.50^{ab}	20.50^{bc}	36.50^{a}	12.00^{c}	2.36
Lymphocyte (%)	66.00^{bc}	69.50^{b}	70.50^{b}	59.00^{c}	84.00^{a}	2.28
Monocyte (x10^3/µl)	1.50^{c}	3.00^{ab}	4.00^{a}	2.00^{bc}	1.00^{c}	0.31
Eosinophil (x10^3/µl)	3.00^{ab}	4.00^{ab}	4.50^{a}	2.50^{b}	3.00^{ab}	0.26
MCV (fl)	65.05^{b}	68.65^{b}	54.80^{c}	68.60^{b}	79.15^{a}	1.97
MCHC (%)	21.65^{b}	22.85^{b}	18.30^{c}	22.85^{b}	26.35^{a}	0.65
MCH (%)	33.00	33.00	33.00	33.00	33.00	0.00

^{abc}means in the same row with different (P<0.05)

S.E.M = Standard Error of Mean

IV. DISCUSSION

The proximate composition of test ingredient was numerically higher than that of pineapple waste; moisture (84.9%), crude protein 3.6%, ether extract 2.35%, crude fibre 9.14%, ash 1.7% and carbohydrate 83.02% (Kodagoda and Marapana, 2017) and that of rice bran (3% fat, 8-9% crude protein, 80% carbohydrate and 4% fibre) reported by Ijaz *et al.*, (2021). The reason for this was as a result of the use of rice bran as an absorbent of pineapple waste as Makinde *et al.*, (2011) reported that the use of absorbent to capture the moisture content of

pineapple improve the efficiency of utilization of pineapple waste as an animal feed ingredient. The feed gain ratio result showed that birds fed with 12.5% PW/RB had lesser and better feed to gain ratio, feed consumed were better translated to weight gain, at faster rate than those on other diets as evidenced from their final live weight. Since performance is an indication of quality and utilization of the ration (Bamgbose and Niba, 1998). However, the decline in feed intake of birds on 12.5% PW/RB could be attributed to the presence of some anti-nutritional factors which are prevalent in most unconventional feed stuff (D'Mello, 1982). The depression of final live weight which resulted in high feed to gain ratio among the birds on 15% PW/RB and 17.5% PW/RB and the inconsistency in feed intake values of these treatments suggested poor utilization of these diets. Previous works have shown that at higher inclusion levels, unconventional feedstuff may alter the texture, colour, taste and odour of diets. Feed consumption and ultimately utilization may be affected by each of the above factors independently or in combination (Ander 1992, Nir *et al*., 1994, Odunsi *et al*., 1996).

Since carcass yield is an indication of the quality and utilization of the ration (Bamgbose and Niba, 1998). It would seem that birds fed with 12.5% PW/RB better utilized their feed as evidenced by the significantly ($P<0.05$) higher defeathered weight, carcass weight, bled weight and drumstick. Significantly higher values were also observed for gut length, this could be due to additional bulk and greater volume of digester staying in the gastrointestinal tract during enzymatic digestion (Longe and Fagbenro-Byron, 1990; Ander, 1992). Furthermore it has been observed that structural carbohydrate in monogastric diets specifically have mechanical effect on intestinal wall and cause gastrointestinal tract to increase in length and thickness (Faniyi et al., 1998). Though the mean values of haematological parameters obtained were all significant ($P<0.05$) except WBC and MCH, but no definite trend was observed for any of the parameter. Therefore, it is difficult to attribute the variation to the utilization of PW/RB mixture. However, all the values were within the normal ranges of healthy growing birds reported by Coles, (1996) and the values were in the range reported by Mitruka and Rawnsley, (1977). These substantiate the nutritional adequacy of PW/RB mixture in the diets of broiler chicken.

V. CONCLUSION

It can be concluded that addition of rice-bran to pineapple waste improved the nutritional value of pineapple waste and that pineapple waste-rice bran mixture can be used to replace wheat offal in broiler finisher chicken up to 17.5% without deleterious effect on growth, carcass characteristics and haematological parameters of broiler chicken.

REFERENCES

[1] K.A. Buckle. "Biotechnology opportunities in waste treatment and utilization for food industries". *In: Rogers, P. L. (ed) biotechnology and food industry. Breach science publishers, New York*, 1989, Pp 261-277.
[2] D.A. Krueger, R. C. Kruegar, and J. Maciel, "Composition of pineapple juice." *Journal of Association of Official Analytical Chemist international* 1992, 75: 280-282.
[3] F.A.O. "Food and Agricultural Organization of the United Nation" *FAOSTAT database. FAO. Rome Italy*, 2004.
[4] A.W. Lamidi, A.O. Fanimo, D. Eruvbentine. and W. O. Biobaku, "Effect of graded level of pinapple (*Ananas comosus* L. meer) crush waste on the performance, carcass yield and blood parameters of broiler chicken". *Nigerian journal of animal production*, 2008. 35: 40-47.
[5] A.O. Olosunde. "Utilization of pineapple waste as feed for West African Dwarf (WAD) sheep": M. phil. Thesis. Obafemi Awolowo University, Ile-Ife, Nigeria. 2010.
[6] G.N. Lamb, "Manual of veterinary laboratory technique". CIBA- GEIGY, Kenya. 1991.
[7] C.N. Jain, "Schalm's veterinary hematology". *4th edition. Lea and Febiger, Philadephia*, 1986.
[8] A.O.A.C., "Official Methods of Analysis," 16th edition, Association of Official Analytial chemist, Washington DC. 2000.
[9] D.B. Duncan. Multiple range and multiple F tests. Biometrics, 1955, 11: 1-42
[10] K.H.G.K. Kodagoda and R.A.V.J. Morapana. "Analysis of proximate composition and phytochemical properties of pineapple waste," "Abstract", *Sri Lanka Association for Advancement of Science Proceedings of the 73rd Annual Sessions*, 2017, pp94
[11] U. Ijaz, H.U. Nadeem, A. Shafique, A. Rasheed,R Batool and F Azeem. "Rice bran composition and its emerging potential application", *Green sustainable process for chemical and environmental engineering and science, Elsever*. 2021, *p1-16*.

[12] O.A. Makinde, S. M. Odeyinka and S. K. Ayandiran. "Simple and quick method for recycling pineapple waste into animal feed." *Livestock research for rural development* 23(9) 2011.
[13] A.M. Bamgbose, and A. T.Niba. "Performance of broiler chicken fed cotton seed cake in starter and finisher rations". In Ologhobo A. D. and Iyayi E. A. (editors) in Nigerian livestock in the 21st century, *Proceeding of 3rd Annual Conference of Animal Science Association of Nigeria, September 22-24, 1998, Lagos* 1998, Pp 84-87.
[14] J.P.F.D' Mello. "Toxic factors in some tropical legumes". *World review of animal production*, 1982, 4: 41-46.
[15] K.O. Ander, "Some physical characteristics of diets containing graded levels of palm kernel and corn offal and dressing characteristics of broiler fed these diets". M. Sc. Thesis, department of animal science, University of Ibadan, Nigeria, 1992.
[16] I. Nir, Y. Twina, E. Grossman and Z. Nitsan. "Quantitative effects of pelleting on performance, gastro-intestinal tract and behavior of meat type chicken". *British poultry science.* 1994 35: 589-602.
[17] A.A.Odunsi, G.O. Farinu, and J.O. Akinola. "Influence of dietary wild sunflower (*Tithonia diversifolia* Helms A. Gray) leaf meal on layers performance and egg quality". *Nigeria Journal of Animal Production* 1996, 23: 28-32.
[18] G.O. Longe, and V. Fagbenro-Byron. "Composition and some characteristics of some fibrous wastes and by- products for pig feed in Nigeria". *Bietr. Trop. Landwietsch Vet. Med.* 1990, 28: 199-205.
[19] G.F. Faniyi, A.D. Ologhobo, G.A. Adeniran, and O. O. Alaka, "Replacement value of biodegradable cowpea and sorghum seed hulls for brewers' dried grains (BDG) in broiler diets". *In: Ologhobo, A. D. and Iyayi E. A. (editors), the Nigerian livestock in the 21st century, proceedings of 3rd annual conference of Animal Science Association of Nigeria, September 22-24, 1998, Lagos,* 1998. Pp 84-87.
[20] E.H. Coles. "Veterinary clinical pathology", *4th edition, W. B. Sanders company Philadephia*, 1986, Pp 1-4.
[21] B.M Mitruka, and H.M. Rawnsley, Chemical, biochemical and hematological references values in Normal Experimental animals". *Masson pub. USA inc. New York,* 1977. Pp: 86-87.

AUTHOR'S PROFILE

First Author
Dr Olayeni T.B., is a senior Lecturer in the department of Animal Production and Health, Ladoke Akintola University of Technology Ogbomoso, Oyo State, Nigeria. email id: tbolayeni@lautech.edu.ng

Second Author
Dr Rafiu T.A., is an Associate Professor in the Department of Animal Production and Health Department Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria. Mobile no: +234 8168662151.

Third Author
Akilapa, T.P., is a Lecturer and Researcher in the Department of Agricultural Education, School of Vocational and Technical, Osun State College of Education, Ila-Orangun, Nigeria.