EFFECTS OF THREE PLANT EXTRACTS ON GROWTH PERFORMANCE AND SENSORY PROPERTIES OF BROILER BIRDS

Rosemary Ozioma Igwe[1], Jude Ogunnupebi[1], Isaac Ikechukwu Osakwe[2] and Udo Herbert[3]

1*Ebonyi State University, Abakaliki. Ebonyi State Nigeria, Animal Science, Nigeria*
2*Alex-ekwueme Federal University Undufu-Alike Ikwo, Eboyi State Nigeria, Animal Science.*
3 Michael Okpara University of Agriculture Umudike, Abia State Nigeria, Animal Breeding and Physiology,

Abstract

The ban on the use of antibiotics due to its deleterious effect on the consumers' necessitated the need for prophylactic use of plant extract. An experiment was conducted to evaluate the phytogenic effects of three plants extracts (Mango leaves, Pawpaw leaves and Guava leaves) on the performance, intestinal histopathology and sensory characteristics of broiler birds. A total of 128 day – old broiler chicks of Cobb strain were randomly divided into four treatment groups of 32 birds, each replicated four times with 8 birds per replicate in a completely randomized design (CRD). The groups were fed four diets. Diet 1(T_1) is ordinary water, contained no extract and served as the control. Diets 2, 3, and 4 designated T_2, T_3 and T_4, respectively, contained 100ml each of mango, pawpaw and guava leaves extract, respectively. The extract was obtained by squeezing 1000g each of mango, guava and pawpaw fresh leaves in 1litre of water. There was no form of medication given to the birds outside routine immunization. Data were collected on growth performance organ and sensory properties and analyzed using Mini Tab Statistical software. Results showed that there were significant ($p<0.05$) differences on the body weight gain, daily water intake and feed conversion ratio. Birds fed guava and pawpaw leaves extract significantly ($p<0.05$) had higher body weight gain with low feed conversion ratio compared to the control and group fed mango. Group fed pawpaw leaves had higher final body weight of 2623.33g followed by groups fed mango leaves, guava and control, 2400.00g, 2231.67g and 2097.57g, respectively. There were significant ($p>0.05$) differences in the sensory properties. Meat of birds on T_2 and T_3 were significantly ($p<0.05$) more tender and juicy compared to those on T_4 and T_1. Results from this study indicate that the extracts had no deleterious effect on the wellbeing of the broiler birds rather it improved growth performance and welfare of the bird. Therefore, the use of plants extracts especially pawpaw and guava leaves extracts should be encouraged in broiler production

Keywords; Histopatholoy, Broiler, Mango, Pawpaw, Guava, leaves

Introduction

It is a common practice in the management of poultry to administer antibiotics through drinking water as growth promoters and to prevent or control infectious bacterial diseases (Faluyi and Agbede, 2018). The benefit of such practice is to maintain good health, suppress mortality in birds, and to support maximum growth via improved utilization of nutrients in order to maximize profit

(Zeweil *et al.*, 2006). However, the use of synthetically-produced substances especially antibiotic growth promoters has been found to have objectionable side-effects (Makanjuola *et al.*, 2014). This has led to antibiotics growth promoter being banned; mainly due to cross and multiple resistance effects respectively. Therefore due to the desire for improved economic status in poultry production, researchers have revolutionized the application of feed and water additives by focusing on organic or natural supplements instead of using synthetic medicament (Zeweil *et al.*, 2006). Medicinal plants, such as herbs or their extracts are being investigated as natural sources of biologically important substances that may positively influence poultry health and productivity. The use of medicinal plants either alone or in group (combination) as possible therapeutic measures has become a subject of active scientific investigation (Oyewole, 2012). Some medicinal plant products are known to enhance natural resistance of host to infection due to the presence of bioactive phytochemicals or phyto-nutrients (Soetan and Oyewole, 2009). According to Garcia *et al*. (2003) and Garrido *et al*. (2004), mango, leaves extracts have some health promoting properties such as analgesic, antioxidant, antimicrobial, anti-inflammatory, and antifungal activities which could result to a marginal increase in growth performance and feed conversion ratio of broiler birds. Despite the pharmacological potential of mango phytochemicals, the use of its extract in poultry production has not been widely investigated. Therefore, this study was conducted to investigate the effect of three plants leaves extracts on the on the growth performance and sensory properties of broiler birds.

Materials and Methods.

Experimental Site: The experiment was carried out at the Poultry Unit of the Teaching and Research Farm in the Department of Animal Science, Faculty of Agriculture and Natural Resource

Management, Ebonyi State University, Abakiliki. The experimental site lies within latitude 07°3'N, and 08°30'E and longitude of 05°40N and 06°45N. The experiment lasted for 56 days.

Source of experimental materials and preparation

The extracts used in this study were obtained from the leaves of a mango, pawpaw and guava leaves within Abakaliki metropolis. The leaves were detached from the branches of the trees and washed with clean water to remove dirty particles. 500g of the fresh leaves each were squeezed in a litre of water; after which the mixture were sieved to remove the residues. The extracts were administered based on treatment specification.

Experimental birds and management; a total of eighty four (84) day-old broiler chickens used in this study were purchased from a reputable hatchery. All management practices geared towards successful operation were dully carried out.

Experimental treatment/Design; the birds were randomly assigned to four treatment groups in a completely randomized design as follows,

T_1 (Control treatment) = 0ml (No extract); T_2 contained 100ml of mango leaves extract

T_3 contained 100ml of pawpaw leaves extract; T_4 contained 100ml of guava leaves extract

Feed intake: a weighed quantity of feed were served the birds per replicate on daily basis and the left over feed were collected, weighed and recorded. Thus, the total feed intake of each group was determined by the different between the feed served and the left over feed.

Such that the total feed intake= total feed served – left over feed.

Average daily feed intake: the average daily feed intake was determined by dividing the total feed intake with the number of days that the experiment lasted.

Mathematically, Average daily feed intake = $\frac{\text{Total feed intake}}{\text{56 days}}$

Water intake: a measured quantity of water were served to the birds per replicate on daily basis. The same quantity of water was kept in a separate drinker away from the reach of birds to determine the amount of evaporated water. The left over water was collected, measured and recorded. The water intake of the birds was determined by adding the amount of evaporated water and left over. The value gotten was subtracted from the amount given to birds.

Mathematically, Water intake = quantity of water served – (left over + evaporated water)

Body weight gain: prior to the commencement of the experiment the initial body weight of each bird were collected and recorded. Subsequently the birds were weighed on weekly basis. At the end of the experiment, the body weight gain of the birds was determined by subtracting the initial body weight from the final body weight. Then the average daily body weight gain of the birds was determined by dividing their body weight gain with the number of days the experiment lasted.

Mathematically; Body weight gain = final body weight – initial body weight

Average daily body weight gain = total body weight gain dividing by the number of days of experiment.

Feed conversion ratio (FCR); feed conversion ratio was calculated by dividing the average daily feed intake with the average daily weight gain

FCR = $\frac{quantityoffeedconsumed}{bodyweightgain}$

RESULT AND DISCUSSION

The results of the effect of the three extracts on the growth performance characteristics of broiler chickens are presented in Table 1

Table 1: Effect of three plant extracts on the growth performance of broilers

Parameters	**T_1 (0ml) Control**	**T_2(100ml) Mango**	**T_3(100ml) Pawpaw**	**T_4(100ml) Guava**	**SEM**
Initial Body Weight (g)	186.28	185.30	187.20	183.07	2.68
Final Body Weight (g)	2097.57^{c}	2400.33^{a}	2623.00^{a}	2231.67^{b}	10.35
Body Weight Gain (g)	1911.2^{b}	2212.4^{a}	2438.3^{a}	2048.6^{b}	14.28
AV. Daily Weight Gain	34.14c	36.13c	39.96b	42.36a	0.26
Total Feed Intake (g)	5600.00^{c}	6153.5 ^{b}	5443.3^{c}	7166.67^{a}	172.8
Av. Daily Feed Intake (g)	99.99^{c}	97.17^{b}	109.89^{b}	127.97^{a}	3.08
Total water intake (ml)	8400.20	8164.99	9230.34	10750.55	205
Av. Daily water intake(ml)	150.50	145.81	164.82	191.96	11.40
Feed Conversion Ratio	2.93^{b}	2.56^{b}	2.07^{c}	3.21^{a}	0.42
Mortality Rate (%)	28.0^{a}	14.20^{b}	0.00^{c}	9.50^{b}	0.15

a,b,c,d = Means on the same row with different superscripts are significantly (P<0.05) different. SEM = Standard Error of the Mean.

From the results presented in Table 1, the three extracts significantly increased the final body weight, body weight gain, average daily weight gain, total feed intake, average daily feed intake, total water intake and average daily water intake of the birds compared to the control treatment. The results are in agreement with Zhang *et al*. (2017) who reported significant improvement in the growth rate of the birds due to the supplementation of mango leaf extract. Banjoko *et al.,* (2020)

also observed significant increase in body weight gain of broilers fed pawpaw leaves extract. The result contradict the findings of Onyimonyi *et al*. (2009) who observed non-significant differences on the body weight gain of broiler fed guava leaves extract but recorded significant reduction on the mortality rate of the birds. The significant improvement in the growth rate of the birds and reduced mortality rate could be attributed to the presence of phytochemicals present in these extract which played a significant role both in performance and health status of the birds (Manzanilla, *et al*., 2001)). The growth promoting effect of plants extract can also be attributed to the presence of complete amino acids, considerable amount of vitamins, and mineral content, antioxidant, immunostimulant and antibacterial properties of most plant leaves (Makkar and Becker, 1997; Fahey, 2005 and Anwar *et al.,* 2007). It has also been reported that crude extracts from the leaves of some herbal plants such as guava, mango and citrus plants may contain digestion enhancing properties which stimulates favorable growth of good bacteria while decreasing harmful microorganisms (Hernandez *et al.,* 2004). Zhang *et al*. (2017) also pointed out that the positive response of average daily weight gain and body weight of broiler birds to the dietary supplementation of the extracts is an indication of the beneficial effect of the extracts. According to Garcia *et al*. (2003) and Garrido *et al*. (2004), plants extracts have some health promoting properties such as analgesic, antioxidant, antimicrobial, anti-inflammatory, and antifungal activities which could result to a marginal increase in feed conversion efficiency in broiler birds (Banjoko *et al.,* 2020). There were no significant increase in the total water intake as well as the average daily water intake of the birds. This result is in consonance with the findings of Al-fifi, (2007) who reported a decline in the water consumption of the birds fed various plant extracts and attributed the decline to either the salty or bitter taste of the extracts which made the birds less interested in drinking them. Ayoola

and Adeyeye (2010) also reported that chicks do not like drinking water that is too salty or bitter.

Table 2: Effect of three plants extracts on the sensory evaluation of finisher broilers

PARAMETERS	T1(0ml) Control	T2(100ml) Mango	T3(100ml) pawpaw	T4(100ml) Guava	SEM
Appearance	7.70	6.80	7.00	6.00	1.02
Colour	8.10	7.20	7.30	7.00	0.57
Texture	8.87^{a}	6.87^{c}	8.12^{ab}	6.50^{cd}	0.54
Juiciness	3.60	3.90	3.40	3.90	0.48
Tenderness	3.50^{bc}	3.50^{bc}	4.20^{a}	3.60^{b}	0.23
Taste	4.20^{a}	3.00^{c}	4.00^{ab}	2.30^{d}	0.26
Flavour	4.10	3.70	3.89	3.20	1.08
Acceptability	2.30	2.25	2.50	1.50	0.62

a,b,c,d = Means on the same row with different superscripts are significantly ($P<0.05$) different. SEM = Standard Error of the Mean.

The mean sensory score for the meat's tenderness were higher in treatment groups that had pawpaw and guava compared to the control groups. This result is in agreement with Pardo-Andreu *et al*. (2008) who reported that some plants extracts increased tenderness of broiler's meat. The colour of the meat decreased from white to light brown though it was not statistically significant The result is in agreement with Odunsi (2005) who reported that leaves extracts had no effect on the

colour of broiler's meat. The result showed that there was a no significant ($p>0.05$) difference in juiciness across the treatment groups. Thee result is not in line with the finding of Pardo-Andreu *et al*. (2008) who reported that mango leaves extract decreased juiciness of broiler meat. The three extract had no effect on the general acceptability of the meat. This indicate that it can be used in the production as it has no negative effect on consumer's preference.

References

Al-fifi Z (2007). Effects of leaf extract of Carica papaya, Vernonia amygdalina and Azadiratcha indicant on the coccidiosis in free-range chickens. *Asian Journal of Animal Science*, 1(1):26-32.

Ayoola B.P and Adeyeye. A (2010). Phytochemical and nutrient evaluation of Carica papaya (Pawpaw) leaves. *IJRRAS* 5(3):325-328.

Banjoko O.J., Adebayo. I. A., Osho I.B., Olumide M.D., Fagbiye.O. O.A., Ajayi. O. A and Akinboye. O.E., (2020). Evaluation of varying levels of *Carica papaya* leaf meal on growth, carcass, hematological parameters and its use as anticoccidial for broiler chicken. *Nigerian J. Anim. Sci. 2020 Vol 22 (3): 229-241*

Faluyi, O.B. and Agbede, J.O. (2018). Immuno-Modulatory Activity of Aqueous Leaf Extract of Moringa Oleifera in Brioler Chickens. *International Journal of Environment, Agriculture and Biotechnology*. Vol-3, Issue-1,

Garcia, E., J. Brufau, A. Perez-Vandrell, A. Miguel and K. Duven, (2003). Bioefficiacy of enzyme preparations containing beta-glucanase and xylanase activities in broiler diets based on barley or wheat in combination whit flavomycin. *Journal of Poultry Science*., 76: 1728-1737.

Garrido G, González D, Lemus Y, (2004). In vivo and in vitro anti-inflammatory activity of Mangifera indica L. extract (Vimang). Pharmacol Res 2004; 50:143- 149.

Harnandez., Salvador, F.M., Wendy, A., and Alfredo Vazquez – Ovando, (2004). Effect of chitosan coating on some characteristics of mango (Mangifera indica L.) Ataulfo subjected to hydrothermal process. *African Journal Research* 6 (27): 5800- 5807

Makkar, H.P.S. and Becker, K. (1999) Plant toxins and detoxification methods to improve feed quality of tropical seeds - Review. *Asian - Australian Journal Animal Science* 12 (3):467-480

Manzanilla, E. G., Baucells, F., Kamel, C., Morales, J., Perez, J. F., Gasa, J., (2001): Effects of Plant Extracts on the performance and Lower Gut Microflora of Early Weaned Piglets. *J. Anim. Sci. Suppl*., 1:473.

Odunsi, A. A., (2005). Response of laying hens and growing broilers to the dietary inclusion of mango (*Mangifera indica L*.) seed kernel meal. Trop. Anim. Health Prod., 37 (2): 139-150

Onyimonyi A E, Adeyemi O and Okeke G C (2009). Performance and economic characteristics of broilers fed varying dietary levels of neem leaf meal *(Azadirachta indica). International Journ. Poult. Sci*. 8(3):256-259.

Oyewole B.O, Oluremi OIA, Aribido S.O and Ayoade J.A (2012). Effect of Naturally Fermented Sweet Orange (Citrus sinensis) Peels Meal on Egg Quality and Blood Constituents of Nera Black Layers. *International Journal of Agriculture and Rural Development (*IJARD). 15 (2):1022-1028.

Pardo-Andreu, G., Barrios, M. and Curti, C. (2008). Protective effects of Mangifera indica L extract (Vimang), and its major component mangiferin, on iron-induced oxidative damage to rat serum and liver. Pharmacol Res;57:79-86.

Soetan K.O., and Oyewole O.E., (2009).The need for adequate processing to reduce the anti-nutritional factors in animal feeds- A review, *African Journal of Food Science*, 2009, 3(9), 223-232.

Zeweil H.S., Genedy S.G., and Bassiouni M., (2006).Effect of Probiotic and Medicinal Plant Supplements on the Production and Egg Quality of Laying Japanese Quail Hens.Proceedings of the 12th European Poultry Conference, 2006, Sept. 10 14, ZWANS, Verona, Italy