Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol.3, No.14, 2013

Response of Broiler Birds to Varying Dietary Levels of *Gongronema Latifolium* Leaf Meal

*Ani, A.O.,Ogbu, C.C., Abakasanga, I.U. and Ugwuowo, L.C.
Department of Animal Science, University of Nigeria, Nsukka, Nigeria
*Corresponding author Email: coschi07@yahoo.com

Abstract
The study was conducted to investigate the response of broiler birds to varying dietary levels of *Gongronema latifolium* leaf meal (GLLM) as an antibacterial, vitamin and mineral feed additive. A total of 120 fourteen days old broiler birds (Anak strain) were used for the study. *Gongronema latifolium* was harvested fresh, air dried for 5 days under shade and milled to powder before incorporation in feed at the rate of 0g, 25g, 37.5g, 50g, 62.5g and 75g per 25 kg of feed, respectively to form 6 dietary treatments (T_1 – T_6). Birds were allotted to one of the six dietary treatments in a completely randomized design (CRD) with two replications per treatment. Feed and water were given *ad libitum* to the birds during the experiment. Significant ($P < 0.05$) differences occurred among treatments in most of the traits studied. Broiler chicks fed 75g of GLLM per 25 kg of feed (3 g per kg) had significantly ($P < 0.05$) higher final body weight (FBW) compared to the rest of the test groups but was similar to that of the control. Carcass weight, dressing percentage, weight of internal organs and relative organ weights differed significantly ($P < 0.05$) among test groups. Effects on haematological indices were significant ($P < 0.05$) but followed no definite trend except for WBC count which exhibited a dose related reduction in value (4800 x 10^3/mm^3 at 0g/25kg or control to 3150 x 10^3/mm^3 at 75g/25kg). It was concluded that up to 75g of GLLM can be incorporated per 25 kg of broiler starter and finisher diets (3 g/kg) as feed additive to enhance growth and well being.
Keywords: Anak broiler, feed additive, feed conversion ratio, *Gongronema latifolium*, growth performance, haematological indices.

Introduction

The need for animal protein by humans cannot be overemphasized. Animal protein contains large amounts of the essential amino acids needed for normal body function. Modern technological has enabled the wide scale production of meat type birds in intensive, well controlled and coordinated production systems. Poultry production has been described as the most economic means of reducing the animal protein shortfall in developing countries (Smith, 2001; Oluyemi and Roberts, 2007). At this time of global concern over antibiotic resistance in humans and animals due to residual effects from animal products (meat and egg), there arises the need for alternative, economically viable feed additives. Vegetables and other leafy plants are known to be rich in protein, essential fatty acids, vitamins and minerals and also possess anti-microbial (anti viral, bacterial, fungal and parasitic) effects and as such they can be used in the feeding of poultry to enhance production (Alabi *et al.,* 2008; Antai *et al.,* 2009; Ikpeme *et al.,* 2012). However, their incorporation into animal feeds is still negligible in view of the huge dependence on vitamin/mineral premixes which are well adopted sources of micronutrients: vitamins and minerals (Alabi *et al.,* 2008). The vegetable being considered in the present study is *Gongronema latifolium*, commonly called 'utazi' and 'arokeke' in the South East and South West geopolitical zones of Nigeria, respectively. It is a tropical rainforest plant primarily used as vegetable spice and also in traditional folk medicine (Ugochukwu *et al*., 2003). *G. latifolium* has been shown to be nutritionally high in minerals, vitamins and proteins (Okafor, 2005). As a medicinal plant, it is used in the treatment of many diseases such as diabetes and hypertension (Etukudo, 2003; Agbo *et al.,* 2005). It strengthens the immune system (Mensah *et al.,* 2008) and is used in the treatment of stomach problems, typhoid fever, dysentery, malaria, worm, cough etc (Agbo *et al.,* 2005). Phytochemical evaluation of the leaf, stem and root revealed the presence of saponins, tannins, alkaloids, flavonoids, triterpenes and cardiac glycosides (Essien *et al.,* 2007; Antai *et al.,* 2009) which have varied health applications (Kubmarawa *et al.,* 2007). Ugochukwu *et al.* (2003) reported the effect of *G. latifolium* on serum lipid profile and oxidative stress in hepatocytes of diabetic rats.

In order to ensure steady supply of animal protein to meet the protein need of Nigerians, it is necessary to use those locally available feed ingredients that will serve both as sources of nutrients and medicaments for the control of poultry diseases. The use of *G. latifolium* leaves in the feeding of broiler birds could serve this purpose. In addition, it will help to reduce the cost of production. This study was therefore conducted to investigate the effect of varying dietary levels of *Gongronema latifolium* leaf meal (GLLM) on growth performance, carcass yield, organ weight, relative organ weight and haematological profile of broiler birds.

Materials and Methods

The study was carried out at the Poultry Unit of the Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka between 2009 and 2010. The study lasted for eight weeks. *Gongronema latifolium* leaves used in the study were obtained from communities around the experimental station. The leaves were air-dried at room temperature for 72 hrs, ground and preserved in sealed plastic tins during use.

Experimental Diets

Broiler starter and finisher diets were formulated and the test material added as a supplement. The composition of the basal diets (no GLLM) is shown in Table 1 while the proximate compositions of the experimental broiler starter and finisher diets are presented in Table 2.

Experimental Birds and Management

A total of one hundred and twenty day-old unsexed commercial broiler chicks (Anak strain) were used for the study. The birds were brooded together for two weeks in a deep litter system. The floor was washed, disinfected and covered with absorbent litters some days before the chicks arrived. Kerosene lamps and electric bulbs were used as sources of heat and light. Proper vaccination schedules for the birds were strictly adhered to during the experiment. At two weeks of age, the birds were allotted randomly into one of six treatment groups each having 20 birds in a completely randomized design (CRD). The treatments received varying levels of *G. latifolium* leaf meal (GLLM) per kilogramme of feed as follows: treatment 1 (T1), 0g; treatment 2 (T2), 25g; treatment 3 (T3), 37.5g; treatment 4 (T4), 50g; treatment 5 (T5) , 62.5g and treatment 6 (T6): 75g. Each treatment group was divided into two replicates of 10 birds each. The birds were fed broiler starter diet from the 2^{nd} to the 6^{th} weeks of age and broiler finisher diet from the 6^{th} to the 10^{th} weeks of age. Feed and water were supplied *ad libitum* throughout the eight weeks experimental period. Weekly body weight and daily feed intake were measured. Feed conversion ratio was calculated from these data as gramme feed consumed per gramme weight gained over the same period.

Blood Collection and Evaluation

At the 4^{th} week of the experiment (6 weeks of age), two birds per replicate were randomly selected and blood samples were collected from the wing veins of each bird into sterilized bottles containing EDTA (Ethylene diamine tetracetic acid) for haematological analysis. Haematological parameters determined were haemoglobin concentration (HbC), packed cell volume (PCV), white blood cell count (WBC count), red blood cell count (RBC count) and erythrocyte indices: mean corpuscular haemoglobin (MCH), mean corpuscular volume (MCV) and mean corpuscular haemoglobin concentration (MCHC). The PCV was determined by the microhaematocrit method (Schalm *et al.,* 1975; Mitruka and Rawnsely, 1977) using a microhaematocrit centrifuge and reader (Hawksley and Sons Ltd, England). The HbC was determined using a haemoglobinometer (Marienfeld, Germany) while the RBC and WBC counts were carried out by the haemocytometer method using an improved Neubauer counting chamber (Hawksley, England) and avian RBC and WBC diluting fluids as described by Campbell and Coles (1986) and Lamb (1991). The MCV, MCH and MCHC were calculated using standard formulae (Mitruka and Rawnsely, 1977; Thrall and Weiser, 2002).

Carcass and Organ Evaluation

At the end of the eight weeks experimental period (10 weeks of age), two birds per treatment (one per replicate) were randomly selected, starved overnight and weighed for carcass and organ evaluation. The birds were slaughtered by severing the jugular vein, scalded in warm water for a minute and de-feathered by manual plucking. The birds were eviscerated and weighed to obtain their dressed carcass weight. The kidneys, liver, gizzard, heart, intestine, lungs, head and legs were removed and weighed using a sensitive scale. The kidneys, liver, heart, intestine and lungs were grossly examined for any pathological lesion. The dressed carcass weight and the organ weights were expressed as percentages of live weight.

Proximate and Statistical Analyses

Feed and excreta samples were assayed for proximate composition by the method of AOAC (1990). Data collected were subjected to analysis of variance (ANOVA) for completely randomized design (CRD) using a Stat Graphic Computer Package (SPSS, 2007) Model. Significantly different means were separated using Duncan's New Multiple Range Test (Ducan, 1955) option in SPSS.

RESULTS

The results of the evaluation of the effects of GLLM on broiler starters and finishers are presented in tables 3 to 7. There were significant ($P < 0.05$) treatment effects on most of the traits studied.

Effect of GLLM on growth performance of broiler birds

Table 3 shows the effect of varying dietary levels of *Gongronema latifolium* leaf meal (GLLM) on the growth performance of broiler chicks. There were significant differences (P<0.05) among treatments in final body weight, average daily body weight gain, total body weight gain, feed conversion ratio and protein efficiency ratio. The final body weight of birds in T6 was similar to that of the control but significantly ($P < 0.05$) different and higher than those of other treatments. The response in final FBW increased with levels of GLLM. Average daily body weight gain was lowest ($P < 0.05$) in treatment T2. Other treatments did not differ significantly though values somehow increased with levels of GLLM. For total body weight gain, birds on T2 and 3 had similar values and these were significantly lower than T1, 4 and 6 values which were the highest values for this parameter. Birds in treatments 1, 4, 5 and 6 were more efficient ($P < 0.05$) in feed conversion than those of T2 and 3. The same trend was observed for PER with treatments 1, 4, 5 and 6 having the highest ($P < 0.05$) values. Daily feed intake, total feed intake, daily protein intake and mortality did not differ significantly ($p > 0.05$) among treatments.

Table 4 presents the effects of different dietary levels of *Gongronema latifolium* leaf meal on the performance of the experimental birds at the finisher stage. Final body weight, average daily body weight gain, total body weight gain, feed conversion ratio and protein efficiency ratio differed significantly ($P < 0.05$) among treatments. As observed in the starter stage, birds in treatment 2 attained the least final body weight which was comparable to those of the control and T3. Treatment 4, 5 and 6 had the highest final body weight values which were not statistically ($P > 0.05$) different from those of T1 and 3. Birds in the control (T1) achieved the least average body weight gain which was significantly different ($P < 0.05$) from those of the treated groups. Total body weight gain, feed conversion ratio and protein efficiency ratio followed a similar trend. Daily feed intake and total feed intake did not differ according to treatment.

Effect of *G. latifolium* leaf meal on carcass and organ weights of broiler finishers

The effect of dietary levels of *G. latifolium* leaf meal on carcass yield, organ weight and relative organ weights of broiler finishers are presented in Tables 5 and 6. Birds from T5 were similar in live weight with those of T4 and T6 but significantly ($p < 0.05$) heavier than those of T1, T2 and T3 which were similar. For carcass weight, T4, T5 and T6 birds significantly ($p < 0.05$) surpassed birds on other treatments with T2 birds having the least carcass weight. Dressing percentage also differed significantly ($P < 0.05$) between treatments. Birds in T1 and T4 had the highest dressing percentage which were significantly ($P < 0.05$) higher than those in T2, T3 and T5 but comparable to birds in T6. Weight of liver was lowest in T4 but highest in T3 and T1. Birds in T2, 4, 5 and 6 had similar values. Heart weight differed significantly ($P < 0.05$) between control and the test groups with birds in the test groups maintaining higher heart weight across treatments. For the spleen, birds in T4 had significantly ($P < 0.05$) lower weight of spleen than birds on T1, 3 and 5 but similar to those in T2 and T6. The gizzard weight was lowest in T6 which was statistically comparable to T1 and T4 but significantly ($P < 0.05$) lower than T2, 3 and 5. The weight of small intestine of birds in the treated groups (except T4) exceeded ($P < 0.05$) those in the control which had the lowest value. The reverse was however the case for weight of large intestine which was highest in the control (T1) but lowest ($P < 0.05$) in T4. Relative organ weight (Table 6) differed significantly (P<0.05) among treatments even though no particular trend was maintained. The weight liver was significantly (P<0.05) lower in treatments 4 and 6; spleen in treatments 4, 6 and 2; heart in treatment 1; small intestine in treatments 4, 6 and 2; large intestine in treatments 4 and 1 and gizzard in treatment 6 compared to other treatments.

Effect of *G. latifolium* leaf meal on haematological profile of broiler finishers

Table 7 shows the haematological profile of the experimental birds according to treatment. The Table shows that HbC was lower for T4 compared to T3 which differed significantly (P<0.05) from T5 only. Packed cell volume was significantly (P<0.05) higher in treatment 1, 3 and 6 compared to treatment 2, 4 and 5. Birds in T2 had overall highest (P<0.05) WBC count followed by those T3 and T4 whereas birds in treatments 1, 5 and 6 had the lowest values in that order. Thus WBC exhibited a dose related response. Red blood cell count was significantly (P<0.05) higher for birds in treatments 1 and T6 but lowest for those in treatment 4 while birds in treatments 1, 5 and 6 had the lowest MCV. Mean corpuscular haemoglobin was highest in birds belonging to treatments 2, 4 and 5 which had comparable values and these were significantly different from birds in treatments 6 and 1 which had the lowest values. For MCHC, treatment 5 was significantly (P<0.05) higher compared to other treatments followed by treatment 2 while treatments 3, 1 and 6 had the lowest values. Generally, the changes in haematological profile with treatments did not follow a definite trend except in the case of WBC which values decreased with level of inclusion of G. latifolium. In most cases however, the haematological values for the highest level of G. latifolium (T6) was comparable with the control.

DISCUSSION

Growth performance of broiler birds fed varying dietary levels of *G. latifolium*

It was observed that significant (P<0.05) differences existed among treatments in final body weight; total body weight gain, average body weight gain, feed conversion ratio and protein efficiency ratio of broiler chicks (Table3) which generally appeared dose dependent for the test groups and similar to the standard or control (T1). The positive effect of *G. latifolium* on growth performance of chicks therefore increased with increasing levels of GLLM and was most pronounced at the 75g GLLM inclusion level (T6). The similarity between treated groups and the control suggests that the inclusion of *G. latifolium* in the broiler diet was quite beneficial. Okafor (1983), Okafor (2005) and Kubmarawa et *al.* (2007) had reported that *G. latifolium is* one of the cheapest and most available sources of important proteins, vitamins, minerals and essential amino acids that can boost the physiological status of birds and promote their growth. The inclusion of *G. latifolium* in the broiler diet might have resulted in better gut and overall health status, more efficient nutrient utilization, normal development and better growth response of the treated birds. The absence of mortality in especially the treatment groups tends to corroborate the report of Mensah *et al*. (2008) that *G. latifolium* is known to contain important compounds that can strengthen the immune system and serve as antibiotics for the treatment of common pathogenic strains in birds. Agbo *et al*. (2005), Ugochukwu *et al*. (2003) and Kubmarawa *et al.* (2007) had reported that *G. latifolium* can be used in the prevention and treatment of many diseases that can cause death in farm animals. It does appear therefore, that *G. latifolium* can be included in broiler diets as an additive to prevent, reduce or manage the incidence of disease causing organisms in growing chicks. The inclusion of *G. latifolium* in broiler diets may also help to minimize the cost of medication by the rural or resource poor farmer since the vegetable is readily available and can be obtained at little or no cost to the farmer.

The trend observed in Table 3 was repeated at the finisher stage (Table 4) but to a lesser degree. Most significantly, the test groups were better than the control in the most economically important parameters measured: mean body weight gain, total body weight gain, feed conversion ratio and protein efficiency ratio confirming the beneficial effect of *G. latifolium* on the performance of the broiler birds. Again, the response of the birds to G. latifolium inclusion became less dose dependent at the finisher phase signifying an age related response to the effects of this material. Thus *G. latifolium* may be more profitably introduced at the chick phase of the broiler programme with a possibility of securing a carry over positive effect to the finisher stage. The final body weight of broiler finishers obtained in the present study exceeded the range of 1198.50g-1350.33g, 1000g-1100g/bird and mean of 1261.33g reported by Esonu *et al.*(2002), Nworgu *et al.*(2007) and Etuk *et al* .(2004), respectively for broilers fed diets containing *Microdermis puberula* leaf meal, heat-treated *Telfaria occidentalis* and *Cajanus cajan* meal, respectively but compares favourably with the range of 2050-2425g reported by Machebe *et al*. (2011) for broilers fed aqueous extracts of *G. latifolium* leaf meal. The average daily weight gain and daily feed intake values also exceeded the values reported by Esonu *et al.*(2002) but agreed considerably with those reported by Obioha (1992) and Oluyemi and Roberts (2007). Baring the possible effects of different environments and breeds of birds, the observed differences in the performance traits may be attributed to differences in the efficacy of the test materials (vegetable leaves) in the above experiments.

Effect of *G. latifolium* leaf meal on carcass and organ weights

As shown in Table 5, live weight and carcass weight of sacrificed finisher birds differed significantly between treatments and were higher on the average for test groups than for the control probably following the observed positive response of test broilers to *G. latifolium* inclusion in their diet. Dressing percentage, liver, heart, spleen, gizzard, small and large intestine weights were generally similar for treated and control groups or higher for test groups compared to control showing that *G. latifolium* inclusion in the diets was not detrimental to the birds. Specifically, the significantly larger heart associated with test birds may be in response to the need for increased cardiac output to meet the circulatory needs of the bigger birds that resulted from the inclusion of *G. latifolium* in the diets. *G. latifolium* is known to have anti-inflammatory, immune modulatory, cardiac and cardiovascular stimulatory (tonic) properties (Morebise and Fafunsho,1998; Morebise *et al*., 2002; Antai *et al.*, 2009).

Effect of *G. latifolium* leaf meal on the haematological indices of broiler birds

Observation (Table 7) showed that the inclusion of *G. latifolium* in the diet of broilers had significant effect on haematological indices of the experimental birds. The results were however varied and without definite trends except in very few cases. The inconsistency in the results obtained for most parameters could be due to various levels of interaction between the animal's internal environment on the one hand and the active ingredients in the test material on the other. Antai *et al.* (2009) and Akinnuga *et al.* (2011) reported similar inconsistencies in haematological values in response to administration of varying doses of ethanolic extracts of *G. latifolium* to rats. For instance, the increase in WBC count above the value for the control at the initial levels of *G. latifolium* leaf meal (T2, 3 and 4) could be in response to the presence of anti nutritional factors in *G. latifolium* (Antai *et al.*, 2009; Iweala and Obidoa, 2009; Machebe *et al.*, 2011) while the reduced count at higher levels of inclusion (T5 and 6) could result from the body's adaptation to the factors and hence a lesser need for immunological

response. Alternatively, it could be that low doses of *G. latifolium* stimulates leukocytosis while higher doses has a reverse effect both of which could have considerable health implications. Akinnuga *et al.* (2011) reported similar dose related reduction in WBC in rats treated to different doses of ethanolic extract of *G. latifolium*. The initial reduction/increase in Hb, PCV, RBC count, MCV, MCH and MCHC at low doses and their subsequent restoration to control values at higher doses (T6) could follow from the above reasoning. These treatment variations among the test groups notwithstanding, the haematological profile of treated birds in the present study agree substantially with the control and lie within normal values for broilers (Okoye and Ihedioha, 2004; Machebe *et al.*, 2011) suggesting that *G. latifolium* at the range fed had positive/no detrimental effects on haematopoietic tissues and organs of the birds (Mensah *et al*., 2008).

Conclusion

The results presented revealed that up to 75g of *Gongronema latifolium* leaf meal can be included in broiler starter and finisher diets to enhance growth performance, haematological status and carcass yield of broilers. The results also show that locally available leafy vegetables like *Gongronema latifolium* can serve as cheap sources of feed additives for improved poultry production.

REFERENCES

Agbo, C.U; Baiyeri, K.P. & Obi, I.U. (2005). Indigenous Knowledge and utilization of *Gongronema latifolium* Benth. A case study of women in University of Nigeria, Nsukka. Bio-Research Journal vol. 3(2) pp 66-69.

Akinnuga, A.M. et al. (2011). Effects of an ethanolic leaf extract of Gonglonema latifolium on some haematological parameters in rats. Afr. J. Biomed. Res. 14: 153-156.

Alabi, O.M. et al. (2008). Physiological response of broiler chickens to oral supplementation with *Telifaria occidentalis* leaf extract at finisher phase. Proceedings of the 13th Annu.Conf. Anim. Sci.Assoc. Nig. (ASAN). Sept. 15-19 ABU Zaria. Pp 114-117.

Antai, A.B. et al. (2009). Physiochemistry and some haematological changes following oral administration of ethanolic root extract of Gonglonema latifolium in rats. Nig. J. Phyiol. Sci. 24 (1): 79-83.

AOAC (1999). Association of Official Analytical Chemists. Official Methods of Analysis (21st edition) Washington D.C. USA

Campbell, T.W. & Coles, E.H (1986). Avian clinical pathology. In: Coles E.H (ed) Veterinary clinical pathology. 4th edn. Saunders, Philadelphia, pp 279-291.

Duncan, D.B. (1955). New Multiple Range Test Biometrics. 11:1-42

Esonu, B.O. et al. (2002). Performance of nutrient utilization and organ characteristics of broilers fed *Microdermis puberula* leaf meal. Livestock Res. For Rural Dev. 14(6).

Etuk, E.B.; Esonu, B.O. & Njoku, C. (2004). Effect of methionine supplementation on the performance of broilers fed pigeon pea (*Cajanus cajan*) seed meal-based diets. Trop. J. Anim. Sci. vol. 7. Pp 37-42.

Essien, J.P.; Ebong, G.A. & Akpan, E.J. (2007). Antioxidant and Antitussive Properties of *Gongronema latifolium*. J. Appl. Sci. Environ. Manage. Vol. 11(4)47-50

Etukudo (2003). Ethnobotany (Conventional and Traditional uses of plant). The verdict press, Uyo. Pp 23-24.

Ihedioha, T.I. & J.O. Okoye (2004). Reference values for the erythrocytic profiles of Anak 2000 broilera and Lohman brown pullets in Nsukka, Eastern Nigeria. J. Comparative Clinical Pathology 16 (2): 139-148.

Ikpeme, E.V. et al. (2012). Phytochemical screening and haematological evaluation of Parkia biglobosa and Gonglonema latifolium. J. Basic Appl. Res., 2 (3): 2599-2606.

Iweala, E. & O. Obioha (2009). Effect of a long term consumption of of a diet supplemented with leaves of Gonglonema latifolia Benth on some biochemical and histological parameters in male Albino Rats. J. Biol. Sci. 9(8): 856-865.

Kubmarawa, D. et al. (2007). Preliminary Phytochemical and Antimicrobial screening of 50 medicinal plants from Nigeria. Afri.J.Biotechnol.vol.6 (14) pp 1690-1696.

Lamb, G. N. (1991). Manual of Veterinary Laboratory Technique. CIBA – GEIGY, Kenya. Pp. 92 – 109.

Machebe, N.S., Agbo, C.U. & Onuaguluchi, C.C. (2011). Oral administration of Gonglonema latifolia leaf meal: Implications on carcass and haematological profile of broiler finishers raised in the humid tropics. African Journal of Biotechnology 10 (30): 5800-5805.

Mensah, J.K. et al. (2008). Phytochemical, Nutrtional and Medical properties of some leafy vegetables consumed by Edo people of Nigeria. African J. of Biotech. Vol. 7(14). Pp 2304-2309. Available online at http://www.academicjournalorg/AJB

Mitruka, B.M. & Rawnsley, H. M. (1977). Clinical Biochemical and Haematological Reference Values in Normal Experimental Animals, Masson, New York. Pp. 42 – 45.

Morebise, O. & Fafunsho, M.A. (1998). Antimicrobial and phytotoxic activities of saponin extracts from two Nigerian edible medicinal plants *Biokemistri*. 8(2):69-77

Morebise, O. et al. (2002). Anti-inflammatory property of the leaves of *Gongronema latifolium*. Phytother Res. 16(sl) S75-S77. doi:10.1002/ptr.784.[Pubmed].
Nworgu, F.C. et al. (2007). Performance of broiler chickens served heat-treated fluted pumpkin (*Telfaria occidentalis*) leaves extra supplement. J. Appl. Sci. Research. Vol.3(7).pp540-548.
Obioha, F.C. (1992). A Guide to Poultry Production in the Tropics. Acena Publishers, Enugu-Nigeria.
Okafor, J.C. (2005). Conservation and use of traditional vegetables from woody forest species in South Eastern Nigeria. Fame Agricultural Centre, Enugu, Nigeria. www.Agri.Cigiar.org
Okafor, J.C. (1983). Horticultural promising indigenous wild plant species of the Nigeria forest zone. Acts. Horticulture 123 pp 165-177.
Oluyemi, J.A. & F.A. Roberts (2007). Poultry Production in the Warm Wet Climates. Spectrum Books Ltd, Ibadan pp 58-87.
Schalm, O.W; Jain, N.C; Caroll, E.J. (1975). Veterinary Haematology, 3rd edn. Lea and Febiger, Philadelphia.
Smith, A.J. (2001). *Poultry. The Tropical Agriculturalist*. Revised ed. Macmillan Education Ltd. London. Pp 1-11.
SPSS. (2007). Statistical Package for Social Sciences version 17.0. SPSS Inc. Chicago, U.S.A.
Thrall, M.A. & Weiser, M.G. (2002). Haematology. In: Hendrix CM (ed) Laboratory procedures for veterinary technicians. 4th edn. Mosby, St. Louis, M.O, pp 29-74.
Ugochukwu, N.H., Babady, N.E. & Coboune, M. (2003). The effect of *Gongronema latifolium* leaf extracts on serum lipid profile and oxidative stress of hepatocytes of diabetic rats. J. Bio.Sci. 28(1):1-5.

Table 1: Percentage compositions of experimental diets

	Percentage (%)	
Ingredients	Broiler Starter Diet	Broiler Finisher Diet
Maize	42	38
Wheat offal	7	13
Soybean meal	14	8
Groundnut cake	20	14
Palm kernel cake	10	20
Fish meal	2	2
Bone meal	4	4
Salt	0.25	0.25
*Vitamin/mineral premix	0.25	0.25
Methionine	0.25	0.25
Lysine	0.25	0.25
Total	100	100
Calculated compositions:		
Crude protein (%)	23.57	18.56
Energy (Mcal/KgME)	2.80	2.89
Crude fibre(%)	4.80	5.85

*Vit A – 10,000.00 iu., D_3-2,000 iu., B_1-0.75g., B_2-5g., Nicotinic acid – 25g., Calcium pantothenate 12.5g., $B_1$2-0.015g., K_3-2.5g., E-25g., Biotin – 0.050g., Folic acid –1g., Manganese 64g., Choline chloride 250g., Cobalt-0.8g., Copper 8g., Manganese 64g., Iron –32G., Zn-40g., Iodine-0.8g., Flavomycin-100g., Spiramycin 5g., Dl-methionie-50g, Selenium 0.6g., Lysine 120g., BA

Table 2: Proximate compositions of experimental diets

	Percentage (%)	
Components	Broiler Starter Diet	Broiler Finisher Diet
Dry matter	89.85	95.9
Crude protein	23.27	20.24
Crude fibre	13.75	7.5
Ether extract	2.85	1.0
Ash	7.4	9.2
Nitrogen-free extract	42.58	57.96

Table 3: Effect of *G. latifolium* leaf meal on growth performance of broiler chicks

	Dietary levels of *Gongronema latifolium* (g)						
	0	25	37.5	50	62.5	75	SEM
Parameters/Treatments	1	2	3	4	5	6	
Initial body weight(g)	249.00	243.00	248.50	231.00	251.00	258.00	3.67
Final body weight(g)	965.00^{ab}	850.00^{b}	930.00^{b}	920.00^{b}	937.50^{b}	1010.00^{a}	19.08
Av.daily weight gain(g)	28.50^{a}	24.25^{b}	25.70^{ab}	29.70^{a}	27.38^{a}	29.35^{a}	0.76
Total body weight gain(g)	786.00^{ab}	680.00^{d}	720.00^{cd}	832.50^{a}	767.50^{bc}	823.00^{a}	21.27
Daily feed intake(g)	32.84	33.84	33.22	33.34	32.06	33.07	0.22
Total feed intake(g)	3678.00	3790.00	3721.00	3735.00	3690.50	3710.50	25.14
Feed conversion ratio	1.17^{c}	1.40^{a}	1.30^{b}	1.12^{c}	1.17^{c}	1.13^{c}	0.03
Daily protein intake(g)	7.55	7.78	7.64	7.66	7.36	7.62	0.05
Protein efficiency ratio	3.72^{a}	3.12^{b}	3.36^{b}	3.87^{a}	3.71^{a}	3.85^{a}	0.10
Mortality %	0.00	0.00	0.00	0.00	0.00	0.00	-

abc: Means having different superscripts on the same row are significantly (P<0.05) different. SEM= Standard error of mean

Table 4: Effect of *G. latifolium* leaf meal on growth performance of broiler finishers

Treatments	1	2	3	4	5	6	
	Gongronema latifolium levels (g)						
Parameters	0	25	37.5	50	62.5	75	SEM
Initial body weight(g)	965.00	850.00	930.00	920.00	937.50	1010.00	19.08
Final body weight(g)	2476.00^{ab}	2420.00^{b}	2495.00^{ab}	2522.50^{a}	2605.00^{a}	2580.00^{a}	23.92
Av.daily weight gain(g)	53.96^{b}	56.08^{a}	55.89^{a}	57.23^{a}	59.55^{a}	56.06^{a}	0.76
Total body weight gain(g)	1511.00^{c}	1570.50^{b}	1565.00^{b}	1602.50^{ab}	1667.50^{a}	1570.00^{b}	21.38
Daily feed intake(g)	204.64	200.71	200.36	203.51	202.50	204.29	1.12
Total feed intake(g)	5655.00	5620.00	5610.00	5627.00	5630.00	5633.50	15.39
Feed conversion ratio	3.80^{a}	3.58^{b}	3.58^{b}	3.56^{b}	3.40^{b}	3.65^{b}	0.06
Daily protein intake(g)	47.06	46.16	46.08	46.82	46.57	46.99	0.26
Protein efficiency ratio	1.14^{d}	1.21^{b}	1.20^{b}	1.22^{b}	1.28^{a}	1.19^{c}	0.01

abc: Means having different superscripts on the same row are significantly (P<0.05) different; SEM= Standard error of mean

Table 5: Effect of *G. latifolium* leaf meal on carcass and organ weight of broiler finishers

Treatments	1	2	3	4	5	6	
	G. latifolium levels(g)						
Parameters	0	25	37.5	50	62.5	75	SEM
Live weight(g)	2476.00^{bc}	2420.00^{c}	2495.00^{bc}	2522.50^{ab}	2605.00^{a}	2580.00^{ab}	33.92
Carcass weight(g)	2217.10^{b}	2107.7^{c}	2172.35^{b}	2254.35^{a}	2292.17^{a}	2283.22^{a}	23.65
Dressing %	89.54^{a}	87.10^{b}	87.07^{b}	89.37^{a}	87.99^{b}	88.50^{ab}	0.41
Liver (g)	51.55^{ab}	48.25^{bc}	52.90^{a}	45.40^{c}	48.80^{bc}	48.20^{bc}	1.65
Heart (g)	8.40^{b}	10.80^{a}	10.00^{a}	10.35^{a}	11.35^{a}	10.80^{a}	0.39
Spleen (g)	4.45^{a}	4.00^{ab}	4.70^{a}	3.65^{b}	5.00^{a}	4.05^{ab}	0.22
Gizzard (g)	77.95^{ab}	79.95^{a}	79.65^{a}	78.00^{ab}	83.70^{a}	75.10^{b}	1.58
Small Intestine(g)	94.75^{b}	152.55^{a}	156.55^{a}	115.60^{b}	144.10^{a}	142.15^{a}	11.27
Large Intestine(g)	21.60^{a}	16.75^{bc}	18.60^{b}	15.10^{c}	19.70^{ab}	16.35^{bc}	0.96

a, b, c: Means having different superscripts are significantly (P<0.05) different; SEM=Standard error of mean

Table 6: Effect of varying dietary levels of *Gongronema latifolium* leaf meal on relative organ weights of broiler finishers

Treatments	1	2	3	4	5	6	
	Gongronema latifolium levels (g)						
Parameters	0	25	37.5	50	62.5	75	SEM
Liver (%)	2.07^{a}	1.94^{ab}	2.11^{a}	1.82^{b}	1.95^{ab}	1.88^{b}	0.07
Spleen (%)	0.18^{ab}	0.16^{bc}	0.19^{a}	0.15^{c}	0.20^{a}	0.16^{bc}	0.01
Heart (%)	0.34^{b}	0.44^{a}	0.40^{a}	0.42^{a}	0.45^{a}	0.42^{a}	0.02
Small intestine (%)	0.86^{a}	0.67^{c}	0.75^{bc}	0.61^{c}	0.79^{ab}	0.64^{c}	0.04
Large intestine (%)	3.77^{b}	6.17^{a}	6.13^{a}	4.64^{b}	5.77^{a}	5.51^{ab}	0.43
Gizzard	3.12^{a}	3.22^{a}	3.17^{a}	3.12^{a}	3.35^{a}	2.92^{b}	0.08

a, b, c: Means having different superscripts are significantly (P<0.05) different; SEM=Standard error of mean.

Table 7: Effect of *G. latifolium* leaf meal on haematological profile of broiler birds

Treatments	1	2	3	4	5	6	
	Gongronema latifolium levels (g)						
Parameters	0	25	37.5	50	62.5	75	SEM
HbC (g/dl)	8.50^{ab}	8.30^{ab}	7.60^{b}	6.40^{c}	9.90^{a}	8.50^{ab}	0.48
PCV (%)	23.50^{a}	18.00^{b}	21.00^{a}	17.50^{b}	18.00^{b}	23.00^{a}	1.16
WBC count (x 10^3/mm^3)	4800.00^{c}	7200.00^{a}	6650.00^{b}	6550.00^{b}	4400^{d}	3150^{e}	439.5
RBC count(x 10^6/mm^3)	2.35^{a}	1.25^{b}	1.65^{b}	1.15^{c}	1.60^{b}	2.40^{a}	0.16
MCV (μm^3)	102.50^{c}	141.50^{a}	125.00^{b}	156.60^{a}	114.00^{c}	103.50^{c}	7.66
MCH (pg)	36.50^{bc}	65.50^{a}	46.00^{b}	57.00^{a}	63.50^{a}	29.00^{c}	4.61
MCHC (%)	36.00^{cd}	46.00^{b}	38.00^{c}	36.50^{cd}	55.00^{a}	30.00^{d}	2.66

a,b,c: Means having different superscripts are significantly (P<0.05) different: SEM=Standard error of mean; HbC: haemoglobin concentration; PCV: packed cell volume; WBC: white blood cell; RBC: red blood cell; MCV: mean corpuscular volume; MCH: mean corpuscular haemoglobin; MCHC: mean corpuscular haemoglobin concentration.