*International Academic Research Consortium Journals (IARCJ)*
*International Journal of Agricultural Science and Technology*
*ISSN: 2360-9888. Volume 9, Number 4*
*Pages 76-87 (September, 2021)*
*www.iarcj.org, www.arcnjournals.org*

# Response of Broiler Birds to Dietry Inclusion of *Leptadenia hastata* Leaves as an Additional Source of Vitamins and Minerals in a Semi-Arid Environment

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***Abstract:*** *An experiment was designed to study the effect of Laptadenia hastata leaf meal (LHLM) on performance, and carcass characteristics of broiler chicken. A total of two hundred and forty day-old broiler chicks of the Agrited strain were randomly assigned to 4 dietary treatment groups of 60 chicks each replicated four times (15 chicks per replicate) in a complete randomized design (CRD) arrangement. The birds were fed similar diets at both starter and finisher phases of growth containing varying quantity of LHLM. Birds in Group 1 served as the control and were fed diets without LHLM. Those in Groups 2, 3, and 4 were fed 250,500, and 750g/100kg diets respectively. Parameters measured include body weight, body weight gain, feed intake, water intake, feed conversion ration (FCR) and mortality. Results showed no significant (P >0.05), was observed for birds fed diet 3 compared to 2.79, 2.65 and 2.40 for those fed Diets 1,2, and 4 respectively. No significant (P>0.05) difference was observed among the carcass parameters except for the dressed weight, dressing percentage and neck weight. On the organ relative weight, there were no significant effects (P>0.05) on heart. On the organ relative weight, there was no significant effects (P< 0.05) affected proventiculus and gizzard weights. It was concluded that Laptadenia hastata leaf meal can be included up to 500mg in broiler diet for improved growth performance and carcass characteristics.*

***Keyword:*** *Leptadenia hastata, Broiler Chicken, Stator, Finisher*

## INTRODUCTION

The poultry industry in Nigeria in the last decade has been greatly affected by high cost of feed. The provision of feed alone has been reported to account 60-80% of the total cost of livestock production in developing countries such as Nigeria (Igboeli, 2000; Esonu, 2000). In view of this, there is increased interest by Nigerian livestock farmers to harness unconventional feed ingredients. The use of unconventional feedstuff is gaining more recognition in the field of animal nutrition. This is basically due to the high cost of conventional feeds which is a contributory factor to high cost of livestock production in Nigeria (Obh, 2006). Hence, widely cultivated vegetables in the tropics and sub-tropics need to be exploited. The leaves of these vegetables can contribute protein and vitamins, there complementing the inadequacies of most feedstuffs (Ifon and Bashir, 1980).

The rapid growth of broilers demands that they be supplied with high quality diets to sufficiently cater for their nutrients requirements. The principal constituents of broilers are soft tissues which are mainly proteins. The protein required by depends primarily on the amount needed for maintenance of health, tissue integrity and for productive for purposes (Olomu and Offiong, 1980). Broiler chicken production is an important source of income and employment. Meat from broiler chickens has become important dietary component of the People in Nigeria. Chicken meat is an important source of high quality protein; it is easily digested and contains all essential amino acids. It is also an excellent source of Vitamin A, thiamine, riboflavin and niacin (Roberts et al., 1999).

Although dietary vitamin and mineral requirements for birds have been periodically re-established NRC (1984;1994). Some aspects of these requirements are continuously questioned. The requirement are normally determined in young birds by using purified diets and in thermoneutral conditions; however, the actual requirement can be quite different in poultry production system, as the birds are subjected to stressful situations that can be avoided during experimental trials (Lesson and summer 1997). Vitamin or mineral supplements in diets have been evaluated in the last few years as a way of reducing the cost of broiler chicken production (Skinner *et al.,1992).* Several reports have show the effect of vitamins or minerals during the finisher period on the performance of broiler chickens (Deyhim and Teeter, 1993).

Vitamin-mineral premix is the combination of vitamins and minerals which is added to the formulated diet to meet-up the requirements of at least few vitamins and minerals that are deficient in the formulated diet. Inclusion of vitamin-mineral premix in the formulated diet has become indispensable practice because feed ingredient do not contain all essential vitamins and minerals at the right amounts needed for the requirement of chickens (Bhowmik, 1996). Critiacal vitamins (Choline, Folic acid, pantothenic acid, pyridoxine, riboflavin, vit-A, vit-D3 and vit-E) and minerals (calcium, phosphorus, copper, iodine, iron, manganese, sodium and zinc) should be checked carefully in the diet. It is not unusual to add all vitamins in poultry diets. Minerals and vitamins contribute only 10 percent of the total cost of feed (Singh and Panda, 1988). Reducing safety margin of these vitamins and minerals can restrict performance of birds with heavy losses.

Several medicinal plants have been used as dietary adjunct and in the treatment of numerous diseases without proper knowledge of their function. Ethnobotanical information obtained from traditional medical practictioners in northern Nigeria revealed that *L. hastate* is used for the treatment of diabetes mellitus. The antibacterial and antimicrobial effect of L. hastate would have been reported (Aliero and Wara, 2009) and the result of its toxicity studies show that plant is relatively safe to use (Tambuora et al., 2005).

## MATERIALS AND METHODS

### Study Area

The study was conducted at the Poultry Production and Research Unit of Animal Health and Production Technology Department, Umaru Ali Shinkafi Polytechnic, Sokoto, Sokoto State. The experiment lasted for eight weeks.

Sokoto State is located between latitudes $12^{o}$ and $13^{o}$N and between longitudes $4^{0}$ and $6^{0}$E in the northern part of Nigeria at an altitude of 350m above sea level (Mamman et al., 2000). The state falls within the Sudan Savannah Vegetation zone to the south and Sahel Savannah to the north while alternating wet and dry seasons. The hot dry spell extends from March to May and sometime to June in the extreme northern part. A short cool, dry period (Harmattan) occurs and last between late October and late February (Malami et al., 2001). Mean annual temperature is $34.9^{o}$C with the highest in April ranging from 38 to $40^{o}$C and the lowest in January ranging from 13 to $16^{o}$C (SEPP, 1996).

### Sources of Ingredients for Experimental Diet

The major feed ingredients (maize, ground-nut cake, wheat offal, blood meal, bone meal and lime-stone) used for the study were sourced from the Sokoto central market while methionine, lysine and premix were sourced from vendors within Sokoto metropolis.

### Sources and Processing of *Laptadenia hastata* Leaves

Fresh leaves of *L. hastata*were collected from the wild usually at river banks and lowlands where they thrive better. The leaves were dried under shade and then ground to powder using motar and pestle and preserved in airtight plastic container, until they were required for use.

### Experimental Birds, Diets and Procedure

A total of 240 day-old broiler chicks (*Arbor acre strain)*, were divided into 4 treatment groups. Each group of 60 chicks were divided into 4 groups of 15 chicks to serve as replicates using complete randomized design (CRD). Similar diets were formulated and fed to the birds at starter phase of growth (0-4 weeks of age), except that brids on the control diet contained no LHLM added to it. Diet 2 had 250g LHLM, Diet 3 and 4 contained 500 and 750g LHLM, respectively. The composition for the starter diets is shown in Table 1.1 Similarly, during the finisher phase of growth, diets fed to birds in treatment groups 1,2,3, and 4 and 0, 250, 500 and 750g LHLM, respectively. The composition of the diets fed at the finisher phase of growth is shown in Table 1.2, Table 1.3, shows the calculated nutrient composition of the starter and finisher diets.

Table 1.1: Percentage composition of broiler starter diets

| | Dietary treatments | | | |
|---|---|---|---|---|
| **Ingredient** | **1** | **2** | **3** | **4** |
| Maize | 57.00 | 57.00 | 57.00 | 57.00 |
| Groundnut Cake | 30.00 | 30.00 | 30.00 | 30.00 |
| Wheat Offal | 5.00 | 5.00 | 5.00 | 5.00 |
| Blood Meal | 4.00 | 4.00 | 4.00 | 4.00 |
| Bone Meal | 2.00 | 2.00 | 2.00 | 2.00 |
| Limestone | 1.00 | 1.00 | 1.00 | 1.00 |
| Vitamin-Mineral Premix | 0.30 | 0.30 | 0.30 | 0.30 |
| Methionione | 0.20 | 0.20 | 0.20 | 0.20 |
| Lysine | 0.20 | 0.20 | 0.20 | 0.20 |
| Salt | 0.30 | 0.30 | 0.30 | 0.30 |
| **Total** | **100** | **100** | **100** | **100** |
| *Laptadenia hastate leaf meal* | 0 | 250g | 500g | 750g |
| **Calculated analysis** | | | | |
| Metabolize Energy (Kcal/kg) | 2956 | 2956 | 2956 | 2956 |
| Crude Protein (%) | 23.25 | 23.25 | 23.25 | 23.25 |
| Crude Fibre (%) | 3.11 | 3.11 | 3.11 | 3.11 |
| Ether Extract (%) | 4.32 | 4.32 | 4.32 | 4.32 |
| Calcium (%) | 1.17 | 1.17 | 1.17 | 1.17 |
| Phosphorus (%) | 0.43 | 0.43 | 0.43 | 0.43 |
| Methionine (%) | 0.49 | 0.49 | 0.49 | 0.49 |
| Lysine (%) | 1.26 | 1.26 | 1.26 | 1.26 |
| **Cost of Feed Per kg (₦)** | **75.79** | **77.04** | **78.29** | **79.54** |

Table 1.2: Percentage composition of broiler finisher diets

| | Dietary treatments | | | |
|---|---|---|---|---|
| **Ingredient** | **1** | **2** | **3** | **4** |
| Maize | 60.00 | 60.00 | 60.00 | 60.00 |
| Groundnut Cake | 22.00 | 22.00 | 22.00 | 22.00 |
| Wheat Offal | 10.00 | 10.00 | 10.00 | 10.00 |
| Blood Meal | 3.00 | 3.00 | 3.00 | 3.00 |
| Bone Meal | 2.50 | 2.50 | 2.50 | 2.50 |
| Limestone | 1.50 | 1.50 | 1.50 | 1.50 |
| Vitamin-Mineral Premix | 0.30 | 0.30 | 0.30 | 0.30 |
| Methionione | 0.20 | 0.20 | 0.20 | 0.20 |
| Lysine | 0.20 | 0.20 | 0.20 | 0.20 |
| Salt | 0.30 | 0.30 | 0.30 | 0.30 |
| **Total** | **100** | **100** | **100** | **100** |
| *Laptadenia hastata leaf meal* | 0 | 250g | 500g | 750g |

| **Calculated analysis** | | | | |
|---|---|---|---|---|
| Metabolize Energy (Kcal/kg) | 2913.70 | 2913.70 | 2913.70 | 2913.70 |
| Crude Protein (%) | 20.00 | 20.00 | 20.00 | 20.00 |
| Crude Fibre (%) | 3.18 | 3.18 | 3.18 | 3.18 |
| Ether Extract (%) | 4.12 | 4.12 | 4.12 | 4.12 |
| Calcium (%) | 1.52 | 1.52 | 1.52 | 1.52 |
| Phosphorus (%) | 0.51 | 0.51 | 0.51 | 0.51 |
| Methionine (%) | 0.47 | 0.47 | 0.47 | 0.47 |
| Lysine (%) | 1.10 | 1.10 | 1.10 | 1.10 |
| **Cost of Feed Per kg (₦)** | **71.61** | **72.86** | **74.11** | **75.36** |

Table 1.3: Proximate composition of dried leaves of *Laptadenia hastata leaf meal*

| **Nutrients** | **Content** |
|---|---|
| Dry Matter (DM%) | 92.67 |
| Protein (%) | **9.61** |
| Carbonhydrates (%) | **58.56** |
| Lipids (%) | **58.56** |
| Fibre (%) | **11.33** |
| Ash (%) | **13.83** |
| Ca (%) | **0.12** |
| Mg (%) | **1.27** |
| P(%) | **0.54** |
| K(%) | **1.131** |
| Na (%) | **1.29** |

Source: Hassan et al., (2007)

**Management of Experimental Birds and Data Collection**

The experimental birds were first kept for three days after transport to take care of stress due to transportation. During the three days they were administered anti stress drug (Vitalyte). They were later weighted and randomly allotted to their respective treatment groups. Routine management practices including feeding, supply of water; medication and vaccination were carried out as described by (Oluyemi and Roberts, 2000). This birds were housed on deep litter. Before the arrival of the birds, the pens were cleaned and disinfected with germicide solution (Izal).

Data were collected on feed intake, initial weight, weekly final body weight. Weight gain and feed intake, weekly weight, final body weight.

Weight gain and feed intake values were determined and used to compute feed conversion ration. Mortality was recorded as it occurred.

**Results and Discussion**

There were no significant differences (P> 0.05) in final body weight gain (g/bird), body weight gain (g/bird) and weight gain (g/bird/day) among broilers in the treatment groups (Table 2.1). The higher weight gain of birds fed 500g LHLM at the end of trial could be as a result of higher digestion of that nutrient consumed by birds and greater efficiency in the utilization of feed which resulted in enhanced growth Kamal (2001). Alcicek et al. (2004) and Zhang et al. (2005) had reported that plant leaf meals posses digestion stimulating properties. The performance of broilers in this study was similar to, (1898.33, 1892.09, 1871.68, 1884.67) and 1881.14g) reported by Nwogu *et al.* (2007) and Obun *et al.* (2008) because all the values of final body weight gain and feed conversion ration were statistically the same.

The average feed intake of birds did not differ significantly (P>0.05) between treatment groups even though birds fed 500g of LHLM consumed slightly more feed compared to those fed 250, 700g LHLM and the control based diets. The average daily feed intake of (61.73, 71.89, 76.02 and 74.26/bird/day) recorded across the treatments was statistically similar to values reported by (60.43, 6971, 74.14 and 67.86g/bird/day) Ani *et al.* (2008) when they fed raw Bambara nut waste and supplementary enzymes to broilers from 0-8weweks. However, Obun et al. (2011) reported higher value 101.67, 100.00, 96.67 and 91.66g/bird/day. Although the increase in feed intake between birds was higher as the amount of LHLM added to the diet increased.

Feed conversion ration differed significantly (P< 0.05) between treatments as the additive levl of LHLM increased from Og in diet 1 to 500g in Diet 3. The birds in Treatment 3 had better feed conversion ration (2.33) than the others 2.40, 2.65 and 2.79 for 0,250 and 750g LHLM, respectively. The additive level of 500g might be the most optimum for effective feed conversion ratio in broiler as increase in additive level up to 750g worsened the feed conversion ration. Feed conversion ration obtained in this study compared favourably with those recorded by Olabode and Onyekwere (2010) for broilers chicks fed three different commercial poultry feeds. Feed conversion ratio is among the important factors to consider when making statement on cost of production (Sonaiya *et al.,* 1986); Ukachukwu and Anuguwa, 1995). Lower body weight gain was recorded in the birds fed 250g of LHLM and the poor feed conversion ration was observed in birds served 750g of LHLM.

Morality was not influenced by dietary treatments during the trial period. There was no significant differences (P>0.05) between birds in the treatment groups. Since mortality was similar across the treatment groups, it could be concluded that mortality was not as a result of the additive inclusion of the test ingredient in the diet of the birds. It could be due to other factors that equally affected the birds in all treatment groups and therefore did not agreed with the reports of Doyle (2001), Biu *et al* (2006) and Durrani *et al.*(2008) that the application of medicinal plant reduces the number of

mortality. Mortality of broilers in this study was considerably higher than the 5% allowable proportion suggested by Oluyemi and Roberts (2000).

There were significant difference ($p<0.05$) in feed cost per kg gain among the treatments. This could be due to the increase in level of inclusion of *Laptadenia hastata* leaf meal in the diet. Ani et al., (2012) reported increase in feed cost per kg gain might be attributed to increase in average daily feed intake. Better significant cost of feed per kg gain was obtained from bird fed diet 1.

Live weight value of 2136.20g was obtained for birds that were fed 750g LHLM based diet and the least value of 1838.30g for birds fefd 250g LHLM (Table 6). To the facat that *Laptadenia hastata contained* some medicinal properties Aliero and Wara (2009). This support by the report of Doyle (2001) and Lucy (2002), who stated that application of medicinal plants allowed chicken to grow strong and healthy. The dressing percentages obtained in this study was significantly ($P<0.05$) different among the treatments. The dressing percentage obtained for diets 1,3 and 4 (74.67,74,19, and 73.65% were higher than the range of 66.56-68.49% obtained by Omojola et al. (2004).it appeared that the additive levels of the inclusion of the test ingredient did not have impact on the carcass characteristics of broilers fed the treatment diets. This is because most of the parameter did not differ significantly between birds in the four treatment groups.

The slight increase in organs weights with increasing LHLM the diets might have resulted from their heavy live weight as reported by Broadhent (1981) since the surface area and the live weight determine the amount of feathers and visceral organs required. The increase in the size of liver and gizzard could be related to increase activity to overcome the effect of toxic anti-narrative compound in the leaf meal and other ingredient. The significant differences ($P< 0.05$) that existed between the treatments in terms of gizzard and proventiculus may be as result of this. The relative weight values of the organs obtained generally are in agreement with the report of Fanimo et al. (2005) and Isikwenu et al. (2010), who noted no morphological changes in the organs weight of birds fed diets compounded from other ingredients. Hermandez et al (2004), Durani et al. (2008) and Machebe *et al* (2010) reported no effect of feeding plant leaf meal on liver (1.88, 1.72, 1.97, 2.03 and 1.98) and gizzard weight (2.07, 2.13, 2.13, 2.21 and 2.18) whereas, Fairley et al. (1985) associated an increase in the relative weight of gizzard for the broilers given antimicrobial agents in their diets.

**Performance of Broilers Fed Laptadenia hastate LM (0-8 weeks of age).**

Results of their performance characteristics of Broilers fed LHLM from 0-8 weeks of age is presented in Table 4.1.

Table 2.1: Performance of Broilers fed *Laptadenia hastata* leaf meal from 0-8weeks of age

| | Diets | | | | |
|---|---|---|---|---|---|
| **Parameter** | **Control** | **(250g) LHLM** | **(500g) LHLM** | **(750g) LHLM** | **SEM±** |
| Initial body weight (g/b) | 40.89 | 40.40 | 40.97 | 41.00 | 0.62 |
| Final body weight (g/b) | 1943.94 | 1819.64 | 2017.61 | 1861.53 | 99.63 |
| Today body weight gain (g/b) | 1905.61 | 1779.41 | 1977.41 | 1820.53 | 99.63 |
| Average Weight gain (g/b/d) | 1905.61 | 1779.74 | 1977.41 | 1820.53 | 99.54 |
| Average Feed intake (g/b/d) | 34.71 | 32.47 | 36.03 | 33.24 | 1.78 |
| Average Water intake (g/b/d) | 61.73 | 71.89 | 76.02 | 74.26 | 3.99 |
| Feed conversion ration (FCR) | $2.40^{a}$ | $2.65^{ab}$ | $2.33^{a}$ | $2.79^{b}$ | 0.23 |
| Morality (%) | 45.00 | 41.67 | 38.33 | 46.67 | 9.53 |
| Feed Cost/kg gain (₦/b) | $130.71^{a}$ | $160.70^{b}$ | $166.22^{c}$ | $173.63^{d}$ | 0.069 |

abcd: Means within same row with different superscripts are significantly different (P<0.05)

Table 2.2: Carcass characteristics and weight of parts relative to dressed weights of broiler chickens fed diets containing *Laptadenia hastata* leaf meal (LHLM).

| | Diets | | | | |
|---|---|---|---|---|---|
| **Parameter** | **Control** | **(250g) LHLM** | **(500g) LHLM** | **(750g) LHLM** | **SEM±** |
| Live weight (g) | 2085.65 | 1838.30 | 2017.13 | 2136.20 | 102.79 |
| Dressed weight (g) | 1558.25 | 1311.93 | 1497.00 | 1576.13 | 85.29 |
| Dressing percentage (%) | $74.67^{a}$ | $71.24^{b}$ | $74.19^{a}$ | $73.65^{a}$ | 0.69 |
| Prime Cuts expressed as percentage of dressed weight | | | | | |
| Back | 11.76 | 11.94 | 11.94 | 11.62 | 0.22 |
| Breast | 32.86 | 33.49 | 34.39 | 34.59 | 0.77 |
| Wing | 10.86 | 11.81 | 11.00 | 10.65 | 0.34 |
| Head | 3.42 | 3.86 | 3.81 | 3.38 | 0.17 |
| Neck | $6.82^{a}$ | $6.45^{ab}$ | $5.64^{b}$ | $5.94^{b}$ | 0.27 |
| Shank | 5.95 | 6.39 | 5.66 | 5.59 | 0.37 |
| Thigh | 28.33 | 23.07 | 27.55 | 28.23 | 0.82 |

Abc: Means within same row with different superscripts and significantly different (P<0.05).

Table 2.3: Organ characteristics relative to carcass weight of broiler chickens fed diet containing *Laptadenia hastata leaf* meal (LHLM).

| | Diets | | | | |
|---|---|---|---|---|---|
| **Parameter(%)** | **Control** | **(250g) LHLM** | **(500g) LHLM** | **(750g) LHLM** | **SEM±** |
| Gizzard | 2.89[a] | 2.78[a] | 2.26[b] | 2.53 | 0.17 |
| Liver | 2.39 | 2.76 | 2.71 | 2.83 | 0.27 |
| Spleen | 0.17 | 0.21 | 0.18 | 0.18 | 0.02 |
| Kidney | 0.19 | 0.22 | 0.22 | 0.20 | 0.02 |
| Lungs | 0.56 | 0.76 | 0.61 | 0.67 | 0.07 |
| Proventiculus | 0.48[b] | 0.65[a] | 0.54[ab] | 0.60[ab] | 0.04 |
| Intestine | 3.55 | 4.15 | 4.22 | 4.09 | 0.25 |
| Heart | 0.55 | 0.54 | 0.53 | 0.55 | 0.02 |
| Fats | 1.82 | 2.08 | 1.72 | 2.19 | 0.34 |
| Crop | 0.41 | 0.34 | 0.39 | 0.39 | 0.07 |

abc: Means within same row with different superscripts and significantly different ($p< 0.05$).

**Conclusion and Recommendation**

It could be concluded that *Laptadenia hastata* leaf meal included at 500g in broiler diet improved the growth performance without adverse effect on haematology and carcass. Therefore, LHLM can be used as an additive in the broiler diets.

Based on the observation and findings from the study, the following recommendations were offered;

- Since the test ingredient *Laptadenia hastata* is abundant in the study area, there is need to utilize it is an additional source of vital phytochemicals.
- Higher concentration of the LHLM could be tried in other experiments to see if the efficacy can be increased for better growth and performance of broiler production and disease prevention.
- *Laptadenia hastata*leaf meal is potentially useful for broiler production. It will be worthwhile to continue investigations into the use of this plant for other poultry species

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