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Efficiency of *Centella asiatica* (Gotu kola) leaf meal as feed additive in broiler chicken diet

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Abstract

The use of conventional supplements as feed additives has been criticized for their potential negative impact on the food chain hence, the need for viable organic alternatives. Centella asiatica has been found to contain essential phytochemicals. This study was therefore carried out to evaluate the utilization of dried Centella asiatica leaf meal (CALM) as phytogenic feed additive in broiler chicken diet. A total of 180, one-day-old Arbor acre broiler chicks were randomly allocated to six dietary treatment groups with thirty birds, at three replicates of ten chicks per replicate. Experimental diets included control basal diet + 0% CALM (T1), basal diet + antibiotics (T2). T3, T4, T5 and T6 were basal diet + 3%, 4%, 5% and 6% CALM, respectively. Completely randomized design was used and feeding trial was carried out for 49 days. Parameters measured were growth performance and carcass characteristics. All data were subjected to analysis of variance using Statistical Package for Social Sciences (version 21) while treatments means were separated using Duncan's multiple range test at P≥0.05 level of significance. There were significant differences in final live weight, body weight gain and feed conversion ratio. Birds fed with 4% CALM had the highest weight gain (1,683.30g) and feed intakes (3,295.30g), while T3 had the lowest weight gain (1,446.70.30g) and feed intake (3,107.80g). The breast cut showed significant (P<0.05) variation across the treatment with treatment T2 having the largest value of 31.9% and lowest value of 26.0% was in obtained in T3, thigh showed highest value in T5 and lowest value in T4. Gizzard values obtained in this finding showed significant (P<0.05) difference value ranged from 1.8-2.6% the highest value was obtained in T3 and lowest value in control diet. It can be concluded that the inclusion of Centella asiatica in the diets of broiler chicken has no detrimental effect on the performance characteristics of the experimental birds but improved the average body weight, feed conversion ratio and livability of the birds at 4% level of inclusion.

Keywords: Centella asiatica, Performance, Carcass, Broilers, Additives.

Introduction

Feed is a major component affecting net return from the poultry business, because 80% of the total expenditure is on feed purchase (Qureshi,1991). To ensure more net return and to minimize high expenditure on feed which is the main challenge, many research strategies have been practiced such as introducing feed supplements and feed additives (Perves, 1992). Due to intensification of poultry production in the last decade, varieties of non- nutritive feed additives have been used in poultry production to improve the overall performance of birds. Antibiotics growth promoter (AGP) have been included in poultry diets to promote growth, health and to maximize the genetic potentials of modern poultry. (Bozkurt *et al*., 2008). However, the presence of residue of antibiotics in meat and meat products meant for human consumption and the development of drug resistant micro-organisms in human has brought about the

search for alternative plant extracts as antibiotics and growth promoters (Denli *et al.,* 2003). Cross *et al.* (2003) and Lewis *et al.* (2003) identified several beneficial chemical components in medicinal plants which play an important role in improving production and immune system of birds against diseases and have strong medicinal and could be effectively utilized as natural growth promoter to replace antibiotics and other synthetic feed additives. Many types of feed additives are being used in broiler rations to improve its performance; spices are very common additives in broiler diets (Zhang *et al*., 2009). However, Feed additives are added to the diets of broilers to improve its production performance by increasing growth rate, feed conversion efficiency and greater livability in poultry birds. The environment of man is endowed with plants and fruits which are used as sources of spices in food, stimulants and some micro nutrients. These plants or spice include garlic (*Allium sativum*), ginger (*Zingiber officinale*) and gotu kola (*Centella asiatica*) ***Centella asiatica*** L. (Gotu Kola) Urban is a tropical medicinal plant from Apiaceae family native to Southeast Asian countries such as India, Sri Lanka, China, Indonesia, and Malaysia as well as South Africa and Madagascar (Jamil *et al.,* 2007). It is native to the warmer regions of both hemispheres. This plant grows wild in damp, shady places up to 7000 ft. and can be commonly seen along banks of rivers, streams, ponds, and irrigated fields. It also grows along stone walls or other rocky areas at elevation of approximately 2000 ft. The nutritional value of C. ***asiatica*** is attributed to its richness in carotenoids and vitamins C and B complex. The herb is commonly used for children in Sri Lanka in order to combat nutritional deficiency (Cox *et al.,* 1993). C. ***asiatica*** is also a traditional green leafy vegetable (GLV) and locally consume it as "Gotu kola sambola. It is used as a health tonic and processed into cordial drinks and it is available at some markets as a ready-made juice (Mohd Ilham, 1998). It is believed that *C*. ***asiatica*** herbal tea is a source of antioxidants with many beneficial effects (Huda-Faujan *et al.,* 2007). The objective of this to evaluate the efficiency of dried CALM as phytogenic feed additives for broiler chicken.

Materials and method

Experimental site

The research was carried out at the teaching and research farm. Department of Agriculture and Industrial Technology, Babcock University, Ilishan-Remo, Ogun State Nigeria.

Source and preparation of experimental plant

Centella asiatica plant was harvested from Babcock University farm. The plant was washed, chopped and air dried. The dried material was pulverized into fine powder in a blender and mixed with the feed in varying proportion for experimental study

Experimental design and management

A total of 180-day-old Arbor acre birds were randomly allocated to six dietary treatment groups with thirty birds, at three replicates of ten chicks per replicate.

Experimental diet

Basal diet (Control), basal diet + antibiotics, basal diet + 3% CALM, basal diet + 4% CALM, basal diet + 5% CALM and basal diet + 6 % CALM

Data collection

Data were collected on growth performance (feed intake, changes in body weight, feed conversion ratio and survivability), Carcass characteristics (breast, thigh, drumstick, intestine, gizzard, heart and liver)

Average feed intake/animal =

$$\frac{\text{Feed offered(g)} - \text{feed leftover(g)}}{\text{Total number of animal in the group}}$$

Table 1: Gross composition of starter diet containing varying levels of CALM

Ingredient	Control (T1)	T2 (antibiotics)	(T3) 3% (CA)	(T4) 4% (CA)	(T5) 5% (CA)	(T6) 6% (CA)
Maize	55.00	55.00	55.00	55.00	55.00	55.00
GNC	20.00	20.00	20.00	20.00	20.00	20.00
SBM	14.30	14.30	14.30	14.30	14.30	14.30
Fish meal (72%CP)	3.00	3.00	3.00	3.00	3.00	3.00
Wheat offal	2.00	2.00	2.00	2.00	2.00	2.00
Limestone	1.00	1.00	1.00	1.00	1.00	1.00
DCP	2.00	2.00	2.00	2.00	2.00	2.00
PKC	2.00	2.00	2.00	2.00	2.00	2.00
Common Salt	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10	0.10
Premix	0.25	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100	100
Determined value						
Crude fibre	3.28	3.28	3.30	3.31	3.32	3.33
Crude protein	22.34	22.34	22.37	22.39	22.40	22.41
Ether extract	3.51	3.50	3.51	3.52	3.32	3.55
Metabolizable energy (kcal/kg)	2960	2960	2960	2960	2960	2960

GNC = Groundnut cake; PKC = Palm kernel cake
DCP = Dicalcium Phosphate; SBM = Soya bean Meal.

Table 2: Gross composition of finisher diet containing varying levels of *Centella asiatica*

Ingredients	T1 (Control)	T2 (antibiotics)	3% (CA)	4% (CA)	5% (CA)	6% (CA)
Maize	59.00	59.00	59.00	59.00	59.00	59.00
GNC	17.00	17.00	17.00	17.00	17.00	17.00
SBM	8.00	8.00	8.00	8.00	8.00	8.00
Fish meal (72%cp)	1.00	1.00	1.00	1.00	1.00	1.00
Wheat offal	5.30	5.30	5.30	5.30	5.30	5.30
Limestone	1.50	1.50	1.50	1.50	1.50	1.50
DCP	2.00	2.00	2.00	2.00	2.00	2.00
PKC	5.50	5.50	5.50	5.50	5.50	5.50
Common Salt	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10	0.10
Premix	0.25	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100	100
Determined value						
Crude protein	19.58	19.57	19.63	19.68	19.75	19.82
Metabolizable energy (kcal/kg)	2998	2998	2998	2998	2998	2998
Ether extract	4.01	4.02	4.01	4.03	4.05	4.06
Crude Fibre	4.23	4.22	4.27	4.28	4.30	4.30

GNC = Groundnut cake; PKC = Palm kernel cake; DCP = Dicalcium Phosphate; SBM = Soya bean Meal

Weight gain

Weight Gain = Final Weight – Initial Weight

Average weight gain/ animal =

$$\frac{\text{Final weight (g)-initial weight in (g)}}{\text{Total number of animal in the group}}$$

Feed conversion ratio

This was obtained by dividing the quantity of total feed consumed by the weight gain.

$$\text{FCR} = \frac{\text{Total feed consumed}}{\text{Weight gain}}$$

Carcass characteristics

At the end of 49days experimental period, six birds were randomly selected from each treatment, two (2) per replicate for the carcass parameter. The selected birds were starved overnight and their live weights were recorded. Birds were slaughtered by bleeding through the jugular vein the slaughtered birds were plucked and eviscerated manually. Dressed carcass and internal organ such as thigh, drumstick, breast, heart, gizzard and liver were recorded as the percentage of the live weight.

Statistical analysis

All data were subjected to analysis of variance using Statistical Package for Social Sciences (version 21) while treatments means were separated using Duncan's multiple range test at $P \geq 0.05$ level of significance.

Results and discussion

The effect of *Centella asiatica* leaf meal on growth performance of broiler chickens at starter and finisher phase is shown in Tables 3 and 4, significant ($P<0.05$) difference was observed in weight gain, feed intake, Survivability and feed conversion ratio. Birds fed with 4% CALM had the highest weight gain (1,683.30g) and feed intake (3,295.30g), while the control had the lowest weight gain (1,466.70g) and feed intake (3,107.80g). Carcass parameters showed significant ($P<0.05$) variations across the treatments. Defeathered weight, Eviscerated weight and dressed weight was highest in T4 lowest value was obtained in the control diet. Highest% weights of thigh and breast muscles were recorded in experimental group. Dietary levels of CALM significantly ($P<0.05$) affect gizzard highest weight (2.60%) was obtained in T3 and lowest value (1.70%) in T4.

Table 3: Growth performance of broiler chickens fed varying level of *Centella asiatica* at starter phase

Parameters	T1	T2	T3	T4	T5	T6	SEM
Initial weight (g)	80.20	80.00	80.00	80.20	80.10	80.00	0.10
Final weight (g)	515.00^{c}	506.00^{c}	485.00^{d}	539.00^{a}	524.0^{b}	516.00^{c}	28.80
Total weight(g)	434.60^{c}	426.00^{d}	405.00^{e}	458.80^{a}	443.9^{b}	436.00^{c}	3.90
Feed intake(g)	774.00^{e}	824.10^{c}	775.70^{d}	824.10^{c}	870.70^{a}	864.70^{b}	11.20
Daily average weight(g)	20.30^{ab}	20.30^{ab}	19.30^{b}	22.00^{a}	21.10^{ab}	21.00^{ab}	0.30
Feed conversion	1.50^{c}	1.60^{bc}	1.71^{ab}	1.70^{ab}	1.80^{a}	1.74^{ab}	0.30
Survivability %	100.00	100.00	100.00	100.00	100.00	100.00	0.20

^{a,b,c} means within a row with difference superscripts are significantly different ($p<0.05$)

Growth performance of broiler chickens fed CALM as feed additives at the starter phase showed that daily weight gain, feed conversion ratio and total weight gain were significant across the treatments ($P<0.05$). Birds on T4, T5 and T6 performed better than the control diet and antibiotics supplemented diet. This can be attributed to the ability of the birds to utilize the CALM efficiently. This result agrees with the findings of Ramiah *et al.* (2014) who reported significance variations in chickens fed *Centella asiatica* leaf meal, garlic and antibiotics and observed highest weight

Table 4: Growth performance of broiler chickens fed varying level of *Centella asiatica* leaf meal at finisher phase

Parameters	T1	T2	T3	T4	T5	T6	SEM
Initial weight (g)	515.00^{c}	506.00^{c}	485.00^{d}	539.00^{a}	542.00^{b}	516.00^{c}	4.70
Final weight (g)	1508.33^{e}	1516.67^{d}	1466.70^{f}	1683.30^{a}	1575.00^{b}	1533.30^{c}	16.70
Total weight (g)	993.33^{e}	1010.70^{d}	981.70^{f}	1144.30^{a}	1051.00^{b}	1017.30^{c}	13.20
Daily average weight(g)	47.00^{e}	48.10^{d}	46.70^{f}	54.50^{a}	50.00^{b}	48.40^{c}	0.20
Feed Intake(g)	2260.00^{d}	2337.90^{b}	2332.10^{c}	2471.40^{a}	2276.70^{cd}	2331.00^{c}	18.0
Feed conversion ratio	1.60	1.60	1.80	1.60	1.60	1.60	0.90
Dressing out %	76.30^{b}	77.70^{a}	75.60^{bc}	77.30^{a}	75.00^{c}	76.30^{b}	0.20
Survivability	96.70^{a}	96.70^{a}	93.30^{b}	93.30^{b}	96.70^{a}	96.70^{a}	0.30

^{a,b,c} means within a row with difference superscripts are significantly different (P<0.05)

Table 5: Carcass characteristics of broiler chickens fed varying level of *Centella asiatica* leaf meal

Parameters (g)	T1	T2	T3	T4	T5	T6	SEM
Live weight	1508.30^{e}	1516.70^{d}	1466.70^{f}	1683.30^{a}	1575.00^{b}	1533.30^{c}	37.90
Bled weight	1435.00^{e}	1445.30^{d}	1383.30^{f}	1597.30^{a}	1498.70^{b}	1454.30^{c}	37.30
Defeathered weight	1361.70^{d}	1373.30^{c}	1300.00^{e}	1510.70^{a}	1422.00^{b}	1374.30^{c}	36.90
Eviscerated weight	1150.70^{d}	1179.00^{b}	1108.30^{e}	1302.30^{a}	1176.00^{bc}	1170.30^{c}	32.90
Dressed weight	995.00^{d}	1009.70^{b}	953.00^{e}	1118.30^{a}	1008.70^{b}	1031.70^{c}	27.70
cut part							
Breast (%)	30.00^{b}	31.90^{a}	26.00^{c}	31.70^{a}	26.30^{c}	29.10^{ab}	0.70
Thigh (%)	16.60^{b}	14.50^{cd}	15.60^{bc}	13.00^{d}	18.40^{a}	15.50^{c}	0.50
Drumstick (%)	15.80^{b}	15.50^{bc}	15.40^{c}	14.20^{d}	16.80^{a}	15.50^{bc}	0.30
Wings (%)	12.90^{b}	12.50^{c}	11.50^{d}	12.50^{c}	13.60^{a}	12.50^{c}	0.20
Internal Organ							
Gizzard (%)	1.80^{b}	2.00^{b}	2.60^{a}	1.70^{b}	1.80^{b}	1.80^{b}	0.10
Intestine (%)	5.30	4.90	5.70	5.00	6.00	5.80	0.20

^{a,b,c} means within a row with difference superscripts are significantly different (p<0.05)

gain in broiler chickens fed CALM, Seyed *et al*. (2013) also observed the effect of four medicinal plant and flavomycin on broiler chickens but in contrast observed highest weight in chicken fed flavomycin (antibiotics). Findings support the report of Farhad *et al*. (2011) who observed significant (P<0.05) difference in growth parameters of Ross-304 broiler chickens fed different medicinal plant blend. Maidala *et al*. (2017) also observed higher values in growth parameters in Anak-2000 fed *Moringa oleifera*. Alagbe (2019) also observed higher value in growth parameters of Ross-308 fed CALM. The highest weight observed in T4 affirm the claim of effectiveness of phytogenic feed additives as growth promoter. Debnath *et al.* (2014). Value obtained for dressing out percentage in this study ranged from 75.0-77.7% the highest dressing out percentage was observed in T2 and lowest was observed in T5. Values obtained in this study was higher than the value of 68.60-73.40% obtained by Olumide *et al.* (2018) and lower to the value of 77.33-83% by Akpodiete (1997) and higher than the recommended value of 60.30-74.65% by Bamgbose *et al*. (1998). It can be concluded that the dressing out percentage of broiler chicken fed CALM was within the appreciable recommended value. Carcass yield is an indication of the quality and utilization of the ration (Bamgbose *et al*., 1998). Broiler chickens fed 4% CALM showed superior record in live weight, defeathered weight, eviscerated weight and dressed weight compare to T1 and T2. Pongmanee (2003) also observed similar result in broiler chicken fed 0.4g/kg crude extract of *Centella asiatica*. Portugaliza *et al*. (2011) observed similar result in broiler

chicken fed varying concentrations of aqueous leaf extract of *Moringa oleifera* and obtained significant ($P<0.05$) difference in all the treatment compare to the control diet. The high body weight obtained at 4% inclusion level of CALM showed that phytogenic feed additives (PFA) improve feed efficiency and growth rate. The breast part constitute the larger percentage of the animal muscle breast cut showed significant ($P<0.05$) variation across the treatment with treatment T2 having the largest value of 31.9% and lowest value of 26.0% was obtained in T3 Value obtained from this study ranged from 26.0- 31.9%. Value obtained in this study was similar to the value of 28.08-29.43% obtained by Olumide *et al.* (2018) who fed broiler chicken with varying level of *Ocimum gratissimum*. Drumstick, thigh, wings showed significance ($P<0.05$) variations highest percentage of thigh was observed in T5 and lowest value was obtained in T4. According to Koreleski *et al.* (2007) higher carcass yield was also recorded by the addition of aqueous extracts of coneflower, thyme, Nigella sativa in feed. Marcinčák *et al.* (2011) observed similar observation in breast and thigh muscle weight of chicken fed phytogenic feed additives. The effect of the treatment diets on visceral organs of broiler chickens fed *Centella asiatica* leaf meal. Gizzard values obtained in this finding showed significant ($P<0.05$) value ranged from 1.8-2.6% the highest value was obtained in T3 and lowest value in control diet. Gizzard is a special part of the internal organ that is well appreciated by the consumer and command good price. It can be inferred that gizzard of chicken fed with *Centella asiatica* at 0.3% can be of good economic value to the farmer. The impact of dietary treatments on intestine showed no significant ($P>0.05$) variations across all the treatments with T5 having the highest value of 6.0% and T2 having the lowest value of 4.9% This might be related to the antinutritional factor in the leaf meal causing an increase in weight of internal organ during digestion.

Conclusion

The study has shown that *Centella asiatica* leaf meal improved feed utilization, carcass quality, growth performance of broiler chickens at 4% inclusion level without any detrimental effect on the birds.

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