THE EFFECT OF TURKEY BERRY LEAF MEAL (*SOLANUM TORVUM*) SUPPLEMENT ON GROWTH PERFORMANCE AND SERUM METABOLITES ON BROILERS CHICKEN

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Abstract
The study was carried out to determine the effect of *Solanum torvum* supplemented diets on growth and serum metabolites of broiler chickens. Ninety six (96) day-old broiler chicks were used for the experiment. The birds were fed four (4) experimental diets with each diet replicated six times. Treatment 1, the control had no *Solanum torvum*,treatments 2, 3 and 4 contained 0.2%, 0.4% and 0.6% of *Solanum torvum,* respectively. The feed trial lasted for 42days, Data were collected on body weight, feed intake and feed conversion ratio on weekly basis. four birds were randomly selected from each treatment and blood sample was collected from jugular vein into plain bottles without anticoagulant and were sent to laboratory. serum parameters were assessed. The result showed that treatments had no significant effect ($p<0.05$) on growth parameters. The serum cholesterol was significantly ($p<0.05$) higher in birds fed treatment 1 compared to the treated groups. Cholesterol values of birds fed treatments 3 and 4 were similar ($p>0.05$) but significantly lower ($p<0.05$) than the values recorded for birds fed treatment 1 and higher ($p<0.05$) than the value obtained in treatment 2. The serum creatinine of birds on diets 2, 3 and 4 were similar ($p>0.05$) but significantly ($p<0.05$) higher than birds fed the control diet. The aspartate transaminase concentration of birds fed the control diet was significantly higher ($p<0.05$) than for birds fed treatment 4. Alanine transaminase of birds were not significantly influenced ($p>0.05$) by the treatments. In conclusion, the inclusion of *S. torvum* into broiler diet did not influence body weight gain, feed intake and feed conversion ratio. It is hereby recommended to explore the alternate dietary treatments that may improve broiler chicken growth performance and feed efficiency.

Keywords: Solanum, Glucose, Aminotransferase, Globulin, Metabolizable energy, Growth.

Introduction

The poultry industry in the developing countries like Nigeria is facing some challenges, of which is the increase in the cost of feeds because of high prices of protein and energy sources (Abbas, 2013) as well as the micro nutrients. To encourage growth, health, and to maximize the genetic potential of contemporary fowl, antibiotic growth promoters (AGP) have been incorporated into poultry diets (Bozkurt *et al.*, 2013). The recognition and utilization of herbs and their extracts as natural feed additives in poultry diets have increased in recent years due to their inherent multi-bioactive properties and ability to enhance performance traits, reduce pathogenic bacteria and decrease antibiotic residues in meat (Adodo, 2004).

The utilization of plant and leaf extracts in animal production has found widespread scientific and commercial acceptance as a strategy to improve the health status and performance of animals. Leaf extracts also have appetizing and digestion stimulating properties and antimicrobial effects. Leaf meal supplementation has been included in the diet of poultry as a means of reducing high cost of conventional protein sources and to improve profit margin (Onyimonyi *et al.,* 2012). Leaves can also be used as feed additives for the biological function of birds such as vitamins and trace elements as growth promoters, absorption enhancers, antimicrobial agents and metabolic modifiers (Abaza, 2001, Hassan *et al.*, 2004).

The plant Turkey berries are used to treat a wide range of illnesses, including high blood pressure, wounds, anemia, and bacterial and viral infections (Haider, 2015). They are a good source of proteins, carbohydrates, fats and minerals like potassium, sodium, iron, magnesium and copper. The phytochemicals in turkey berries include phenols, alkaloids, antioxidants, sterols and triterpenes (Bozkurt *et al.*, 2009). These bioactive chemicals may help regulate blood glucose levels (Singh *et al*., 2017). This might be related to the phenols. These phenols function as antioxidants and may promote insulin sensitivity and secretion. Gandhi *et al*. (2011) conducted a study that showed that turkey berries might help reduce blood glucose

levels in diabetic rats. Therefore, this study aimed to determine the effect of turkey berry leaf meal supplement on growth performance and serum metabolites on broilers chicken

Materials and Methods.

Experimental site

The study was carried out at the Poultry Unit of Teaching and Research Farm Department of Agricultural Technology, The Federal Polytechnic Ado Ekiti, Ekiti state, Nigeria. Fresh *Solanum torvum* leaf (Turkey Berry leaf meal) were obtained from Federal Polytechnic Ado Ekiti compound in Nigeria. After harvesting the leaves they were shaded dry and later grinded into powdered form and added to their feed.

Experimental animals and managements

A total number of 96 birds of commercial breeds was used for the experiment. The birds were purchased from a reputable hatchery in Nigeria. The chicks were brooded for two weeks for acclimatization using electric bulb as source of light and heat in the pen. In the brooder house, enough provision was made for space, ventilation, polythene was also used to cover the pen to provide warmth, and protect against cold extreme weather and predator proof roof to protect against predators, they were fed the experimental diets;the starter diet from day old to 28^{th} days of age and finisher diets from the 29^{th} to 42 days. Proper and adequate management practice were undertaken. Vaccinations and medications were given appropriately.

Experimental diets

The experimental diet were formulated with the inclusion of *Solanum torvum* (turkey berry leaf).
The diets were formulated for broiler starter (0-28) days and finisher phase (29-42) days. The basal diets were divided into 4 diets.
Diet 1- control (without supplement), Diet 2 - 0.2% of *Solanum torvum*, Diet 3 - 0.4% of *Solanum torvum*, Diet 4 - 0.6% of *Solanum torvum*

Experimental design

A total number of 96 a-day old broiler chicks were used in the experiment. The birds were allotted to 4 treatment and replicate 6 times, 4 birds per replicate in a randomized design.

Performance indices

The average initial weight of the birds were taken on arrival and the body weight gain were taken on weekly basis, the replicate were usually weighed together and the value were divided by the number of birds to get the average initial weight is subtracted to give average body weight gain in grammes. Average quantity of feed consumed per birds per weeks were recorded for each treatment by subtracting the leftover from quantity of feed measured per diet per week.

Serum

At the six weeks, Blood collection was done in the morning, after the birds have been starved overnight. Four birds were randomly selected from each treatment and blood sample was collected from jugular vein at the termination of the experiment. Blood sample for serum was collected into a plain bottle without anticoagulant The tubes were kept slanting in the wooden rack and the blood sample were centrifuged in order to separate the serum from clotted blood. The serum obtained were assayed for Creatinine, Alanine Amino transferase (ALT), Aspartate Amino transferase (AST).
Aspartate aminotransferase and alanine aminotransaminase were determined manually by spectrophotometric method as described by (Schmidt and Schmidt, 1976). Cholesterol was determined by enzymatic colorimetric reaction according to method of (Siedel *et al*., 1981).

Statistical analysis

All data collected in this study were subjected to statistical analysis using analysis of Variance (ANOVA) experiment in completely randomized design (CRD).

Results and discussion

Effect of levels of *Solanum torvum* leaf meal on growth performance of broiler chickens

Table 1 below showed the Performance characteristics of broiler chicken fed *Solavium torvum* supplemented diet. The results showed that treatments had no significant effect ($p>0.05$) on initial body weight, final body weight, body weight gain, feed intake and feed conversion ratio of broiler chickens fed the experimental diets. However, the feed conversion ratio (FCR) which is an important index of performance accounting for how best feed offered to birds was utilized for meat production is comparable across the treatments. The lower the FCR value, the better the feed utilization, birds with higher FCR value had suppressed growth.
There were no significant variations in growth performance indices measured in response to *Solanum torvum* diets. This constancy in the

body weight disagreed with the reports of Agbulu *et al.* (2010) who found reduction in both body weight and weight gain in broiler chickens fed herbal supplemented diet when used as replacement for methionine. The feed intake remained statistically the same with the control when *Solanum torvum* was added to the diets. The similar feed intake observed in this study could be attributed to the absence or at least tolerable levels of phytic and oxalic acid content in the herb (Mamputu and Buhr, 1991). The similarity in values obtained at all levels of *S. tortum* diets incorporation indicated that the *S. tortum* was acceptable in the diets and the anti-nutritional factors contained in the herb is tolerable (Liener, 1980).

Table 1: Performance characteristics of broiler chicken fed *Solavium torvum* supplemented diet

Parameters	T1	T1	T3	T4	P values
Initial body weight (g)	36.88±1.40	35.80±0.58	36.65±0.46	37.82±0.69	0.460
Final body weight (g)	1713.50±40.63	1591.00±46.35	1614.25±100.59	1656.50±30.22	0.526
Body weight gain (g)	1676.95±40.31	1555.20±46.22	1577.85±100.64	1618.68±29.54	0.531
Feed Intake (g)	2434.50±132.65	2309.25±42.51	2588.25±199.12	2685.25±29.53	0.194
Feed conversion ratio	1.46±0.10	1.49±0.07	1.65±0.14	1.66±0.05	0.346

a,b means with different superscript across the same row are statistically different (P<0.05).

The serum metabolites of broiler chickens fed *Solanum tortum* as feed additive in broiler diets

Table 2 showed the Serum metabolites of broiler chicken fed feeds with addition of *Solanum torvum*. Result shows the serum metabolites of broiler chickens fed *Solanum tortum* as feed additive in broiler diets. The serum metabolites of broiler chicken fed experimental diets indicated that the serum cholesterol concentration was significantly higher ($p<0.05$) in birds fed control diet when compared to the treated groups. Cholesterol values of birds fed treatments 3 and 4 were similar ($p>0.05$) but significantly higher ($p<0.05$) than the values recorded for birds fed treatment 2 and lower ($p<0.05$) than the value obtained in treatment 1 The serum concentration of creatinine of birds on diets 2, 3 and 4 were similar ($p>0.05$) but significantly higher ($p<0.05$) than birds fed the control diet. The aspartate transaminase concentration of birds fed the control diet was significantly higher ($p<0.05$) than for birds fed treatment 4. Alanine transaminase of birds were not significantly influenced ($p>0.05$) by the experimental diets. Protein content was highest ($p<0.05$) in treatment 4 which was similar to treatments 1 and 2 while treatment 3 was significantly lower ($p<0.05$) than treatment 4.

Serum is the fluid and component of blood that does not play a role in clotting because the clotting factor has been removed. The result in this study revealed that *Solanum torvum* reduced the cholesterol value of the birds, the cholesterol value is within the range recorded by Daramola *et al*. (2017). This may be due to the anti-inflammation, and antioxidant activity of the tested ingredient (*Solanum torvum*) (Karuppusamy, 2009; Stuart, 2022). The creatinine values recorded for birds on treatments 2, 3 and 4 were within the range of chemical components in the serum of chicken (Mitruka and Rawnsley, 1977). The creatinine values recorded for birds on treatments 2, 3 and 4 were within the range of chemical component in serum of chicken (Mitruka and Rawnsley, 1977). The kidney removes creatinine from the blood mostly by glomerular filtration. Creatinine tubular reabsorption is little or absent, although creatinine blood levels rise when renal filtration is impaired. As a result, creatinine levels in blood may be used to determine creatinine clearance, which is related to the glomerular filtration rate (Herita *et al*., 2009). The increase in creatinine levels in birds fed experimental diet compared to the control group, signify a potential impact of the experimental diets on renal function and the creatinine levels indicate impaired kidney function or renal disease. The high values recorded for creatinine observed for diets 2, 3 and 4 was a reflection of the poor protein quality of the test diet (Aletor *et al*., 1998). ALT and AST are major indicators used for assessing the liver conditions of animals (Agbede *et al*., 2011). The alanine transaminase was not influenced by

experimental diets. The result for aspartate transaminase revealed the lower levels birds fed experimental diet suggest a protective effect of this particular dietary supplementation. Serum protein levels are important for preserving the immune system and can increase under disease and stress conditions, such as toxicity (Tekce and Gül, 2016). In birds, serum total protein consists mainly of albumin and globulin (Scholtz *et al.*, 2009). Thus, high total protein levels are accompanied by high serum concentrations of albumin and globulin and vice versa (Sigolo *et al.*, 2019). Urea is a protein metabolits and is a useful indicators of nitrogen utilization. In birds, a decreased serum concentration of urea and/or uric acid is related to an increased amino acid incorporation into tissue muscle proteins (Donsbough *et al.,* 2010). The observed variation in protein content in treatments suggests that *Solanum torvum*, in treatment 4, may have a beneficial effect on protein metabolism. This could be due to increased digestibility or utilization of dietary proteins.

Table 2. Serum metabolites of broiler chicken fed feeds with addition of *Solanum torvum*

Parameters	T1	T2	T3	T4
Cholesterol (µmol/L)	7.15±0.07^{a}	4.65±0.07^{c}	5.10±0.14^{b}	5.15±0.00^{b}
Creatinine (µmol/L)	9.60±1.80^{b}	15.65±1.75^{a}	13.90±3.50^{a}	12.15±1.75^{a}
Aspartate aminotransferase (AST) (U/L)	49.10±0.70^{a}	44.40±6.30^{ab}	45.40±0.70^{ab}	39.95±2.45^{b}
Alanine transaminase (ALT) (U/L)	28.00±0.50	30.20±2.40	33.30±1.30	35.05±3.35
Total Protein (g/dL)	37.00±0.50^{ab}	37.70±1.80^{ab}	36.05±0.05^{b}	40.70±0.20^{a}
Albumin (g/dL)	21.20±4.7	17.65±0.45	19.35±0.95	19.35±0.65
Globulin (g/dL)	14.80±4.70	20.05±2.25	16.70±0.90	21.45±0.45
Urea (mmol/L)	8.38±0.29	7.65±0.23	7.75±0.15	8.00±0.10

^{a,b} means with different superscript on the same row are significantly different ($p<0.05$)

Conclusion and Recommendation

The inclusion of *Solanum torvum* into broiler diet had similar body weight gain, feed intake and feed conversion ratio among the treatments and it enhanced the serum metabolites by reducing the cholesterol levels and influencing creatinine concentration positively. It is hereby recommended to explore the alternate dietary treatments that may improve broiler chicken growth performance and feed efficiency.

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