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

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Abstracts

The study was carried out to determine the effect of *Solanum torvum* supplemented diets on growth performance characteristics 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 standing as a treatment and was replicated six times. Treatment 1, the control had 0% Treatments 2, 3 and 4 contained 0.2%, 0.4% and 0.6% of *Solanum torvum,* respectively. Data were collected on growth performance characteristics on weekly basis. At six weeks of age, four birds were randomly selected from each treatment and blood sample was collected from jugular vein into plain bottles without anticoagulant. Data were collected on cholesterol, creatinine, aspartate transaminase and alanine transaminase. The result obtained for body weight gain, feed intake and feed conversion ratio showed that all treatments had no significant effects ($p>0.05$). The results indicated that the serum cholesterol concentration was significantly higher ($p<0.05$) in birds fed treatment 1 (control treatment) when compared to the treated groups. 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 treatments. In conclusion, the inclusion of *S. torvum*into broiler diet had similar body weight gain, feed intake and feed conversion ratio as compared to that of control group of broilers. *S. torvum*at 0.6% can be incorporated in the diets of broiler chickens without any adverse effect on performance.

Keywords: *Solanum tortum,* broiler chicks, Creatine

Introduction

The plant Turkey berries are found on a spiny, flowering shrub which produces clusters of pea-sized, yellow-green berries. Turkey Berry (*Solanum torvum*) belongs to the botanical family of Solanaceae (Plowden, 2013). It is a member of the same plant family as other familiar vegetables such as eggplant, tomato, and peppers (Yang *et a*l., 2014). It is 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 (Koomson *et al.*, 2018).

Turkey berries may have numerous properties that could reduce painand inflammation, while boosting the immunity and lowering blood glucose levels.Turkey berries may also have antioxidant and anticancer properties. Fruits and vegetables are packed with bioactive compounds, which may help manage blood glucose levels. These bioactive compounds may help in controlling blood glucose levels (Singh *et al.*, 2017). *Gandhi et al. (2011)*conducted a study that showed that turkey berries might help reduce blood glucose levels in diabetic rats. This might be due to the phenols. These phenols act as antioxidants and may lead to insulin sensitivity and secretion. This indicates that turkey berry has the potential to lower blood glucose and thus may help in managing diabetes.

Due to its short generation period, high turnover rate, and relatively little capital investment, poultry farming is one of the fastest ways to significantly improve the nutritional standard of the population (Smith, 2011). If broiler chicken performance, biochemical response, and haematological response are promoted and tracked, Nigeria's poultry sector would have advanced beyond its current state. The high price and widespread usage of traditional, commercial multivitamins to promote growth have already done more harm to consumers than benefit. Due

to this, there have been recorded usage of several plant extracts in the production of broilers (Gerry *et al.*, 2010). A range of non-nutritive feed additives have been employed in poultry production over the past several decades to enhance the overall performance of birds due to intensifications in production. 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, 2014). The poultry industry in the developing countries like Nigeria is facing some challenges, of which the greatest 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. The use of shrubs has been suggested to be a viable alternative source of proteins, vitamins and minerals for poultry feeding. Plant leaves are commonly processed into leaf meals for use as poultry feed supplement. (Dhama*et al.,* 2019)

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 may also be utilized as feed additives for biological functions such as vitamins and trace elements as growth boosters, absorption enhancers, antibacterial agents, and metabolic modifiers in birds. (Igugo, 2014)

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 environment in Nigeria. After harvesting the leaves they were shaded dry and later grinded into powdered form, and added to the experimental feed.

Experimental animals and managements

A total number of 96 birds of commercial breeds were 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 the protection against predators and cold (extreme weather).They were fed the experimental diets giving the starter diet up to 28th days of age and finisher diets from the 29th to 42 days. Proper and adequate management practices were undertaken. Vaccinations and medications were given appropriately.

Experimental diets

The experimental diets 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 old broiler chicks were used in the experiment. The birds were allotted to 4 treatments and replicated 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 replicates were usually weighed together and the value were divided by the number of birds to get the average initial weight, and is subtracted to give average body weight gain in grammes. Average quantity of feed consumed per bird per week were recorded for each treatment by subtracting the leftover from quantity of feed measured per diet per week.

Parameters measured Initial Weight, Body Weight Gain, Feed Consumption, Feed Conversion Ratio (FCR) and Feed Intake

Serum metabolites indices

At the six (6) weeks, birds were randomly selected from each replicate. 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 serum was collected into plain bottles 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.

Parameters; Creatinine,Alanine Amino transferase (ALT), Aspartate Amino transferase (AST), Albumin and Globulin

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

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 comparable feed consumption seen in this study might be due to the herb's lack of, or at least tolerable amounts of, phytic and oxalic acid (Al-Hasan *et al*., 2016). 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 (Addisu and Assefa,2016).

Table 1: Performance characteristics of broiler chicken fed *Solaviumsortum*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.

Result shows the serum metabolites of broiler chickens fed *Solanum tortum*as feed additive in broiler diets. The serum metabolites of broiler chickens 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 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 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.

Hyper lipidaemia is one of the risk factors for cardiovascular disease, while cholesterol is the major lipid constituent of atherosclerotic plaque (Daramola *et al.*, 2017). The creatinine values recorded for birds on treatments 2, 3 and 4 were within the range of chemical component in serum of chicken reported by Ilekee*t al*. (2014)The low creatinine value recorded for birds on treatment 1 (control) was clinically non-significant (Saleh *et al.*, 2018). The aspartate transaminase, and alanine transaminase and total protein were not influenced by experimental diets. 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 indicator 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)*

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

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

Conclusion and Recommendation

The inclusion of *Solanumtorvum*into broiler diet had similar body weight gain, feed intake and feed conversion ratio among the treatments and it enhanced the serum metabolites capacity of broiler chicken. It is therefore recommended that *Solanum torvum*could be incorporated up to 0.6% of feed in the diets of broiler chickens without any adverse effect on performance and serum metabolites.

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