Growth performance, carcass yield and blood profile of broiler chickens fed diets containing varying levels of thorn apple (*Datura stramonium*) powder

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Abstract

A total of 180 Ross 308, day-old broiler chicks were used to determine the effect of thorn apple as feed additive on growth performance, carcass, organ characteristics, haematology and serum biochemistry of broiler chicken. They were randomly distributed into four (4) treatments of 3 replicates per treatment and 15 birds per replicate. T1 was the control treatment while T2, T3 and T4 contained 2 g/kg, 4 g/kg and 6 g/kg of thorn apple supplementation levels respectively and were arranged in a complete randomized design. Data on growth performance, carcass yield, organ characteristics, haematology and serum were collected. Result revealed that the highest ($p < 0.05$) weight gain (2.61 kg) and feed intake (4.01 kg) were recorded from broiler chicken fed the diet containing 2 g/kg of thorn apple and the control diet respectively. The best feed conversion ratio (1.35) was recorded for T2 (2 g/kg thorn apple). Highest ($p < 0.05$) carcass proportion (85.5%) was recorded from broiler chicken fed diet containing 2 g/kg of thorn apple while broiler chicken fed diet containing 0g/kg inclusion of thorn apple had the least (76.12%). Other cut parts were statistically ($p > 0.05$) similar. Highest ($p < 0.05$) gizzard and liver (1.79 g and 1.64 g) were recorded from broiler chicken fed diet containing 2 g/kg of thorn apple while broiler chicken fed diet without the inclusion of thorn apple had the least (1.39 g and 1.45 g respectively) values. Highest ($p < 0.05$) packed cell volume (30.00%) was recorded with broiler chicken fed diet containing 6 g/kg of thorn apple while broiler chicken fed control diet had the least (24.25%). Highest ($p < 0.05$) Haemoglobin concentration (13.88%) was recorded with broiler chicken fed diet containing 2 g/kg of thorn apple while broiler chicken fed diet without the inclusion of thorn apple had the least (10.35%). Highest ($p < 0.05$) white blood cell (137.50) was recorded from broiler chicken fed diet containing 2 g/kg of thorn apple while broiler chicken fed diet with 0 g/kg thorn apple had the least (97.00). Highest ($p < 0.05$) cholesterol (4.18 mmol/L) was recorded with broiler chicken fed the control diet while broiler chicken fed diet containing 2 g/kg of thorn apple had the least (2.15 mmol/L). The research concluded that adding 2 g/kg of thorn apple to the diet of broiler chickens can operate as a growth booster, improving carcass, and organ features, as well as potentially preserving and enhancing the health of the birds.

Keywords: broiler chicken, thorn apple, performance, carcass, blood indices.

Desempenho de crescimento, rendimento de carcaça e perfil sanguíneo de frangos de corte alimentados com dietas contendo diferentes níveis de pó de trombeta (*Datura stramonium*)

Resumo

Um total de 180 pintos de corte Ross 308, com um dia de idade, foram utilizados para determinar o efeito da adição de trombeta (*Datura stramonium*) na alimentação sobre o desempenho de crescimento, características de carcaça e órgãos, hematologia e bioquímica sérica de frangos de corte. Os animais foram distribuídos

aleatoriamente em quatro (4) tratamentos, com 3 repetições por tratamento e 15 aves por repetição. O tratamento T1 foi o controle, enquanto T2, T3 e T4 continham 2 g/kg, 4 g/kg e 6 g/kg de trombeta na dieta, respectivamente, e foram organizados em um delineamento inteiramente casualizado. Foram coletados dados sobre desempenho de crescimento, rendimento de carcaça, características de órgãos, hematologia e bioquímica sérica. Os resultados revelaram que o maior ($p < 0,05$) ganho de peso (2,61 kg) e consumo de ração (4,01 kg) foram observados nos frangos de corte alimentados com a dieta contendo 2 g/kg de trombeta e na dieta controle, respectivamente. A melhor conversão alimentar (1,35) foi registrada no tratamento T2 (2 g/kg de trombeta). A maior ($p < 0,05$) proporção de carcaça (85,5%) foi observada nos frangos alimentados com a dieta contendo 2 g/kg de trombeta, enquanto os frangos alimentados com a dieta sem inclusão de trombeta apresentaram a menor (76,12%). Outras partes da carcaça não apresentaram diferenças estatísticas significativas ($p > 0,05$). Os maiores ($p < 0,05$) pesos de moela e fígado (1,79 g e 1,64 g) foram registrados nos frangos alimentados com a dieta contendo 2 g/kg de trombeta, enquanto os frangos alimentados com a dieta sem inclusão de trombeta apresentaram os menores valores (1,39 g e 1,45 g, respectivamente). O maior ($p < 0,05$) volume globular (30,00%) foi observado nos frangos alimentados com a dieta contendo 6 g/kg de trombeta, enquanto os frangos alimentados com a dieta controle apresentaram o menor (24,25%). A maior ($p < 0,05$) concentração de hemoglobina (13,88%) foi registrada nos frangos alimentados com a dieta contendo 2 g/kg de trombeta, enquanto os frangos alimentados com a dieta sem inclusão de trombeta apresentaram a menor (10,35%). A maior ($p < 0,05$) contagem de leucócitos (137,50) foi observada nos frangos alimentados com a dieta contendo 2 g/kg de trombeta, enquanto os frangos alimentados com a dieta sem trombeta apresentaram a menor contagem (97,00). O maior ($p < 0,05$) nível de colesterol (4,18 mmol/L) foi registrado nos frangos alimentados com a dieta controle, enquanto os frangos alimentados com a dieta contendo 2 g/kg de trombeta apresentaram o menor nível (2,15 mmol/L). A pesquisa concluiu que a adição de 2 g/kg de trombeta à dieta de frangos de corte pode atuar como um promotor de crescimento, melhorando as características da carcaça e dos órgãos, além de potencialmente preservar e aprimorar a saúde das aves.

Palavras-chave: frango de corte, trombeta, desempenho, carcaça, índices sanguíneos.

1. Introduction

The demand from consumers for natural, safe, and nutrient-dense animal feed presents a problem for animal nutrition. Growing consumer interest in natural bioactive components has led to the use of herbal plants as advantageous ingredients in the food and feed production industries to replace potentially hazardous synthetic additives (Sacchetti et al., 2005). These sectors are currently looking for effective, safe compounds with proven advantages. Because medicinal plants are inexpensive, dependable, readily available, and have low toxicity, they are widely used and accepted in medical care worldwide by people of all faiths. The earliest materials utilized in alternative medicine to treat a variety of illnesses were, in fact, plants. Antimicrobial, antioxidant, anti-infectious, and anti-tumor properties are among the medicinal and pharmacological benefits of certain plants (Akroum et al., 2009). Many nations have made extensive use of herbal medicine as a fundamental component of primary healthcare (Akinyemi et al., 2005).

In animal husbandry, biochemical markers and hematology are helpful tools. Assessing nutritional deficits, metabolic diseases, animal welfare, and health condition are some of their uses (Menon et al., 2013). The normal reference values of several serum biochemical indices and haematological indicators are used to diagnose the occurrence of disease and malnutrition, depending on the case being investigated. Animal nutrition faces a challenge from consumer desire for natural, safe, and nutrient-dense feed derived from animals.

Many herbs and spices have attracted attention because they are thought to be an untapped source of important compounds that can meet these needs. (Al-Shuwaili et al., 2005). According to certain studies, a variety of herbal plants and their extracts can improve the health of animals, which benefits consumers by increasing the safety and quality of their food (Valenzuela-Grijalva et al., 2017; Pandey et al., 2019). The detrimental aftereffects of synthetic medications on humans and animals make it vital to search for herbal feed additives that might enhance animal health, digestive function, and ultimately ration efficiency (European Union, 2006). Samples of such herbals, commonly used in poultry production, are ginger, black pepper, turmeric, garlic, clove, and jimson weed (Ogbuewu et al., 2019).

The thorn apple, also known as Jimsonweed (*Datura stramonium*), is a tropical African erect annual herb that grows up to 1-1.5 meters tall. It is a member of the Solanaceae family. It is possible to cultivate Datura stramonium as an attractive plant. It is widely used in traditional medicine in West and central Africa and is highly valued for its therapeutic qualities as a narcotic and growth enhancer (Ijeh et al., 1996). The plant has

been considered an excellent source of natural medicine and antioxidants that can help animals avoid stress and probable ailments since it includes alkaloids, tannins, carbohydrates, and protein. (Olusola; Nwokike, 2018). This study is necessary because there is a lack of knowledge regarding the overall impact of thorn apple on broiler performance and productivity.

2. Materials and Methods

2.1 Experimental site

The experiment was carried out at the Poultry Unit of Teaching and Research Farm, Ladoke Akintola University of Technology Ogbomoso, Oyo State, Nigeria. The area is in the derived savannah zone of Nigeria. It lies on longitude 4.50 east of the Greenwich meridian and latitude 8.50 North-East towards Ibadan, the capital of Oyo State. The mean annual rainfall is 1247 mm while the relative humidity is between 75% and 95%. It is situated at about 300-600 m above the sea level with a mean annual temperature of 27 ºC (Ayinla; Odetoye, 2015).

2.2 Test ingredient

Thorn apple was cut to increase the surface area and was air dried until the weight remains constant and milled into fine powdery form as described by Okanlawon et al. (2020) and stored in an airtight container until use.

2.3 Experimental birds and treatments

180 Ross 308 5-day-old chicks were used in the experiment. They were weighed, uniformly divided into four (4) treatments, each containing 45 birds, and then divided into three replicates, each including 15 birds, in a completely randomized design. T1 had 0 g/kg of the test ingredient and was tagged the control treatment, T2 contained 2 g/kg of thorn apple, T3 contained 4 g/kg of thorn apple, and T4 contained 6 g/kg of thorn apple. Data on growth performance, carcass, organ characteristics, haematology and serum biochemistry were collected. Before the arrival of the birds, the pen was clean, washed, disinfected with morigad, Lysol. Feeders, drinkers, and other experiments were cleaned and washed. On arrival of the chicks, they were gently unboxed into the brooding partition pens that had been heated a few hours before their arrival. The birds were subjected to normal brooding with the provision of a source of heat while an electric bulb served as a source of lighting. The birds were fed a diet and water mixed with vitamins and glucose to reduce transportation stress. The experiment lasted for six (6) weeks.

2.4 Data collection and evaluation

2.4.1 Weight gain

The difference between the final and initial body weights was used to calculate weight gain (a top load cammry sensitive scale was used).

$$\text{Total weight gain (g)} = \text{Final body weight (g)} - \text{Initial body weight (g)}$$

2.4.2 Feed intake

Feed intake was recorded every week and estimated as;

$$\text{Feed intake (g)} = \text{Total feed supplied (g)} - \text{feed left over(g)}$$

2.4.3 Feed Conversion Ratio (FCR)

This was calculated as the ratio of the average feed intake to the average body weight gain

$$\text{FCR} = \frac{\text{Average Feed intake}}{\text{Average Weight gain}}$$

2.4.4 Carcass yield study

At the end of the 6th week of feeding trial, two samples of birds were randomly selected from each replicate, and

were slaughtered for carcass analysis. The percentage dressed weight was expressed as:

$$\text{Dressing percentage} = \frac{\text{Empty carcass}^* 100}{\text{Live weight}}$$

After evisceration, the cut part (head, neck, breast, thigh, shank, and drumstick) and internal organs (liver, heart, kidney, gizzard, crop, pancreas, spleen, proventriculus and lungs) were carefully excised and weighed using an electronic weighing scale. The measurements were expressed as percentage relative to the carcass and live weight respectively.

2.4.5 Blood analysis

Four birds were randomly selected from each treatment. About 2.5 mL of blood were collected in tubes containing EDTA anticoagulant to determine the values of haemoglobin concentration, packed cell volume, red blood cells count, total white blood cells count, differential white blood cell count, platelets count, and red cell indices as describe by (Iranloye et al., 2002; Venkatesan et al., 2006). The blood was slowly expressed into EDTA tubes to reduce the risk of haemolysis after removing the needles from syringes (Haen, 1995).

Serum parameters include total protein, which was obtained by biuret method in the assay as described by Kohn & Allen (1995). The globulin concentration was obtained by subtracting albumin from the total protein. Albumin was determined using Bromocresol Green (BCG) method as described by Peter et al., (1982). Aspartate transferase (AST) activities were determined using spectrophotometric methods as described by Rej & Hoder (1983). Alanine transferase (ALT) activities were determined using spectrophotometric methods as described by Rej & Hoder (1983). Serum urea was determined using a kit (Quinica clinical spam) having a linear measurement of about 566.6 ml per litre of urea concentration. The serum urea will be determined calorimetrically. The serum cholesterol was determined using enzymatic endpoint method as described by Roeschlau et al. (1974).

2.5 Statistical analysis

Data collected were analysed using ANOVA as contained in SAS (2002). Significant means were separated using *Duncan* Multiple Range Test of the same software package.

3. Results

Table 1 shows the growth performance of broiler chicken fed varying levels of Thorn Apple feed-based diet. Significant ($p < 0.05$) difference was recorded on final weight gain, weight gain, and average feed intake. Significantly highest ($p < 0.05$) final weight gain (2.73 kg) was recorded from broiler chicken fed diet containing 2 g/kg of thorn apple while broiler chicken fed diet with 0g inclusion of thorn apple had the least (2.31 kg) value.

Highest ($p < 0.05$) weight gain (2.61 kg) was also recorded from broiler chicken fed diet containing 2 g/kg of thorn apple (treatments 2) while broiler chicken fed control diet had the least (2.22 kg). Highest ($p < 0.05$) feed intake (4.01 kg) was recorded from broiler chicken fed the diet without the inclusion of thorn apple while broiler chicken fed the diet containing 4 g/kg of thorn apple had the least (2.73 kg). The best feed conversion ratio (1.35) was recorded from treatment 2. It was significantly ($p < 0.05$) different from the control but statistically ($p > 0.05$) similar to other Thorn Apple based diet.

Table 1. Performance characteristics of broiler chicken fed with thorn apple feed additive.

Parameters	T1	T2 (2 g/kg)	T3 (4 g/kg)	T4 (6g/kg)	SEM
Initial weight	105.63	104.25	106.37	105.73	2.76
Final weight (kg)	2.31^{b}	2.73^{a}	2.55^{a}	2.48^{ab}	0.08
Weight gain (kg)	2.22^{b}	2.61^{a}	2.44^{a}	2.38^{ab}	0.08
Average feed intake (kg)	4.01^{a}	3.71^{b}	3.66^{ab}	2.73^{c}	0.23
Feed conversion ratio (kg)	1.79^{b}	1.35^{a}	1.53^{ab}	1.50^{ab}	0.08

Note: ^{abc} Means on the same row with different superscripts are significantly different ($p < 0.05$). Source: Authors, 2024.

Table 2 shows the effect of thorn apple as feed additive on carcass yield of broiler chicken. Highest ($p < 0.05$) live weight (2.96 kg) was recorded with broiler chicken fed diet containing 2 g/kg of thorn apple while broiler chicken fed diet without the inclusion of thorn apple had the least (2.14 kg). Highest ($p < 0.05$) carcass proportion (85.57%) was recorded with broiler chicken fed diet containing 2g/kg of thorn apple while broiler chicken fed control diet had the least (76.12%) though statistically similar ($p > 0.05$) to other thorn apple based (T2 and T4) diets. No significant ($p > 0.05$) difference was recorded from the mean proportion of the bled weight, eviscerated weight, neck, breast, thigh, and drumstick.

Table 2. Effect of thorn apple on carcass yield of broiler chicken.

Parameters (g)	T1	T2 (2 g/kg)	T3 (4 g/kg)	T4 (6 g/kg)	SEM
Live weight (kg)	2.14^{c}	2.96^{a}	2.65^{b}	2.95^{a}	0.42
Blend (%)	95.74	96.92	96.67	96.97	2.95
Evisceration (%)	82.65	79.14	82.10	82.46	2.31
Carcass (%)	76.12^{b}	85.57^{a}	78.94^{ab}	79.77^{ab}	1.96
Cut Part (g)					
Neck	4.02	4.49	4.02	4.05	0.56
Breast	27.66	28.76	29.89	30.32	0.25
Thigh	10.64	9.38	12.16	11.90	0.14
Drumstick	11.09	10.62	9.52	9.17	0.19

Note: ^{ab} Means on the same row with different superscripts are significantly different ($p < 0.05$). Source: Authors, 2024.

Table 3 shows that the organ characteristics of broiler chicken fed a diet fortified with varying levels of thorn apple feed additive. Significantly highest ($p < 0.05$) value of gizzard (1.79%) was recorded from broiler chicken fed diet containing 2 g/kg of thorn apple while broiler chicken fed control diet had the least value (1.39%). Highest proportion ($p < 0.05$) of liver (1.64%) was recorded from broiler chicken fed diet containing 2 g/kg of thorn apple while broiler chicken fed diet without the inclusion of thorn apple had the least (1.45%). Highest value ($p < 0.05$) of proventriculus (0.37%) was recorded from broiler chicken fed diet containing 2 g/kg of thorn apple-based diet while broiler chicken fed diet without the inclusion of thorn apple (control diet) had the least (0.24%). Highest ($p < 0.05$) proportion of empty crop (0.42%) was recorded from broiler chicken fed diet containing 4g/kg of thorn apple while broiler chicken fed control diet had the least (0.26%). No significant ($p > 0.05$) effect was recorded on kidney, lungs, heart, and spleen.

Table 3. Effect of thorn apple on organ characteristics of broiler chicken.

Parameters (g)	T1	T2 (2 g/kg)	T3 (4 g/kg)	T4 (6 g/kg)	SEM
Kidney	0.11	0.15	0.17	0.14	0.33
Lung	0.43	0.47	0.54	0.47	0.02
Heart	0.35	0.51	0.39	0.35	0.03
Spleen	0.15	0.14	0.13	1.11	0.01
Gizzard	1.39^{b}	1.79^{a}	1.40^{b}	1.74^{a}	0.07
Liver	1.45^{b}	1.64^{a}	1.64^{a}	1.50^{b}	0.02
Proventriculus	0.24^{b}	0.37^{a}	0.26^{b}	0.34^{a}	0.01
Crop	0.26^{b}	0.36^{ab}	0.42^{a}	0.35^{ab}	0.03

Note: ^{ab} Means on the same row with different superscripts are significantly different ($p < 0.05$). Source: Authors, 2024.

The effect of thorn apple on haematological parameters of broiler chicken is shown in (Table 4). Significant ($p < 0.05$) difference was recorded on packed cell volume, haemoglobin concentration, white blood cell, lymphocytes and basophils, which varied significantly ($p < 0.05$). Broiler chickens fed a diet containing 6 g/kg of thorn apple had the highest ($p < 0.05$) packed cell volume (30.00%), whereas those fed a diet devoid of thorn apple had the lowest (24.25%).

Broiler chickens fed a meal containing 2 g/kg of thorn apple had the highest ($p < 0.05$) hemoglobin concentration (13.88%), whereas those fed a diet devoid of thorn apple had the lowest (10.35%). Highest ($p < 0.05$) white blood cell (137.50 uL) was recorded from broiler chicken fed diet containing 2 g/kg of thorn apple while broiler chicken fed diet without the inclusion of thorn apple had the least (97.00 uL). Highest ($p < 0.05$) lymphocytes (78.75%) were recorded from broiler chicken fed diet containing 4g/kg of thorn apple while broiler chicken fed diet containing 4 g/kg of thorn apple had the least (55.50%). Highest ($p < 0.05$) basophils (24.00%) were recorded from broiler chicken fed diet containing 2 g/kg of thorn apple while broiler chicken fed diet containing 4 g/kg of thorn apple had the least (12.50%).

Table 4. The effect of thorn apple on the haematological parameter of broiler chicken.

Parameters	T1 (0 g/kg)	T2 (2 g/kg)	T3 (4 g/kg)	T4 (6 g/kg)	SEM
Pack cell volume (%)	24.25^{b}	29.00^{ab}	26.75^{ab}	30.00^{a}	0.91
HB (gdL)	10.35^{b}	13.88^{a}	12.83^{ab}	12.88^{ab}	0.49
RBC ($x10^{9}$ uL)	2.93	2.46	2.26	2.28	0.23
MCV(fL)	117.75	116.50	117.50	115.75	0.85
MCH (gL)	57.25	56.38	57.00	56.50	0.39
MCHC (gL)	485.00	483.75	483.50	485.50	2.17
WBC ($x10^{9}$ uL)	97.00^{b}	137.50^{a}	135.50^{a}	136.00^{a}	6.19
Neutrophils (%)	16.75	14.75	9.50	11.75	2.18
Lymphocytes (%)	64.50^{ab}	55.50^{b}	78.75^{a}	74.00^{ab}	3.78
Eosinophils (%)	0.75	2.00	1.00	0.50	0.27
Monocytes (%)	4.75	3.75	2.25	3.75	0.61
Basophils (%)	15.25^{ab}	24.00^{a}	12.50^{b}	18.00^{ab}	2.50
Platelets ($x10^{9}$)	37.00	39.00	40.50	42.00	2.62

Note: ^{abc} means the same row with different superscript were ($p < 0.05$) significantly different. RBC: Red Blood

Cell, HB: Haemoglobin, MCV: Mean corpuscular volume. MCH: Mean corpuscular haemoglobin, MCHC: Mean corpuscular haemoglobin concentration. Source: Authors, 2024.

Table 5 shows the effect of thorn apple on serum biochemistry of broiler chicken. Highest ($p < 0.05$) globulin (27.00 g/L) was recorded with broiler chicken fed diet containing 2 g/kg of thorn apple while broiler chicken fed diet without the inclusion of thorn apple had the least (16.00 g/L). Highest ($p < 0.05$) cholesterol (4.18 mmol/L) was recorded with broiler chicken fed the control diet, while broiler chicken fed diet containing 2 g/kg of thorn apple had the least (2.15 mmol/L). Highest ($p < 0.05$) triglyceride (0.55 mmol/L) was recorded with broiler chicken fed diet containing 4 g/kg of thorn apple while broiler chicken fed control diet had the least (0.25mmol/L). Highest ($p < 0.05$) glucose (11.90 mmol/L) was recorded with broiler chicken fed diet containing 2 g/kg of thorn apple while broiler chicken fed control diet had the least (10.40 mmol/L). Globulin increased in the bird fed diet containing thorn apple in T2 (2 g/kg).

Table 5. The effect of thorn apple on serum biochemistry of broiler chicken.

Parameters	T1 (0 g/kg)	T2 (2 g/kg)	T3 (4 g/kg)	T4 (6 g/kg)	SEM
Total protein (g/L)	32.50	31.00	33.00	33.50	0.63
Albumin (g/L)	16.50	14.00	15.50	17.00	0.57
Globulin (g/L)	16.00^{b}	27.00^{a}	17.50^{b}	16.50^{b}	1.44
AST (U/L)	88.25	83.50	81.00	106.00	4.83
ALT (U/L)	11.25	11.50	12.00	11.50	0.45
Alkaline Phosphate (U/L)	162.50	158.00	162.00	147.50	4.10
Cholesterol (mmol/L)	4.18^{a}	2.15^{c}	3.00^{ab}	2.90^{bc}	0.23
Triglyceride (mmol/L)	0.50^{a}	0.20^{c}	0.25^{bc}	0.35^{ab}	0.04
Glucose (mmol/L)	10.40^{b}	11.90^{a}	10.80^{b}	10.43^{b}	0.19
Creatinine (mmol/L)	51.50	58.00	72.50	53.00	3.58
Urea (mmol/L)	3.53	3.80	3.65	3.40	0.06

Note: ^{abc} means the same row with different superscript were ($p < 0.05$) significantly different. AST- Aspartate Transaminase, ALT-Alanine Transaminase. Source: Authors, 2024.

4. Discussion

The result for growth performance showed that the inclusion of thorn apple in the diet helps to improve the growth performance in terms of weight gain, feed intake, and feed conversion ratio of broiler chicken. The increase in the weight gain of treated groups could be attributed to the presence of phytochemical compounds (saponins, tannins, and flavonoids) present in the plant (Meenaksh et al., 2021). When given at a tolerated amount, tannin enhances the utilization of proteins, decreases their breakdown, and lessens intestinal irritation, which boosts feed efficiency and the birds' growth performance.

The broiler weight of the treated groups may have increased as a result of these characteristics, which may have helped with digestion and nutrient absorption. The significant increase in body weight gain and final body weight gain of birds fed diet containing thorn apple was in line with the findings of Javendel et al. (2008) who fed herbal plants (Galic meal) as growth promoters in broiler diets and observed a pronounced improvement in their body weight gain and feed conversion ratio. These results might be due to the impact on good health status of the birds or better absorption in the GIT, which may be caused by the influence of the chemical composition of thorn apple as reported by Meenaksh et al. (2021).

The presence of phytochemical compounds in thorn apples may have contributed to the increase in carcass productivity of broiler chickens given thorn apple-containing diet (Meenaksh et al., 2021). Thorn apples contain phytochemicals called tannins at a reasonable rate, which likely contributes to better growth performance and, consequently, higher carcass yield as reported by Raghdad et al. (2012) and Okanlawon et al. (2024). They claimed that because they contained some phytochemicals, adding phytobiotics to the diet increased carcass

production. The proportion of certain internal chicken organs (liver, proventiculus, gizzard, and empty crop) increases when thorn apple is added to the diet. This is comparable to the findings of Al-Sultan (2003), who found that feeding phytobiotics alters the size of some organs involved in nutrient metabolism. It lessens internal organ inflammation. Including phytobiotics in the diet can sometimes have anti-inflammatory effects (Suha et al., 2014). According to Sreenivasa et al. (2012), thorn apples include phytoconstituents such as alkaloids, glycosides, terpenoids, steroids, flavonoids, tannins, and saponins that would improve the function of internal organs.

The findings on haematology demonstrate that the chicken fed a diet containing thorn apples is more immune than the control group. This is consistent with research by Ademola et al. (2009), which proposed that adding phytobiotics to poultry diets helps strengthen the immune system and prevent or combat diseases because they contain phytochemicals (phenol and alkaloid), as reported by Sreenivasa et al. (2012). The addition of thorn apples to the diet had a negligible effect on the measured haematological markers, and it fell within the range that the Merck Manual (2012) had specified for healthy chicken.

Since the liver is where protein synthesis occurs, these elevated values may be explained by improved host immune function and improved hepatic function. This could also indicate normal energy metabolism as a result of phytogenic feed additives stimulating endogenous enzymes to release glucose, a sufficient and stable substrate required for bodily maintenance and mechanical work.

The serum glucose level, however, fell within the Merck Manual's (2012) recommended range for chicken that was in good health. When the test item was added, the birds' overall blood cholesterol and triglyceride levels dropped. When fatty acids, protein, and glucose levels exceed the body's present requirements, the liver produces triglycerides, which are then deposited in adipose tissue (Esubonteng, 2011). According to Sreenivasa et al. (2012), saponin is a phytochemical found in thorn apples that has been shown in this study to have the ability to lower blood and animal product cholesterol levels. Total protein, albumin, aspartate transaminase, alanine transaminase, alkaline phosphate, creatinine, and urea all fall within the usual range for healthy chicken as stated in the Merck Manual (2012). This will support the liver and kidneys in maintaining their optimal health.

5. Conclusions

The conclusion was that the growth performance, carcass, and organs of broiler chickens were not negatively impacted by the addition of thorn apple to their meals. But to ensure effective feed utilization and the health of broiler chickens, it is advised that thorn apples be used at a rate of 2 g/kg^{-1} of diet.

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7. Authors' Contributions

Rafui Tirimisiyu Adewale: project, laboratory analyses, article writing. *Olayeni Tunji Babatunde*: article writing, statistical analyses, revisions. *Okanlawon Eden Olusegun*: project, laboratory analyses, statistics, post-evaluation revisions, publication. *Hammed Opeyemi Oladipupo*: project, laboratory analyses, and revisions. *Sangoniyi Olakiitan*: project, experimental monitoring, laboratory analyses, post-evaluation revisions. *Ameen Falilat Bola*: laboratory analyses, statistical analysis, revisions, and publication.

8. Conflicts of Interest

No conflicts of interest.

9. Ethics Approval

Yes applicable. Approval for this research was obtained from the Departmental Ethical Committee (LAUTECH-APH20-30) of the Faculty of Agricultural Science (Animal welfare board).

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