Performance, Carcass and Organ Characteristics of Broiler Chicken Fed Varying Levels of Thorn Apple (*Datura stramonium)* Powder

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ABSTRACT
This study was carried out to determine the effect of Jimson weed (Datura stramonium) as feed additive on growth performance, carcass and organ parameters of broiler chicken. A total of 180, Ross 308, 5 days old broiler chicks 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 2g/kg, 4g/kg and 6g/kg of thorn apple supplementation levels respectively. Feeding trial lasted for 6 weeks. Data were collected on growth performance, carcass yield and organ characteristics. Result revealed that highest (P<0.05) weight gain (2.61kg) and feed intake (4.01kg) were recorded from broiler chicken fed diet containing 2g/kg of thorn apple and control diet respectively. Best feed conversion ratio (1.35) was recorded from T2 (2g/kg thorn apple). Highest (P<0.05) carcass proportion (85.57%) was recorded from broiler chicken fed diet containing 2g/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 (1.79g and 1.64g) were recorded from broiler chicken fed diet containing 2g/kg of thorn apple while broiler chicken fed diet without the inclusion of thorn apple had the least (1.39g and 1.45g respectively) values. It can be concluded from the experiment that inclusion of thorn apple at 2g/kg in the diet of broiler chicken can serve as growth promoter with positive effect on growth performance, carcass and mild effect on organ characteristics of broiler chicken.
Keywords: Broiler Chicken, Thorn Apple, Growth performance and carcass yield

INTRODUCTION

Consumer demand for safe, natural, and nutritious feed of animal origin is a challenge to animal nutrition. Consumers' growing interest in bioactive components of natural origin has resulted in the use of herbal plant, as beneficial ingredients in the industries of feed and food production to replace the potentially and harmful synthetic additives (Sacchetti et al., 2005). These industries are currently searching for safe and efficient substances with demonstrated benefits. The affordability, reliability, availability and low toxicity of medicinal plants in therapeutic use has made them popular and acceptable by all religions for implementation in medical health care all over the world. Plants are indeed the first material used as alternative to medicine for treatment against many diseases. Several plants have therapeutic and pharmaceutical effects, for antimicrobial, antioxidant, anti-infectious and anti-tumour activities (Akroum et al., 2009). Herbal medicine has been widely used as an integral part of primary health care in many countries (Akinyemi et al., 2005).

There has been interest in many spices and herbs, as they are considered an unexploited reservoir of valuable substances that can accomplish such demands (Al-Shuwaili et al., 2005). Some research suggested that various herbal plants and their extracts have beneficial effects on animals' health, which improves food safety and quality for the consumer (Valenzuela-Grijalva et al., 2017; Pandey et al., 2019). Therefore, it is necessary to look for herbal feed additives that can improve digestive performance, animal health and eventually increase the efficiency of ration (European Union 2006) because of the harmful residual effect of synthetic drugs on both human and livestock. Samples of such herbals, commonly used in poultry production are ginger, black pepper, turmeric, and jimson weed (Datura stramonium) (Ogbuewu et al., 2019).

Thorn apple commonly called Jimsonweed (Datura stramonium) is an erect annual herb forming a bush up to 1-1.5m tall common in tropical Africa. It belongs to the family Solanaceae. Datura stramonium can be grown as an ornamental plant. It has medicinal properties and is used as a narcotic, growth promoter and it's highly appreciated in West and central Africa, where it is commonly used in traditional medicine (Ijeh et al., 1996). The plant contains alkaloids, tannins, carbohydrate, and protein and has been regarded as a good source of natural medicine and antioxidant which can prevent stress and potential diseases in animals (Olusola and Nwokike, 2018). There is dearth information on holistic effect of thorn apple on broiler production and performance, this therefore necessitates the present study.

MATERIALS AND METHODS

The experiment was conducted at the Poultry Unit of the Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria.

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 air tight container until use.

Experimental Birds and Treatments
The experiment was carried out using 180 Ross 308 5days old chicks, they were weighed and equally distributed into four (4) treatments at 45 birds per treatment and each treatment was further grouped into 3 replicates of 15 birds per replicate in a completely randomized design. T1 had 0g/kg of the test ingredient and was tagged the control treatment, T2 contained 2g/kg of thorn apple, T3 contained 4g/kg of thorn apple and T4 contained 6g/kg of thorn apple. Data were collected on growth performance, carcass yield and organ characteristics.

Data collection and evaluation
The difference between the final and initial body weights was used to calculate weight gain.
Total weight gain (g) = Final body weight (g) − Initial body weight (g)

Feed intake
Feed intake was recorded on weekly basis and estimated as;
Feed intake (g) = Total feed supplied (g)−feed left over(g)

Feed Conversion Ratio (FCR)
This was calculated as ratio of average feed intake to average body weight gain

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

Carcass Yield Study
At the end of 6th week of feeding trial, two samples of birds were randomly selected from each replicate were slaughtered for carcass analysis. The percentage dressed weight was expressed as:

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

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 electronic weighing scale. The measurements were expressed as percentage relative to the carcass and liveweight respectively.
Data collected were analysed using ANOVA as contained in SAS (2002). Significant means were separated using Duncan Multiple Range Test of same software package.

RESULTS AND DISCUSSION
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. Highest ($P<0.05$) final weight gain (2.73kg) was recorded from broiler chicken fed diet containing 2g/kg of thorn apple while broiler chicken fed diet with 0g inclusion of thorn apple had the least (2.31kg) value. Highest ($P<0.05$) weight gain (2.61kg) was also recorded from broiler chicken fed diet containing 2g/kg of thorn apple (treatments 2) while broiler chicken fed control diet had the least (2.22kg). Highest ($P<0.05$) feed intake (4.01kg) was recorded from broiler chicken fed diet without the inclusion of thorn apple while broiler chicken fed diet containing 4g/kg of thorn apple had the least (2.73kg). 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. This result 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). Tannin when fed at tolerant level improves the protein utilization, reduces its degradation and intestinal inflammation thus increase feed efficiency and growth performance of the birds. These properties could be contributed to digestion and nutrient absorption with a subsequent increase in the broiler weight of the treated groups. 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 chemical composition of thorn apple as reported by Meenaksh *et al.,* (2021).

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

Parameters	T1	T2 (2g/kg)	T3 (4g/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

[abc]Means on the same row with different superscripts are significantly different (p<0.05)

Table 2 shows the effect of thorn apple as feed additive on carcass yield of broiler chicken. Highest (P<0.05) live weight (2.96kg) was recorded with broiler chicken fed diet containing 2g/kg of thorn apple while broiler chicken fed diet without the inclusion of thorn apple had the least (2.14kg). 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) different was recorded from mean proportion of the bled weight, eviscerated weight, neck, breast, thigh, and drumstick. There was an increase in carcass yield of broiler chicken fed diet containing thorn apple and this could be as a result of the influence of phytochemical compound that the thorn apple contains (Meenaksh *et al.,* 2021). Thorn apple contains phytochemical (tannins) which probably helps to improve growth performance and thus translate to the increase in carcass yield as reported by Raghdad *et al.,* (2012) and Okanlawon *et al.,* (2024) who stated that inclusion of phytoboitcs in the diet had positive effect on carcass yield due to some phytochemical embedded in them.

Table 2: Effect of Thorn Apple on carcass yield of broiler chicken

Parameters (g)	T1	T2 (2g/kg)	T3 (4g/kg)	T4 (6g/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

[ab]Means on the same row with different superscripts are significantly different (p<0.05)

Table 3: Effect of Thorn Apple on organ characteristics of broiler chicken

Parameters (g)	T1	T2 (2g/kg)	T3 (4g/kg)	T4 (6g/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

[ab] Means on the same row with different superscripts are significantly different (p<0.05)

Table 3 shows that organ characteristics of broiler chicken fed diet fortified with varying level of thorn apple feed additive. Highest (P<0.05) value of gizzard (1.79%) was recorded from broiler chicken fed diet containing 2g/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 2g/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 2g/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.

The inclusion of thorn apple in the diet causes an increase in proportion of some internal organ of chicken (Empty crop, gizzard, proventiculus and liver) which was similar to that of Al-Sultan (2003), who reported that feeding phytobiotics changes the size of some organs involved in the metabolism of nutrients. It reduces inflammation in the internal organs. The inclusion of the phytobiotic in the diets at times serve as anti-inflammation (Suha *et al*., 2014). Sreenivasa *et al.,* (2012) stated that thorn apple contains phytoconstituents such as (alkaloids, glycosides, terpenoids, steroids, flavonoids, tannins and saponins) and this will help the internal organ to function better.

CONCLUSION

It could be concluded that the inclusion of thorn apple in the diets had no detrimental effect of growth performance, carcass and organ broiler chicken. However, it is therefore recommended that the use of thorn apple at 2g/kg diet could be assumed as inclusion level for efficient feed utilization in broiler production enterprise.

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