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Influence of tamarind pulp on growth and carcass characteristics of broiler chickens

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Abstract

A study was conducted to determine the influence of an aqueous solution of tamarind pulp on growth and carcass characteristics of broiler chickens. One hundred and sixty, one week old broilers were divided into 4 treatment groups replicated 4 times in a completely randomized design. The control group was given 0g/L tamarind pulp (TP) while the other groups received 20g/L, 30g/L and 40g/L tamarind pulp in drinking water. Feed and water were provided *ad libitum* throughout the 49 days experimental period. Results showed a significant ($P<0.05$) decrease in feed intake with increased tamarind pulp. The group that was given 30g/L TP had higher ($P<0.05$) final weight, body weight gain and feed efficiency. There were no significant ($P<0.05$) difference observed for water intake, slaughter weight, dressed weight and dressing percentage. Tamarind pulp had significant ($P<0.05$) influence on all cut- up parts. It was concluded that aqueous solution of 30g/L tamarind pulp in drinking water will improve performance without adverse effects on carcass measurements of broiler chickens.

Keywords: Broilers chickens, phytobiotics, tamarind, performance

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Introduction

In the past, nutritionists have used antibiotics to improve performance in the broiler chicken industry (Geidam et al., 2006). But in recent years, the use of antibiotics as feed additives has been banned in most countries of the world because of concerns about the potential increase in antibiotic resistant strains of bacterias and antibiotic residues in poultry products (Windisch et al., 2008). A group of feed additives that have been generating interest in recent times as a replacement for banned antimicrobials in the poultry industry are the phytogenic feed additives (Jacela et al., 2010). These phytogenic feed additives also called phytobiotics or botanicals are usually plant derived compounds that are used to improve productivity of livestock through improved feed intake, improved gut function, antimicrobial activity and antioxidative actions (Windisch et al., 2008).

Tamarind (*Tamarindus indica* L.) is a tree which is indigenous to tropical Africa where it still grows wild (El-Siddig et al., 2006). According to Kumar and Bhattacharyya (2008), the tamarind fruit contains about 55% pulp, 34% seeds and 11% shell (pod). Tamarind has been reported to have anti-diabetic (Gray and Flatt, 1999), anti-inflammatory and cholesterol lowering (Chithra and Leelamma, 1999), antifungal (Basilico and Basilica, 1999), antioxidant (Chithra and Leelamma, 1999) and antimicrobial (Deliquis et al., 2002*;* Singh et al., 2002) properties. In addition, it has appetizing and stimulatory effect in the digestive process (Cabuk et al., 2003), with all these beneficial properties of tamarind, report on its value for poultry are limited. Hence this study was designed to determine the influence of an aqueous solution of tamarind pulp on growth performance and carcass characteristics of broiler chickens.

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Materials and Methods

Tamarind fruit was purchased from local markets within the Maiduguri metropolis, sun-dried for 72 hours and the pulp was separated from the seed. The tamarind pulp (TP) was soaked at the concentrations of 20, 30 and 40g per litre of water for 24 hours then sieved through a poplin cloth into separate containers and used for the experiment.

One hundred and sixty day-old mixed sex hybro broiler chicks obtained from a reputable hatchery were used for the experiment. The chicks were brooded together for the first 7 days on deep litter. At the end of the 7th day, they were individually weighed and divided into 4 treatment groups of similar weight (155.26 ± 1.34) in a completely randomized design with four replications per treatment. Drinking water containing 0, 20, 30, and 40g TP/L was offered *ad-libtum* to groups 1 (control) 2, 3, and 4 respectively. Soy-maize based diets (Table 1) were fed *ad libitum* throughout the 49 days experimental period. Growth performance (feed intake, live weight gain, feed conversion ratio), and carcass measurements formed the response criteria.

Table 1: Ingredients composition of the broiler starter and finisher diets fed during the period of the experiment

Ingredients (%)	Starter diet (0 – 4 weeks)	Finisher diet (4 - 8 weeks)
Maize	34.62	47.61
Wheat bran	8.65	11.90
Whole soy bean	52.23	37.14
Bone ash	2.50	1.50
Limestone	1.00	1.00
DL methionine	0.25	0.20
Lysine	0.20	0.10
NaCl	0.35	0.30
*Premix	0.25	0.25
Total	100	100
Calculated analysis		
Crude protein	24.28	20.12
Crude fibre	4.41	4.332
Phosphorus	0.512	0.50
Calcium	0.149	0.119
Fat	11.231	3.089
ME (Kcal/Kg)	3020.39	3009.06

*Each kg premix contains Vit. A (10000000 iu), Vit. D_6 (2000000 iu), Vit. E (15000 iu), Vit. B (3000mg), Niacin (15000ng),Vit. B_6 (3000mg), Vit. B_{12} (10mg), Vit. K_3 (2000mg), Biotin (20mg), Folic Acid (500mg), Calcium pantothenate (800mg), Chlorine Chloride (250000mg), Manganese (75000mg), Iron (25000mg), Copper (5000mg), Zinc (70000mg), Selenium (150mg), Iodine (1300mg), Magnesium (100mg),Ethoxyquine (500g),BHT (700g).

A known quantity of feed was given daily and the left over weighed the next day to obtain feed intake by difference. The birds were individually weighed at the beginning of the experiment and weekly thereafter and weight gain was calculated by weight difference between two consecutive weighing.

At the end of the experiment, one bird was randomly selected from each replicate, starved of feed overnight (6pm-6am), weighed the next morning using a digital weighing balance and slaughtered for carcass studies. The dressed weight (carcass) and the weight of cut-up parts were expressed as percentages of the live weight.

Statistical Analysis

All data collected were subjected to analysis of variance using statistix (2003) and where means differed; they were separated using the least significant difference (LSD).

Results and Discussion

The effect of the treatments on the growth performance is shown in Table 2. Feed intake decreased ($P<0.05$) with increased tamarind pulp extract. The reason for this was not clear, but probably due to the amount of sugar in tamarind pulp (Coronel, 1991) may have met part of the energy requirement of the birds as chickens are known to adjust feed intake to meet energy requirements (Olomu, 1995). Chowdhury et al. (2005), however, reported no influence of up to 8% dietary tamarind on feed intake of layers. The differences observed may be as a result of the route of administration of the tamarind as theirs was offered through the feed. Also, it is possible that broilers will have a different response from layers to tamarind. Similarly Durrani et al. (2006) reported no significant (P 0. 05) difference in mean feed intake among groups fed an aqueous extract of aloe Vera gel.

The heaviest ($P<0.05$) final body weight was recorded in birds receiving 30g TP/L and the lowest ($P>0.05$) in the groups offered 20g TP/L of water. Final body weight did not differ ($P>0.05$) between the control and the group receiving 40g TP/L. This result is in tandem with the reports of Onu and Aniebo (2011) and Galib et al. (2011) who reported significant (P 0.05) differences on live weight when *Moringa oleifera* leaf meal and hot red pepper respectively were fed to broiler. Similarly Onu (2010) reported that the addition of ginger (0.25%) to the basal diet of broiler chicks resulted in higher body weights.

Birds on the 30 and 40g TP/L converted their feed into meat more efficiently than the control and the group receiving 20g/L. This observation is in consonance with the report of Chowdhury et al. (2005) that feed efficiency improved by feeding tamarind to laying hens. It has been shown that feeding of natural products tends to enhance salivary flow and secretion of various gastrointestinal enzymes which promotes

Table 2: Performance of broiler chicken offered an aqueous solution of tamarind pulp in drinking water

	Concentration of tamarind pulp extract (g/L)				±SEM
	0	20	30	40	
Initial weight(g)	155.79	154.20	154.15	156.92	2.05^{NS}
Final weight(g)	2346.4^{b}	2088.3^{c}	2601.7^{a}	2393.3^{b}	56.16^{*}
Overall weight gain(g)	2190.61^{b}	1858.0^{d}	2401.1^{a}	2192.8^{b}	4.23^{*}
Total feed intake(g)	6171.02^{a}	5761.91^{b}	5727.12^{b}	5014.17^{c}	28.88^{*}
FCE	2.88^{b}	3.10^{a}	2.39^{c}	2.29^{c}	0.04^{*}
Water intake (ml)	644.10	642.51	641.22	643.38	1.67^{NS}

[a, b, c....] Means within the same row bearing different superscripts differ significantly (P<0.05); SEM: standard error of mean; NS: not significant (P>0.05); *: Significant (P<0.05)

Table 3: Effect of tamarind pulp extract on carcass measurements of broilers

	Concentration of tamarind pulp extract (g/L)				±SEM
	0	20	30	40	
Slaughter weight	1815	1880	1915	1660	149.85^{NS}
Dressed weight	1157.5	1204	1269	1087.5	98.52^{NS}
Dressing percentage	63.67	63.51	66.03	65.17	1.5708^{NS}
Thighs	15.39^{b}	14.85^{b}	17.45^{a}	16.33^{ab}	0.5457^{*}
Drumsticks	12.86^{b}	13.31^{b}	14.47^{a}	14.29^{a}	0.2669^{*}
Breast	26.78^{b}	27.34^{b}	29.25^{a}	27.92^{ab}	0.5117^{*}
Wings	12.74^{a}	11.87^{bc}	12.11^{ab}	11.16^{c}	0.2727^{*}
Abdominal fat	3.05^{ab}	4.45^{a}	2.14^{b}	3.51^{ab}	0.5042^{*}

[a, b, c....] Means within the same row bearing different superscripts differ significantly (P<0.05); SEM: standard error of mean; NS: not significant (P>0.05); *: Significant (P<0.05)

digestion and hence better efficiency (Chowdhury et al., 2005; Khan et al., 2012). This may be a possible explanation for the improved efficiency of feed utilisation observed on the 30 and 40g TP/L in the present study.

The means for water intake showed no significant (P 0.05) differences among treatments. This is similar to the report of Durrani et al. (2006) who observed no significant (P 0. 05) difference in mean water intake between groups fed an aqueous extract of aloe Vera gel.

The results of carcass measurements are shown in Table 3. There were no significant (P>0.05) treatment effects on dressed weight and dressing percentages. Significant (P<0.05) differences were however, observed for all the cut up parts with the group on 30gTP/L of water recording the highest (P<0.05) percent thighs, drumsticks and breast muscle compared to those on the 0, and 20g. the values for these parts did not differ markedly (P>0.05) between the 30 and 40g groups as well as among the groups placed on 0, 20 and 40g TP/L. Birds on the 30g/L group deposited less (P<0.05) abdominal fat compared to the group on the 20g/L. Percent abdominal fat did not differ (P>0.05) among the control, 20, and 40g as well as among the control, 30, and 40gTP/L groups. This pattern of fat deposition could not be attributed to the concentration of the test material as birds on the control did not differ from those receiving the highest concentration. The dressing percentages obtained in this study are comparable to the 65-70% reported in broiler chickens in the tropics (Oluyemi and Roberts, 1988). Similarly, the values of the carcass cut-up parts are similar to values reported by these authors. In utilizing a phytogenic feed additive, Onu (2010) reported that addition of ginger to the diets of broilers did not result in significant differences in carcass characteristics. Similarly, Alcicek et al. (2003) reported that an additive of essential oils above 48ppm (oregano, daphine, sage, myrtle, fennel and citrus oil) did not affect the carcass yield of broilers.

Conclusion

From these results, it was concluded that an aqueous solution of 30g tamarind pulp/L of drinking water will improve the growth performance of broiler chickens without deleterious effects on carcass yield and the yield of carcass cut-up parts.

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