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## Tumeric paste enhances feed conversion ratios in broilers

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### Abstract

High productivity in broiler production is influenced by the nature of their feed /diets, utilizable feed ingredients as well as distribution of absorbed nutrients to and through tissues and organs. The beneficial effects of phytochemical substances (turmeric) on carcass characteristics, feed conversion ratio and weight gain in broiler chicken was investigated in this study. Forty (40) day old broilers were randomly allocated into 2 groups namely, group A: treated with 0.5g/kg of turmeric paste and group B: untreated (control). There were no significant differences ( $p>0.05$ ) in feed intake, weight gain and carcass characteristics between the two groups but there was a significant increase ( $p<0.05$ ) in feed conversion ratio (FCR) of broilers treated with turmeric paste (0.30) when compared with the broilers not treated with TP (0.25). Feeding broilers turmeric paste is recommended for production of higher quality broiler meat with reduced fat content.

**Keywords:** Carcass characteristics, FCR, feed intake, Tumeric paste, weight gain

### Introduction

About 85% of human health depends on animal health and with recurrent findings indicating that some health issues are due to excess fat content in diet, saturated fatty acid and cholesterol content leading to prevalent diseases in humans such as cardiovascular diseases, diabetes etc [1]. Reactive oxygen species (ROS) and nitrogen species (RNS) are oxidative products of red cells damage via the alteration of lipid profile and cellular activity, [2]. Consumption of different types of phenolic compounds from natural foods has been suggested to be a solution/means to probably decrease the risk of serious health problems due to their antioxidant activities and antiradical [3]. Anti-oxidative substances in plants have been demonstrated to inhibit the formation of toxic oxidation products, improve nutritional quality and possibly stimulate high performance. Turmeric powder (*Curcuma longa*) belongs to the ginger (*Zingiberaceae*) family. It has aromatic and phenolic compounds (curcuminoids) that act as antioxidant and anti-inflammatory agent. Curcuminoids such as curcumin, demethoxycurcumin and bisdemethoxycurcumin are yellowish turmeric pigments that have antioxidative, anticarcinogenic, and anti-inflammatory properties [4]. Curcumin is the prominently potent curcuminoid, reportedly capable of lowering the activity of reactive oxygen species which elevates the antioxidant enzymes superoxide dismutase, catalase, and glutathione peroxidase levels in the blood. Also, [5] reported curcumin as the active substance in turmeric powder capable of inhibiting the generation of ROS like superoxide anions,  $H_2O_2$  and nitrite radical by activated macrophages, which play an important role in inflammation. Kermanshahi and Riasi [6] indicated that turmeric powder at 0.2% decreased serum triglyceride, total cholesterol and LDL-c concentrations in laying hens.

Pepper is widely cultivated in the tropics principally for its economic and nutritional value. Generally, they exhibit protective coverage against mutagens, carcinogens, cholesterol, obesity and pains [7]. Black Pepper, a flowering vine, belongs to family: *Piperaceae*, genus: *piper* and specie: *nigrum*. It is very rich in glutathione peroxidase and glucose-6-phosphate dehydrogenase [8]. Reported to have good antioxidant property, [9]. It is a hot pungent herb that stimulates digestive tracts by enhancing the secretion of fluids and circulation of blood in the gastrointestinal tract thereby increases the absorption of selenium, vitamin B complex, curcmin (Tumeric), Beta carotene and other nutrients [10].

Black pepper's most active constituent is Piperine and has been found to support the absorption of other herbs, specifically the Curcumins found in Turmeric. Work done by [11] revealed that combining Turmeric and Black Pepper increased the bioavailability of Turmeric by 154% versus Turmeric alone. Piperine seems to enhance the inter-cellular permeability and uptake of Curcumins [12]. The combination of the two antioxidants (Curcumins and Piperine) could have a superior effect compared to single antioxidants in facilitating normal physiological activities in broiler chickens [13]. Therefore, Turmeric Paste (TP) is a mixture of turmeric powder (curcumin), black pepper (piperine) and oil (olive). It is in a semi-solid form that is a paste [14]. Hence, this study targets the anti-oxidative effects of turmeric (*Curcuma longa*) powder and supportive anti-oxidants effects of black pepper on absorption, inter-cellular permeability and uptake of turmeric paste on feed intake, weight gain, feed conversion ratio and carcass characteristics of broiler chickens.

## Materials and Methods

### Experimental site /design

This research was carried out at the poultry unit of Research Farm of college of Veterinary Medicine, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. Forty (40) day old broiler chicks vaccinated against Newcastle and Gumboro diseases were randomly assigned into two groups (group A and B) of 30 chicks each and reared in deep litter system. The Group A was not treated with turmeric paste and this serves as the control while Group B was treated with turmeric paste per os at 0.5g/kg body weight from day two till the 5th week of their lives.

### Research Policy

Animal Ethics Committee guidelines of the Michael Okpara University of Agriculture, Umudike were strictly followed throughout the duration of the experiment.

### Performance measurements

The birds were weighed on arrival and then weekly till the end of the experiment, that is till fifth week. Their live weights were taken, Also, average weight gain and feed conversion ratios (FCR) were calculated and recorded. For determination of carcass characteristics, ten birds were randomly chosen from each replicates, sacrificed and their liver, gizzard, heart, abdominal fat, spleen and proventriculus were collected, weighed and calculated as a percentage of body weight.

For calculation: Total Feed Intake (g) = Total Feed supplied (g) – Total feed left over (g)

$$\text{Average feed intake (g/bird)} = \frac{\text{Total Feed Intake}}{\text{Number of birds}}$$

$$\text{Total weight gain} = \text{Final weight} - \text{Initial weight}$$

$$\text{Feed conversion ratio} = \frac{\text{Total Feed intake (g)}}{\text{Total weight gain (g)}}$$

### Carcass traits and morphometric measurements

At the end of the study (Day 35), birds with nearest average live body weight were randomly selected from each replicate and were deprived of feed for 16 h, then humanely harvested, de-feathered, eviscerated and dressed. The birds were weighed, feet were removed and carcasses were manually

eviscerated and the abdominal fat, and giblets (liver, gizzard, heart, spleen, abdominal fat, proventriculus) were removed. The organs and meat was washed with saline and were weighed to calculate dressing and edible organs weights according to [15].

### Statistical analysis

The data collected were analysed using SPSS version 20 statistical package. All data were expressed as Means  $\pm$  Standard Error of Means (S.E.M). Students't' test was used to compare the two groups which are turmeric paste treated and control (untreated). Least significant difference was dictated at 5% significance level.

### Results and Discussion

Table 1 shows mean feed intake, weight gain and feed conversion ratio of broilers treated with 0.5 g/kg body weight of turmeric paste (TP) and the control (untreated). No significant ( $p > 0.05$ ) differences were observed in average feed intake and weight gain between the two groups except in feed conversion ratio (FCR) of the treated group which was significantly higher ( $p < 0.05$ ) than the group untreated with turmeric paste. This finding on FCR agrees with the report of [16] showing improved FCR with dietary supplementation of turmeric while [17, 18] had a contrary report, indicating that turmeric has no effect on FCR. The increase in FCR of broilers treated with TP though, the group had decreased mean feed intake and weight gain compared to the control group suggests that turmeric paste enables broilers convert every amount of feed (whether little or large) they ingest into mass of flesh/muscle mass at a rate faster than the untreated broilers.

The mean feed intake of the boilers (219.70 $\pm$ 38.56) not treated with turmeric paste were insignificantly higher ( $p > 0.05$ ) than the mean feed intake of broilers (186.30 $\pm$ 37.96) treated with turmeric paste. This result agrees with the report of [17, 19, 20] showing that the inclusion of *Curcuma longa* in the feed of broilers have no effect on feed intake. Although turmeric paste was used in this study and not the powder. This result suggests that the feeding of turmeric paste (which contains olive oil) to broilers may be responsible for the reduced feed intake and weight gain since increasing fat sources to broiler diets decreases the amount of feed intake and in turn improves their feed efficiency [21]. It is possible that the ingestion of TP makes the treated broilers to get satiated quicker than the untreated (control) and the feeling of fullness (in the crop of treated broilers) sends signal to the hypothalamus of the central nervous system which regulates/controls the amount of feed desired/taken thus making the broilers to stop feeding/eating [22]. This perhaps explains the lower feed intake observed in the treated group.

Mean weight gain of broilers treated with turmeric paste (612.60) was insignificantly lower ( $p > 0.05$ ) than that of the untreated broilers (822.10). This report agrees with [23, 24] indicating that supplementation of 0.5% turmeric powder decreased weight gain of broilers. The decrease in weight gain compared to the control maybe attributed to the antioxidant, anti-inflammatory and hypocholestraemic effects of turmeric paste and the synergistic actions of its components [25, 26]. In addition to these reasons, the cause of decreased feed intake may be responsible for the decrease in weight gain recorded in this work. The results from this study disagrees with the findings of [27] who reported that the inclusion of 0.5% turmeric powder significantly increased body weight gain compared to the control in broilers.

**Table 1:** Mean feed intake, weight gain and feed conversion ratio of broilers treated with turmeric paste and the control.

| Parameter (g)         | No Turmeric paste (control) (g) | Turmeric paste treated (g) |
|-----------------------|---------------------------------|----------------------------|
| Feed intake           | 219.70±38.56                    | 186.30±37.96               |
| Weight gain           | 822.10±224.87                   | 612.60±137.83              |
| Feed conversion ratio | 0.27±0.00 <sup>b</sup>          | 0.30±0.01 <sup>a</sup>     |

a, b = means on the same row with different Superscript is significantly different ( $p < 0.05$ )

The mean carcass characteristics of broilers treated with 0.5g/kg of turmeric paste and the control are shown in table 2 below. Means of dress weight (1.56), liver (42.18), abdominal fat (8.71), heart (11.38), gizzard (46.36) and spleen (3.89) of the control group were significantly higher ( $p < 0.05$ ) than the means (1.05, 35.00, 2.26, 7.74, 34.16, and 3.16) respectively of the group treated with turmeric paste at 0.5 g/kg body weight. These results concurs with <sup>[20]</sup> reporting that adding turmeric did not affect the carcass yield including the heart, liver and spleen. In contrary to this result, <sup>[28]</sup> reported that turmeric powder at the level of 0.5 g/kg feed significantly increased the carcass characteristics. Singh *et al.*, <sup>[26]</sup> reported that turmeric is hypocholestraemic. This hypocholestraemic effects was noticed in this study especially in mean abdominal fat weight which was significantly lower ( $p < 0.05$ ) in treated broilers than in the control. [Sugiharto, *et al.* <sup>[29]</sup>, reported that turmeric reduced abdominal fat in broilers by the effect of curcumin on adipocyte apoptosis which results in net catabolism of adipose tissues. This effects may be responsible for the decrease in means of dress weight, liver, abdominal fats, heart, gizzard and spleen of broilers treated with turmeric paste compared to the control. In order words, the significant increase in carcass characteristics of the control may be due to high fat accumulation in the tissues/organs measured in this study <sup>[26]</sup>. Study done by <sup>[30]</sup> agrees with the results of this work indicating that turmeric could reduce abdominal fat contents of broilers by regulating the enzymes activities related to fat metabolism <sup>[31]</sup>. The mean weight of proventriculus of the treated broilers was significantly higher ( $p < 0.05$ ) than the untreated group. This results agrees with the report of <sup>[32]</sup> showing relatively higher weight of proventriculus of broilers treated with 0.5 g/kg of turmeric powder compared with chickens in the control group ( $p < 0.05$ ). The proventriculus (also known as the true stomach) is the glandular stomach of chicken where digestive enzymes are secreted to begin the process of digestion <sup>[33]</sup>. It could be that turmeric paste enhances the growth/development and weight of the proventriculus in the treated broilers compared with the untreated broilers (control).

**Table 2:** Mean carcass characteristics of broilers treated with turmeric paste at 0.5 g/kg and the control

| Carcass characteristics | No Turmeric paste (control) | Turmeric paste treated  |
|-------------------------|-----------------------------|-------------------------|
| Dress weight (kg)       | 1.56±0.07 <sup>a</sup>      | 1.05±0.13 <sup>b</sup>  |
| Liver (g)               | 42.18±1.37 <sup>a</sup>     | 35.00±0.4 <sup>b</sup>  |
| Abdominal fat (g)       | 8.71±0.05 <sup>a</sup>      | 2.26±0.36 <sup>b</sup>  |
| Heart (g)               | 11.38±0.18 <sup>a</sup>     | 7.74±0.22 <sup>b</sup>  |
| Gizzard (g)             | 46.36±0.09 <sup>a</sup>     | 34.16±0.31 <sup>b</sup> |
| Spleen (g)              | 3.89±0.12                   | 3.16±0.41               |
| Proventriculus (g)      | 7.69±1.84 <sup>b</sup>      | 10.04±0.66 <sup>a</sup> |

a, b = means on the same row with different Superscript is significantly different ( $p < 0.05$ )

## Conclusion

Turmeric paste administration improves feed conversion ratio

in broilers and the production of higher quality broiler meat with little or no fat content.

## Conflict of Interest

Not available

## Financial Support

Not available

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