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## Dietary feeding of turmeric (*Curcuma longa*) powder on growth performance and carcass quality of Duck

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The demand for duck meat has been increased recently due to its healthy safety to eat. Duck meat has high nutritional value with unique aroma and taste. It is possible to produce quality and safe duck meat to satisfy consumer requirements. During duck farming, the bird-flu is normally occurred so farmers commonly use antibiotic to cure. However, drug abuse causes food safety concerns. Consumers prefer to green and healthy duck meat originated from fattening but free from antibiotic residue. Yellow bioactive substances in the rhizomes of turmeric (*Curcuma longa*) are curcumin, demethoxy curcumin and bisdemethoxy curcumin responsible for various biological activities. Turmeric powder can be utilized as a potential substitute for infeed antibiotics in livestock diet. Our research attempted to evaluate the dietary feeding of turmeric (*Curcuma longa*) powder (1.0, 1.5, 2.0, 2.5, 3.0%) on growth performance and meat quality of duck. Different parameters of growth performance (feed conversion ratio, weight gain, feed intake, mortality) and carcass quality (dressing percentage, giblet percentage, overall acceptance) of duck were examined after 120 days of rearing under a semi-extensive system. Our research revealed that the dietary supplementation of 2.5% turmeric powder can act as a natural antibiotic to support growth promotion and enhance carcass quality of duck.

**Keywords:** Duck meat, turmeric powder, growth performance, carcass quality, dietary supplementation

### INTRODUCTION

Duck production has the potential to play a major role in agricultural sector. Duck meat has higher muscle fibre content in breast meat compared to chicken, and is considered as red meat (Biswas et al., 2019). Duck has fast-feathering, high growth rate, good feed conversion, proper body conformation, high dressing percentage, high viability, high resistance to a harsh rearing weather condition, considerable immunity to disease, low nutritional requirements compared to broiler chicken (Dariusz et al., 2019). Duck is highly adaptable to backyard and organic farming. Duck meat is mostly obtained from the slaughter of Pekin ducks after fattening under an intensive or semi intensive farming system. Duck carcass is high in protein and low in fat with a

desirable profile of fatty acids, rich in polyunsaturated fatty acid, including linoleic and arachidonic fatty acids (Gornowicz and Książkiewicz, 2011; Muhlisin et al., 2013). Generally, the percentage of fat in duck meat is relatively higher than other common poultry meats (Huda et al., 2011). The aroma of duck meat is relatively stronger than other poultry meats. The higher fat content of duck meat may cause the stronger flavor in duck meat (Chartrin et al., 2006). It's very important to enhance the economic value of duck to satisfy the consumer requirement and improve the producer income (Ahmed et al., 2018).

The usage of antibiotic as growth promoter in poultry has been prohibited owing to safety concern about its residue left in muscle as well as bacterial resistance (Choudhury et al., 2019). Due

to the antimicrobial activity of various phytochemical constituents from turmeric (*Curcuma longa*) powder, it would be an ideal alternative for antibiotic. Turmeric has shown numerous pharmacological activities like antioxidant, antibacterial, antifungal, antiprotozoal, antiviral, anti-inflammatory, anti-carcinogenic, antihypertensive, and hypo-cholesteremic activities (Holt et al., 2005; Prasad et al., 2014; Raskar et al., 2019). Curcumin, demethoxycurcumin and bis-demethoxycurcumin are yellowish curcuminoids as the main antioxidants of turmeric preventing the lipid peroxidation and scavenging free radicals (Wuthiodomler et al., 2000). Turmeric powder has been examined as dietary supplementation for chicken in many literatures. However there was not any research mentioned to the dietary feeding of turmeric powder to duck fattening. Therefore purpose of our study penetrated on the effect of different proportions of turmeric powder on growth performance and carcass quality of duck.

## MATERIALS AND METHODS

### Material

Turmeric rhizomes were purchased in local market, primarily washed under soaking to remove foreign matter, sliced into pieces, sun-dried for 12 hours, and finally pulverized into powder.

### Researching method

Ducks were reared under a semi-extensive systemon 120 days feeding by different formulations: T0- control (basal), T1-supplemented with 1.0% turmeric powder, T2-supplemented 1.5% turmeric powder, T3-supplemented 2.0% turmeric powder, T4-supplemented 2.5% turmeric powder, T5-supplemented 3.0% turmeric powder. They were subjected to washing and treatment. At the end of 120 days, ducks were randomly slaughter to evaluate carcass quality.

### Growth performance and carcass quality evaluation

Prior to their slaughter the live weight (g) of the ducks were recorded. Feed conversion ratio was calculated as feed consumed per unit of body weight gain. Mortality (%) has been checked on a daily basis. Feed intake (g) was evaluated as a primary measure of the growth performance during 120 days. After removal of feathers and complete bleeding, the dressed weight (g) of each duck was

recorded. Dressing percentage (%) was calculated by carcass weight (g) \*100/ live weight (g). Giblet weight (g) including heart, liver, and gizzard was recorded also. Giblet percentage (%) was calculated by giblet weight (g)\*100/live weight (g). Overall acceptance (sensory score) was evaluated by a group of panelists using 9 point-Hedonic scale.

### Statistical analysis

The experiments were run in triplicate with three different lots of samples. The data were presented as mean±standard deviation. Probability value of less than 0.05 was considered statistically significant. Statistical analysis was performed by the Stat graphics Centurion XVI.

## RESULTS AND DISCUSSION

### Effect of turmeric powder (%) supplemented to basal feed on growth performance of duck

The present results showed that turmeric powder supplementation at a dose of 2.5% significantly improved weight gain; reduced feed conversion ratio, feed intake and mortality when compared to other groups (see table 1). Our results were similar to other reports. Nouzarian et al. (2011) suggested that broilers fed 1.16% turmeric supplemented diets exhibited better feed efficiency. The influence of decocted turmeric on performance, haematological parameters and carcass traits of broilers was examined. Addition of decocted turmeric via drinking water could improve stress responses and upgrade the breast weight of broiler chickens (Isroli et al., 2017). Johannah et al. (2019) concluded that turmeric powder could improve growth performance and carcass quality of broilers. It's probably due to the better antioxidant activity and antimicrobial effects contributed by the better bioavailability of curcuminoids and turmerones.

### Effect of turmeric powder (%) supplemented to basal feed on carcass quality of duck

The present results showed that turmeric powder supplementation at a dose of 2.5% or 3.0% significantly improved dressing percentage, overall acceptance while slightly decreased giblet percentage when compared to other groups (see table 2).

**Table 1: Effect of turmeric powder (%) supplemented to basal feed on growth performance of duck**

Variables	T0 (control)	T1 (1.0% turmeric)	T2 (1.5% turmeric)	T3 (2.0% turmeric)	T4 (2.5% turmeric)	T5 (3.0% turmeric)
Feed conversion ratio	1.72±0.01 <sup>a</sup>	1.63±0.02 <sup>ab</sup>	1.57±0.01 <sup>b</sup>	1.50±0.00 <sup>bc</sup>	1.44±0.01 <sup>c</sup>	1.43±0.00 <sup>c</sup>
Weight gain (g)	3405.9±0.00 <sup>a</sup>	3497.65±0.03 <sup>a</sup>	3574.29±0.00 <sup>ab</sup>	3685.32±0.02 <sup>ab</sup>	3761.13±0.03 <sup>b</sup>	3772.48±0.01 <sup>b</sup>
Feed intake (g)	5858.15±0.02 <sup>a</sup>	5723.09±0.01 <sup>ab</sup>	5635.19±0.03 <sup>b</sup>	5519.61±0.01 <sup>bc</sup>	5407.95±0.00 <sup>c</sup>	5397.65±0.03 <sup>c</sup>
Mortality (%)	5.23±0.01 <sup>a</sup>	4.86±0.00 <sup>ab</sup>	4.35±0.02 <sup>b</sup>	4.02±0.03 <sup>bc</sup>	3.76±0.02 <sup>c</sup>	3.70±0.01 <sup>c</sup>

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant ( $\alpha = 5\%$ ).

**Table 2: Effect of turmeric powder (%) supplemented to basal feed on carcass quality of duck**

Variables	T0 (control)	T1 (1.0% turmeric)	T2 (1.5% turmeric)	T3 (2.0% turmeric)	T4 (2.5% turmeric)	T5 (3.0% turmeric)
Dressing percentage (%)	68.73±0.03 <sup>c</sup>	69.02±0.01 <sup>bc</sup>	69.53±0.03 <sup>b</sup>	69.78±0.01 <sup>ab</sup>	69.96±0.02 <sup>a</sup>	70.01±0.01 <sup>a</sup>
Giblet percentage (%)	4.85±0.01 <sup>a</sup>	4.82±0.01 <sup>a</sup>	4.75±0.00 <sup>ab</sup>	4.70±0.01 <sup>ab</sup>	4.52±0.00 <sup>b</sup>	4.49±0.02 <sup>b</sup>
Overall acceptance (sensory score)	6.68±0.02 <sup>c</sup>	6.79±0.01 <sup>c</sup>	7.95±0.03 <sup>b</sup>	8.23±0.02 <sup>ab</sup>	8.76±0.01 <sup>a</sup>	8.80±0.00 <sup>a</sup>

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant ( $\alpha = 5\%$ ).

Our findings were similar to other reports. Al-Sultan (2003) and Wattanachant et al. (2004) found that there was non-significant difference in colour, flavor and overall acceptance of broiler chicken carcass among control and turmeric treated groups. Emadi and Kermanshahi (2007) proved that there was an increase in activity of lactate dehydrogenase and decrease in serum alkaline phosphatase of the chickens by supplementation of turmeric powder in the basal diet. Vashan et al. (2012) and Rajput et al. (2013) proved that turmeric powder addition in the broiler diet could limit abdominal fat content of broilers by adjusting the enzyme activity related to lipid metabolism. Hidayat et al. (2017) who confirmed that turmeric powder feeding had no significant effect on meat quality traits including dressed weight and dressing percentage. Hussein (2013), Mondal et al. (2015), Ukoha and Ununkwo (2016) noticed significant differences in the meat traits including dressing percentage in broiler chicken due to supplementation of turmeric powder in the diet. Yesuf et al. (2017) showed that giblet weight of chicken was not significantly affected by dietary feeding of turmeric powder. Supplementation of 0.5% turmeric powder caused significant improvement of carcass weight, dressing percentage as well as meat quality of broilers (Raskar et al., 2019).

## CONCLUSION

Turmeric (*Curcuma longa*) is of special interest owing to its wide range of beneficial pharmacological effects. Duck farming has been quickly growing, but it's susceptible to bird flu outbreak also. Investigation of duck meat quality and growth performance can provide basic information to enhance duck meat utilization. Our research concluded that turmeric powder can be utilized safely and efficiently as a natural antibiotic in duck diet owing to phytochemical constituents responsible for the therapeutic effects on carcass quality

## CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

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## AUTHOR CONTRIBUTIONS

Add contribution of each author (with abbreviated name) here. For example WEP designed and performed the experiments and also wrote the manuscript. EW, OA, and IDJ performed animal treatments, flow cytometry experiments, tissue collection, and data analysis. AS and MR designed

experiments and reviewed the manuscript. All authors read and approved the final version.

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