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Growth performance and carcass characteristics of broilers as affected by herbal decoction (*Curcuma longa*)

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Abstract

The study aimed to determine the growth performance and carcass characteristics of broilers as affected by turmeric decoction at different levels in the drinking water. Two hundred forty-day-old chicks were distributed in five treatments and replicated six times following the Randomized Complete Block Design. The different treatments used were: T_0: 2.5 ml of commercial antibiotic per liter of water (Control); T_1: 2.5 ml, T_2: 5 ml, T_3: 7.5 ml, and T_4: 10 ml of turmeric decoction per liter of water. The study showed that broilers supplemented with 5 ml to 10 ml decocted turmeric significantly reduced the percent fat, however, comparable performance was noted with the birds given commercial antibiotics in terms of final weight, gain in weight, feed consumption, feed conversion ratio, water consumption, survival rate, dressing percentage, and profit. Turmeric decoction can be used as a substitute for commercial antibiotics in drinking water for broilers.

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Introduction

Poultry production in the Philippines has greatly improved because of advances in technologies and facilities. The main products, meat, and eggs, are major sources of the protein requirements of Filipinos. These products are cheaper as compared to other animal products like pork, beef, chevon, etc. Furthermore, chicken meat and eggs are accepted regardless of religious affiliation. The high-density population, a common practice by commercial poultry raisers, caused the rapid multiplication of pathogenic microorganisms that cause diseases. Most poultry raisers are highly dependent on medicinal drugs for broilers and layers. Abusive use of antibiotics can reduce the development of resistance in microorganisms. Antibiotics can accumulate in the bird's tissues, affecting the quality of meat and eggs and their effect on human health. Antibiotics as growth promoters in poultry feed pose serious health risks to human health because of their residual effects in poultry meat and eggs. Poultry scientists today are challenged to find new alternatives to antibiotics as growth promoters with no side effects for poultry that could be as effective against harmful microorganisms in the gastrointestinal tract and stimulate growth by increasing the efficiency of feed utilization and enhancing immunity. There are a lot of compounds and products in nature that have the potential to stimulate growth and combine various diseases by virtue of being antibacterial or antifungal. Phytobiotics are substances obtained from medicinal plants and herbs that have a wide range of medicinal properties and are the best possible alternatives to antibiotics as growth promoters (Adel-Rahman *et al.*, 2014). Beneficial effects of bioactive plant substances in animal nutrition may include stimulation of appetite and feed intake. It can also result in improved indigenous digestive enzyme secretion, activation of immune responses, and antibacterial, antiviral, and antioxidant actions (Toghyani *et al.*, 2010; 2011).

The medicinal plant turmeric (*Curcuma longa*) is commonly used as a spice in human food. It is a perennial herb and a member of the Zingiberaceae family. The plant grows to a height of 3 to 5 feet and has oblong, pointed leaves that bear funnel-shaped yellow flowers. The rhizome is the part used both as a spice and as medicine. Turmeric (*Curcuma longa*) is a tropical native plant, and the main yellow bioactive substances isolated from the rhizomes of Curcuma are curcumin, demethoxycurcumin, and bisdemethoxycurcumin, which are present to the extent of 2–3% of the total spice in turmeric powder. Curcumin is the main bioactive ingredient responsible for the biological activity of Curcuma. Curcumin has been shown to have several biological effects, including anti-inflammatory (Holt *et al.*, 2005), antioxidant (Iqbal *et al.*, 2003), and hypolipidemic (Ramirez-Tortosa *et al.*, 1999) activities. Curcumin has also been extensively studied as a chemopreventive agent in several cancers (Duvoix *et al.*, 2005). Additionally, it has been suggested that curcumin possesses hepatoprotective, antitumor, antiviral, and anticancer activities (Polasa *et al.*, 1991). It is used in gastrointestinal and respiratory disorders (Anwarul *et al.*, 2006). Based on chemical analysis, it contains oils that include aromatic turmerone (25.3%), a-turmerone (18.3%), and curlone (12.5%). It is therefore imperative to investigate the use of Curcuma longa decoction as a growth enhancer in the drinking water of broilers.

According to Herawati (2006), red ginger contains active compounds such as atsiri oil and oleoresin, which are believed to stimulate digestion and conversion efficiency, increasing body weight gain. The result of their study showed that broilers fed rations with red ginger had significantly lower feed conversion than those on control treatments. The addition of red ginger at levels of 1.5% in the ration gave the highest body weight and the lowest feed conversion. However, they also found out that increasing red ginger in the ration by up to 2% showed lower feed intake. In relation to the study of Mehala and Moorthy (2008), carcass characteristics revealed no significant differences among treatment groups due to the dietary inclusion of *Aloe vera* and *Curcuma longa* and their combinations. The carcass eviscerated weight, ready-to-cook percentage, and giblet weight did not differ significantly between the treatment groups.

Materials and methods

Research design

The study was laid out using the Randomized Complete Block Design (RCBD). The following five treatments were randomly and replicated six times.

To -2.5 ml of commercial antibiotic per liter of water (Control)
T1- 2.5 ml of turmeric decoction per liter of water
T2 - 5.0 ml of turmeric decoction per liter of water
T3 - 7.5 ml of turmeric decoction per liter of water
T4 - 10 mL of turmeric decoction per liter of water

Materials and procedures

The turmeric rhizomes were cleaned, washed, and sliced. One-half kilogram of turmeric was boiled in a liter of water on low heat for 30 minutes. The turmeric decoction was allowed to cool, strained, and stocked in a clean container and stored in a refrigerator. The turmeric decoction was added to plain water according to the levels specific to each treatment for day 1-21. During brooding, birds in the control group were provided with commercial antibiotics (containing chlortetracycline/hydrochloride, vitamin A + B12 for a brooding period (7 days) and electrolytes (containing niacinamide, magnesium chloride, potassium chloride, sodium acetate, sodium chloride and glucose in the drinking water for 8 to 21 days). After 21 days, fresh and clean plain water was provided in all treatments.

Broiler ration

Commercial chick booster ratio was given for 1-14 days, and commercial starter crumble for 15-35 days.

Experimental birds

Two hundred- forty head day-old broiler chicks were distributed at random in five treatments and replicated six times at 8 birds per replicate and housed in wire cages.

Experimental cages and management practices

The experimental cages were cleaned by brushing the walls and flooring with soup and disinfected with disinfectant following the manufacturers' recommendation to prevent the growth and multiplication of disease-causing microorganisms. The cages were left for three days to eliminate the odor. Brooding cages were installed with an electric bulb as a source of heat during the two-week brooding period. Cleaned empty bags were placed at the sides of the cages to maintain the proper temperature and prevent the birds from exposure to drafts. The brooder floors were provided with rice hulls as bedding and were changed every other day. Strict hygiene and sanitation were properly imposed and observed throughout the experiment. *Ad libitum* feeding was employed in all treatments with a pure commercial ration from brooding to 35 days old. A chick booster ration was given to the birds during the brooding period and was shifted to a starter ration thereafter. Mortality was noted from brooding through the growing period.

Data gathering

The following data were gathered:

Final weight (kg): This was taken by weighing the birds on the 35th day.

Gain in weight (kg): This was taken by subtracting the initial weight of birds from the final weight.

Feed consumption (kg): This was obtained by summing up the daily feed intake of broilers from day one to 35th day.

Feed conversion ratio (FCR): This was computed by dividing the total amount of feed consumed by the total gain in weight.

Water consumption (LI): This was taken by summing up the total amount of water consumed from brooding to 35th day.

Dressing percentage (%): This was obtained by dividing the dressed weight by the birds' live weight, multiplied by 100%.

Leaf fat (%): This was obtained by dividing the total leaf fats by the total dressed weight, multiplied by 100%.

Percent lean meat (%): This was obtained by dividing the total leaf fats by the total dress weight multiplied by 100%.

Survival rate (%): This was computed by dividing the total number of survival birds by the total number of birds at the start of the study multiplied by 100%.

Cost and return analysis (P): This was taken by subtracting the cost of feed, medicine, and stock cost from the sale value of birds at the end of the study.

Data analysis

The data gathered were analyzed using the analysis of variance, and significance differences among treatment means were determined using Duncan's Multiple Range Test.

Results and discussion

Final weight

The final weight of the broilers ranges from 1.56 kg to 1.59kg (Table 1). The analysis of variance disclosed no significant difference indicating that the final weight was not affected by the different levels of turmeric decoction in the drinking water of broilers. These findings were in harmony with Sadeghi *et al.*, 2012 that the three herb infusions (5 grams/li of cinnamon, thyme, and turmeric) did not improve the performance of broilers. The current results, however, contradict the findings of Nahid *et al.*, 2014, that supplementation with 1 ml of polyherbal (NNT extract) per liter of drinking water in the treatment group caused a significant increase in body weight and improvement in weekly gain as compared to the control group.

Gain in weight

The gain in weight of broilers ranges from 1.41kg to 1.66 kg. The analysis of variance found an insignificant difference. The curcuminoid content of turmeric (Curcumin, demethoxycurcumin, and bisdemethoxycurcumin) did not affect the gain in weight of broilers (Wang *et al.*, 2016).

Feed consumption

The mean feed consumption ranges from 2.70 kg to 2.92 kg. An analysis of variance revealed no significant differences. The presence of curcumin which serves as an anti-oxidant (Sugiharto, 2020) did not enhance the palatability of broilers. The present study is similar to the study of Isroli *et al.* (2020) that decocted turmeric did not affect the performance of broilers in terms of gain in weight, feed and water consumption, and feed conversion ratio.

Feed conversion ratio

There were no significant differences found on the feed conversion ratio as affected by the levels of turmeric decoction in the drinking water of broilers. The present study contradict to the studies of Irwani *et al.*,2022 and Abdel Raman *et al.*, 2014) that supplementation of turmeric in the drinking water reflected highest significant records on feed conversion ratio and body weight gain of broilers.

Water consumption

The water consumption of broilers during the brooding period was not significantly affected by the levels of turmeric decoction. Although numerical differences can be seen, analysis of variance revealed insignificant result.

Percentage dressing and carcass characteristics

Table 2 shows broilers' dressing percentage and carcass characteristics as affected by turmeric decoction levels. The dressing percentage of experimental broilers ranges from 78.74% to 80.32%, while the percentage of lean meat ranges from 49.74% to 54.91%. The analysis of variance disclosed insignificant results. Carcass characteristics as reflected by percent lean ranging from 49.74% to 54.91%. Meanwhile, the percent fat is significantly affected by the use of different levels of turmeric decoction. Those birds given 2.5ml electrolytes got the highest percent fat followed by 2.5, 5 ml, 7.5 ml, and 10 ml turmeric decoctions. The result is in agreement with the findings of Samarasinghe *et al.* (2003) which stated that broilers diet supplementation with turmeric (1 and 3 g/kg of feed) markedly reduced carcass fat content compared with the control group.

Table 1. Performance of broilers as affected by different levels of turmeric decoction (kg).

Treatment	Final Weight (kg)	Feed Consumption (kg)	Gain in weight (kg)	FCR	Water Consumption (li)
2.5 ml of commercial antibiotics/li water	1.58	2.82	1.47	1.97	0.938
2.5 ml turmeric decoction/li water	1.56	2.71	1.48	1.87	1.063
5 ml turmeric decoction/li water	1.58	2.70	1.41	1.90	1.069
7.5 ml turmeric decoction/li water	1.58	2.83	1.52	1.91	1.077
10 ml turmeric decoction/li water	1.59	2.92	1.66	1.83	1.109

Table 2. Survival rate, dressing percentage, and carcass characteristics of broilers as affected by different levels of turmeric decoction.

Treatment	Survival Rate (%)	Dressing Percentage (%)	Percent Lean (%)	Percent Fat (%) **
2.5 ml of commercial antibiotics/li water	95.0	78.74	51.48	1.50 a
2.5 ml turmeric decoction/li water	100.0	80.01	49.74	1.39 ab
5 ml turmeric decoction/li water	97.50	79.36	54.29	1.31 b
7.5 ml turmeric decoction/li water	97.50	80.14	51.76	1.28 b
10 ml turmeric decoction/li water	97.50	80.32	54.91	1.21 b

Durrani *et al.* (2006) reported that higher dressing percentage, breast, thigh, and giblet weight in broilers fed diets containing 5 g/kg turmeric powder, which contradicts the result of the present study. As to the percent fat, broilers provided with pure water obtained the highest percentage of fat, though comparable to broilers treated with 2.5 ml of turmeric decoction. Further, significantly lower percent fat was obtained from broilers treated with 5.0 ml, 7.5 ml, and 10 ml of turmeric decoction, with a mean of 1.31%, 1.28%, and 1.21%, respectively. The result may be attributed to the hypolipidemic activity of curcumin (Ramirez-Tortosa *et al.*, 2015), which causes a decreased level of fat. The result is in agreement with the findings of Samarasinghe *et al.* (2003), who stated that broiler diet supplementation with turmeric (1 and 3 g/kg of feed) markedly reduced carcass fat content compared with the control group.

Survival rate

The mortality rate is usually higher in the first week of age. The highest survival rate of 100% or 0% mortality was obtained by birds given 2.5 ml of turmeric decoction. The lowest was those birds given 2.5 ml commercial antibiotics per liter of water. The analysis of variance failed to show significant differences.

Cost and return analysis

The cost and return analysis of broilers was not significantly influenced by the levels of decocted turmeric (Table 3). The total expenses include the feed cost, the cost of supplements (electrolytes and turmeric decoction), stock, light, and water, the cost of labor, and the cost of feeders and waterers. The net profit ranged from PhP 20.19 to 26.36 per head.

Conclusion

Based on the result of the study, 5 ml to 10 ml turmeric decoction in the drinking water of broilers resulted to highly significant results in terms of percent fat but comparable to gain in weight, feed conversion efficiency, feed consumption, dressing percentage, survival rate and percent lean meat.

Supplementation of turmeric decoction in the drinking water of broilers was comparable performance with those birds given commercial antibiotics in terms of cost and return analysis of broilers. Levels of turmeric decoction from 5 ml to 10 ml per liter of water can be used as a supplement in the drinking water of broilers.

Table 3. Cost and return analysis using turmeric decoction in the drinking water of broilers (PhP/head).

Treatment	Feed Cost (P)	Turmeric/ Electrolytes	Stock Cost	Light & Water	Other Expenses	Total Expenses	Sales	Net Profit (P)
2.5 ml of commercial antibiotics/li water	77.85	1.41	38	1	22.75	141.01	161.20	20.19
2.5 ml turmeric decoction/li water	74.39	0.09	38	1	22.75	136.23	162.50	26.27
5.0 ml turmeric decoction/li water	74.20	0.19	38	1	22.75	136.14	162.50	26.36
7.5 ml turmeric decoction/li water	77.11	0.28	38	1	22.75	139.14	165.10	25.96
10 ml turmeric decoction/li water	79.61	0.39	38	1	22.75	141.75	166.40	24.65

References

Abdel-Rahman HA., SI. Helal Fathallah, AA. Nafeaa, IS. Zahran. 2014. Effect of turmeric (*Curcuma longa*), fenugreek (*Trigonella foenum-graecum* L.) and/or bioflavonoid supplementation to the broiler chick's diet and drinking water on the growth performance and intestinal morphometeric parameters. Global Veterinaria, 12(5), 627-635.

Al-Sultan I. 2003. The effect of *Curcuma longa* (Turmeric) on the overall performance of broilers, International Journal of Poultry Science **2**, 351-353.

Anwarul HG, Abdul J, Muhammad N, Kashif M. 2006. Pharmacological basis for the use of turmeric in gastrointestinal and respiratory disorders, Life Science **76**, 3089–3105.

Durrani FR, Mohammed I, Asal S, Shahid SM, Naila C, Durrani Z. 2006. Effect of different levels of feed-added turmeric (*Curcuma lon*ga) on the performance of broiler chicks. J. Agr. Biological Science **1**, 9-11.

Herawati. 2006. The effect of red ginger as a phytobiotic on body weight gain, feed conversion, and the internal organ condition of broilers. International Journal of Poultry Science **9 (10),** 963–967.

Irwani, N., & Habsari, I. K. 2022. Feed Intake and Feed Conversion Ratio of Broiler Supplemented with Herb Extract. In IOP Conference Series: Earth and Environmental Science, IOP Publishing. Vol. 1012, No. 1, p. 012069.

Isroli I, Yudiarti T, Widiastuti E, Sugiharto S. 2017. Effect of decocted turmeric on performance, hematological parameters and carcass traits of broiler chickens. Journal of the Indonesian Tropical Animal Agriculture **42(4)**, 263-269.

Mehala C, Moorthy M. 2008. Effect of Aloe vera and *Curcuma longa* (Turmeric) on carcass characteristics and biochemical parameters of broilers, International Journal Poultry Science **7**, 857-861.

Nahid Alam, Jashim Uddin, Tahera Dil Akter, Ishrat Zerin Moni, Firoj Alom, Abdur Rahman, Abdullah Al Norman. 2014. Broiler production by using polyherbal medication (Neem, Nishyyinda, Tulsi and Turmeric extract). International Journal of Innovation and Applied Studies **9(3),** 1161-1175.

Polasa K, Raghuram TC, & Krishna TP. 1991. Turmeric (*Curcuma longa*) induced a reduction in urinary mutagens. Food Chem. Toxicol **29**, 699-706.

Sadeghi GH, Karimi A, Padidar Jahromi SH, Azizi T, Daneshmand A. 2012. Effects of cinnamon, thyme and turmeric infusions on the performance and immune response of 1- to 21-day-old male broilers Rev. Bras Cienc. Avic. **14(1)**, Campinas

Samarasinghe K, Wenk C, Silva KFST, Gunasekara JMDM. 2003. Turmeric (*Curcuma longa*) root powder and mannan oligosaccharides as alternatives to antibiotics in broiler chicken diets. Asian-Australian Journal of Animal Science **16**, 1495–1500.

Sugiharto S. 2020. Alleviation of heat stress in broiler chicken using turmeric (*Curcuma longa*)-a short review. Journal of Animal Behaviour and Biometeorology **8(3)**, 215-222.

Toghyani M, Toghyani M, Gheisari AA, Ghalamkari G, Mohammadrezaei M. 2011. Evaluation of cinnamon and garlic as antibiotic growth promotor substitutions on performance, immune responses, serum, and biochemical and hematological parameters in broiler chicks. Livestock Science **138**,167-173.

Toghyani M, Toghyani M, Gheisari AA, Ghalamkari G, Mohammadrezaei M. 2010. Growth performance, serum biochemistry, and blood hematology of broiler chicks fed different levels of black seed (*Nigella sativa*) and peppermint (*Mentha piperita*). Livestock Science **129**, 173–178. https://www.research.net/publication/264555664.

Wang Y, Wang L, Zhu X, Wang D, Li X. 2016. Choleretic activity of turmeric and its active ingredients. Journal of food science **81(7)**, H1800-H1806.