



Comparative efficacy of neem and turmeric extracts as growth promoter in broilers

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ABSTRACT

The aim of this work was to assess the effect of dietary supplement with neem (*Azadirachta indica*) and Turmeric (*Curcuma longa*) extract in drinking water as a growth promoter agent on growth performance in broiler. A total of 60, day-old chicks were purchased from local hatchery (Nourish Poultry Hatchery Ltd.) and after three days of acclimatization, chicks were randomly allocated into two groups: A & B. Keeping group A as normal control group without any treatment, group B was subjected to treat with 2% neem and turmeric extract in drinking water. At the end of the experiment (30th days), it was found that there was no mortality in both group A & B and all the broilers had an increased body weight comparing with control group A (Net body weight gain in group A: 1720±43.5g and group B: 1824±51.25g at day 30). At the view of economic analysis, the net profit of broiler per kg was at Taka 9.83 (Group A) and Taka 19.85 (Group B). On the basis of the result of the study, it was concluded that supplementation of 2% neem and turmeric extracts improve the growth performance of broiler can be a step for the production of organic broiler in Bangladesh.

INTRODUCTION

The poultry production systems have led to marked increase in the production of poultry meats and eggs throughout the world. It has triggered the discovery and widespread use of a number of “feed additives”. These feed additives are termed as “growth promoters” and often called as non-nutrient feed additives. Many synthetic drugs and growth promoters are supplemented to the broilers to affect rapid growth, but their use have shown many disadvantages like high cost, adverse side effect on health of birds and long residual properties etc (Armstrong, 1986).

Positive effects of growth promoter can be expressed through better appetite, improved feed conversion, stimulation of the immune system and increased vitality, regulation of the intestinal micro-flora, etc. In any case, expected results of

the use of these additives are increased financial effects of production. Because of the fact that growth promoters have different mechanisms of action, it is necessary to present every group individually and present the effect, which can be expected with their utilization. With the development and wide use of synthetic and semi-synthetic antibiotics, pros and cons have been experienced throughout the last 50 years, which have been directed research back to natural antimicrobial products as indispensable resources (Singh and Pandey, 1992).

In intensive farming system, growth promoter has become an essential part of diet in improving feed conversion ratio (FCR), significant reduction of mortality rate, enhancing digestion power etc. The use of natural growth promoters such as various plant extract has been proven to be successful.

Organic poultry is a relatively new expression in western countries which is going to expand in other countries. In this kind of poultry method, farmers do not use chemical compounds at all or in a very low level for sake of customers, instead they use alternatives like organic acids, probiotics, and medicinal plants, and despite of higher price of this method, these products have more fans in the costumers. There are a lot of reports indicating the positive effects of herbs like anti-coccidial, anti-oxidant, anti-fungi etc.

Some of medical Effects of herbs are related to their secondary metabolites such as phenols, necessary oils, saponins etc (Akhtar et al., 2006). Herbs have been used for some disease since long time ago because of availability, easy usage and non side effects.

On the other hand, the use of antibiotics for growth promotion has arisen with the intensification of livestock farming. Infectious agents reduce the yield of farmed food animals and, to control these, the administration of sub-therapeutic antibiotics and antimicrobial agents has been shown to be effective. The use of growth-promoters is largely a problem of intensive farming methods. Many of these synthetic drugs and growth promoters are supplemented to broiler diets to effect rapid growth, but their use have shown many disadvantages like high cost, adverse side effect on health of birds and long residual properties and carcinogenic effect in humans. So, researchers are now concentrating efforts on the use of our ancient medicinal system to find beneficial herbs and plants, which can be safely used to increase production.

The use of antibiotic as growth promoters in livestock has been banned due to concern about their residues in animal tissue and induction of bacterial resistance. Due to these concern researchers, it have evaluated alternative growth promoter such as probiotics and prebiotics, which benefits the health of digestive tract (Patterson and Burkholder, 2003). However, manufacturing these alternatives is costly and time-consuming and their effects have not been clearly proven (Sadeghi et al., 2012).

Some researchers have evaluated herbs and their essential oils. It has been shown that the dietary incorporation of herbs and their essential oils may provide beneficial effect on poultry performance and health due to the antimicrobial activity of their phytochemical components (Lee et al., 2004). Beneficial effects of bioactive plant substances in animal nutrition may include the stimulation of appetite and feed intake, the improvement in endogenous digestive enzyme secretion, activation of immune response and antibacterial, antiviral and antioxidant actions (Toghyani et al., 2010, 2011).

More than 135 compounds have been so far isolated from neem (Biswas et al., 2002). Neem products are used for treatment of a whole amount of diseases, including skin infection, cardiovascular disorder, diabetes and cancer. It has important fungicidal and anti-malarial properties.

Considering the hazards of antimicrobials and beneficiary effects of herbs and spices, scientists are again concentrating on the use of our ancient medicinal system to find beneficial herbs and plants, which can be safely used to increase the production. One of such plant is turmeric (*Curcuma longa*).

The active ingredients found in Turmeric (*Curcuma longa*) are curcumin, demethoxy-curcumin, bisdemethoxycurcumin, (Wuthi-Udomler et al., 2000) and tetrahydrocur-cuminoids (Osawa et al., 1995). Plant extracts were found to have antifungal, (Wuthi-udomler et al., 2000) and anti-oxidative value (Osawa et al., 1995; Iqbal et al., 2003). Some pharmacological activities of Turmeric (*Curcuma longa*) as nematocidal (Kiuchi et al., 1993), hypolipidaemic (Ramirez-Tortosa et al., 1999) and anti-inflammatory (Ammon et al., 1993; Holt et al., 2005) were demonstrated. Curcumin has also been studied extensively as a chemo preventive agent in several cancers (Duvoix et al., 2005). Additionally, it has been suggested that curcumin possess hepatoprotective, antitumor, antiviral and anticancer activity (Polasa et al., 1991). It is used in gastrointestinal and respiratory disorders (Anwarul et al., 2006). Moreover Soni et al. (1997) proved the protective effects of Turmeric (*Curcuma longa*) as feed additives on aflatoxin-induced mutagenicity and

hepato-carcinogenicity. In our previous study, we demonstrated that the medicinal plant herbs *Nigella sativa*, guava leaf meal, buckwheat, mulberry leaf and buckwheat supplemented feed improved growth performances and decrease serum cholesterol of poultry birds (Siddiqui et al., 2015; Islam et al., 2014; Rahman et al., 2013; Sayed et al., 2013; Islam et al., 2011). So, we are again concentrating on the use of our ancient medicinal system to find beneficial herbs and plants, which can be safely used to increase poultry production. Keeping this view in mind, the research was conducted to investigate the effect of feeding turmeric (*Curcuma longa*) powder on the growth performances and carcass characteristics of commercial broilers.

Turmeric (*Curcuma Longa*) is a tropical plant. The main yellow bioactive substances of curcuma are curcumin, demethoxycurcumin and bisdemethoxycurcumin which are present to the extent of 2-5 % of the total powder (Kiuchi et al., 1993; Ammon et al., 1993 and Osawa et al., 1995). Curcumin is the main important bioactive ingredient responsible for the biological activity. Curcumin has been shown to have hypolipidaemic (Ramirez Tortosa et al., 1999), antioxidant activity (Igbal et al., 2003) and anti-inflammatory (Holt et al., 2005). Curcumin has also been studied as a chemo preventive agent (Duvoix et al., 2005). It is used in gastrointestinal and respiratory disorders (Anwarul et al., 2006). Studies have shown that supplementing broiler diets with turmeric enhance their performance (Al-Sultan.2003 and Durrani et al., 2006). However, Mehala and Moorthy (2008) demonstrated that 0.1 and 0.2 % turmeric powder used as feed additive had no significant effect on the performance and carcass yield of broiler chickens. A number of studies have been conducted to evaluate its effects on broiler performance, and laying hens, however, the results have not been consistent. The current study was designed to evaluate the effect of different levels of turmeric powder on broiler performance, carcass yield and bacterial count. The study was performed to know the effect of neem and turmeric extract on the growth performance of broilers.

MATERIALS AND METHODS

Experimental shed and bird

A total of 60 day-old Cobb 500 broiler chicks were purchased from a local hatchery (Nourish Poultry & Hatchery Limited). Day-old broiler chicks, 60 in number, were brought in the experimental shed made at Department of Pharmacology, Bangladesh Agricultural University research shed. The birds were kept on cage system in separate pens each measuring 3 × 4 square feet. Then the broiler chicks were managed carefully. All the birds were provided same management conditions like floor space, temperature, relative humidity, ventilation and light. Immediately after unloading from the chick boxes the chicks were given vitamin-C and glucose to prevent the stress occurring during transport.

The broiler chicks were kept in the same compartment for 7 days and brooding temperature were correctly maintained. All the groups were reared under the similar conditions of temperature, humidity, light, ventilation and floor space. The litter management was also done very carefully. The starter and grower broiler rations were supplied to the broiler chicken appropriately. A weighed amount of the ration was offered to the birds twice a day and the left over feed was collected to calculate feed consumption of the birds.

Preparation of neem and turmeric mixture

Young, fresh and blooming neem, leaves were collected locally. The dried leaves were ground separately using the Mixture blender to produce neem leaf meal (NLM) and stored in air-tight bags. Turmeric (*Curcuma longa*) was bought from local market. The superficial bulk of turmeric were removed and then washed with distilled water and sliced into small pieces.

For the preparation of dust, the leaves were dried in sun for 10 days and followed by oven at 55-60°C for 2 days. The dried leaves were pulverized with a blender. A 25mm mesh diameter sieve was used to obtain the fine dust; the dust was preserved in air tight plastic container until they were directly used for screening and preparation of water extract. *Curcuma long* a rhizomes were

cleaned and sliced into small pieces. Then rhizomes were made paste by mortar and pestle and water was added to for extract. For the preparation of 2% extract, 10 gram neem leaf powder and 10 gm turmeric was added to 1000 ml of distilled water. Then it was shaken thoroughly at room temperature, heated and filtered. Sodium chloride was added 5 gm as preservative.

The experiment

After 7thdays all the 60 broiler chicks were randomly divided into 2 groups (A & B) for assessing the efficacy of turmeric extract as growth promoter on broilers. Chicks of group A was kept as non-treated control and chicks of group B was kept as treated with 2% neem and Turmeric extract with drinking water for next 30thdays. All the chicks of treated and control groups were closely observed for 30 days and following parameters were studied.

The experimental birds were kept on a case system in separate pens. A weight amount of the feed was offered to the birds twice a day and the remaining feed was collected to calculate feed consumption of the birds. Fresh and clean water was made available at all the times. The experiment was conducted according to the completely randomized design and data about per replicate body wt., weekly body wt., weekly feed consumptions and mortality were recorded during the experimental period (1-30 days of age).

Antemortem and postmortem examination of bird

The effect of neem and turmeric extract on body weight of broilers was recorded before and after treatment. The weight of broiler chickens was taken weekly. Mean live weight gains of each group of chicken on 7th and 30th days were recorded. Feed Consumption and Feed Conversion Ratio were also recorded at weekly basis.

Blood samples were collected from wing vein of chicken of both control and treated groups at day 30th to observe the Hemoglobin estimation (Hb) and Packed Cell Volume (PCV) as described by Lamberg and Rothstein (1977).

At the end of each experiment a sample of five randomly selected birds from each group was slaughtered to estimate the dressing percentage. Before slaughtering, each bird was weighed and numbered and after those birds were slaughtered, dressing, carcass, giblets percentages were then measured as follows- Dressing % = Carcass weight/live weight x 100; Giblets % = (Liver + Gizzard + Heart + Spleen) weight/Live weight x 100.

Five broilers from each group were slaughtered to see if there were any pathological changes present on 30thday after treatment. There were no significant pathological changes in any internal organs of the broilers of treatment group.

Statistical analysis

The data thus collected regarding weight gain, feed consumption, feed conversion ratio, dressing percentage, relative weights of heart, gizzard, liver, spleen & pancreas and different hematological parameters of control and treated groups were analyzed statistically by the well known student's test ('t' test) : Statistical Package for the Social Sciences (SPSS version 11.5) (Wellman, 1998).

RESULTS AND DISCUSSION

Effect on growth

The birds using drinking water supplemented with 2% turmeric and neem leaf extract in B group gained the higher live weight than Control group A. The birds of group B using drinking water were supplemented with 2% turmeric and neem leaf extracts utilized their feed significantly (at 1% level) more efficiently than control group.

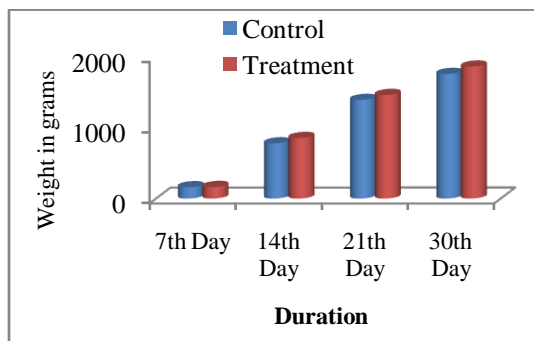
Table 1: Initial and final live weight, weight gain, feed consumption and feed conversion ratio of broilers supplemented with neem leaf and turmeric extracts.

Variables	Treatment	Average weight (Mean±SEM)	P Value	Significance level
Initial live weight (g) on 7 th day	Control	160±3.44	0.05	NS
	Neem & Turmeric extract	163.5±3.56		
Final live weight (g) on 30 th day	Control	1761± 47.29	0.00	**
	Neem & Turmeric extract	1865±58.56		
Net Weight gain (g)	Control	1720±43.5	0.00	**
	Neem & Turmeric extract	1824±51.25		
Feed consumption (g)	Control	3430±34.5	0.00	**
	Neem & Turmeric extract	3320±51.28		
FCR	Control		1.99	
	Neem & Turmeric extract		1.82	

Table 2: Dressing percentage, Relative giblet weight and Pancreas weight of broilers supplemented with neem leaf and turmeric extracts

Variables	Treatment	Average weight (Mean±SEM)	P value	Significance level
Dressing Percentage	Control	64.70±0.44	0.001	**
	Neem & Turmeric extract	66.4 ±0.34		
Relative heart weight	Control	0.46±0.051	0.001	**
	Neem & Turmeric extract	0.49±0.034		
Relative gizzard weight	Control	1.33±0.05	0.001	**
	Neem & Turmeric extract	1.516±0.012		
Relative liver weight	Control	3.44±0.04	0.001	**
	Neem & Turmeric extract	3.82±0.02		
Relative spleen weight	Control	0.27±0.016	0.05	NS
	Neem & Turmeric extract	0.46±0.011		
Relative pancreas weight	Control	0.32±0.018	0.001	**
	Neem & Turmeric extract	0.47±0.015		

** = Significant at 1%; NS= Not significant; Relative weight (g) = Weight of organ / Live body weight of bird X 100; Dressing % = Dress weight of bird / Live weight of bird X 100

**Figure 1:** Comparison of body weight of experimental chickens

Data revealed that the dressing percentage of birds in the treated group increased significantly ($p < 0.00$) compared to non treated control (Table 1). The relative weight of heart, gizzard, liver and pancreas increased significantly ($p < 0.001$) in treated group compared to no treated group indicating the effect of neem and turmeric treatment of the relative body weight of the birds after 30th day post treatment (Table 2). The Comparison of body weight of experimental chickens at different ages from day 7th to day 30th are demonstrated in figure 1.

Table 3: Cost benefit analysis of neem leaf and turmeric extracts treated groups with control group

Description	Control	Neem leaf and Turmeric extract
Cost/chick (Taka)	60	60
Average feed consumed(kg)/bird	3.43	3.32
Feed price/kg (Taka)	43	43
Cost of herbal growth promoters (Taka)	0.00	5.0
Feed cost / broiler (Taka)	147.49	142.76
Miscellaneous(Taka)	25	25
Toal expenditure / broiler (Taka)	232.49	227.76
Average live weight (kg)	1.72	1.82
Sale price/kg live weight (Taka)	145	145
Sale price / broiler (Taka)	249.4	263.9
Net profit / broiler (Taka)	16.91	36.14
Profit / kg live weight (Taka)	9.83	19.85

Table 4: Effect of neem leaf and turmeric extracts on hematological parameters of broiler

Blood Parameters	Treatments	Average blood parameters value (Mean SEM)	P Value	Significance level
30th Day Hb (g/ml)	Control	7.12± 0.491	0.01	**
	Neem &Turmeric extracts	7.45±0.111		
PCV (%)	Control	22.00± 0.134	0.004	**
	Neem & Turmeric extracts	23.95± 0.022		

Supplementation of neem leaves and Turmeric in the treatment groups caused improvement in the feed efficiency as compared to that of non-treated control group. Birds supplemented with neem leaves and Turmeric had higher body weight, weekly gain weight, feed consumption and feed efficiency. These results may be due to antimicrobial and anti-protozoal properties of neem and Turmeric which helped to reduce the microbial load of birds and improved the feed consumption and feed efficiency of the birds. However, supplementation of neem leaves and turmeric Rhizome to the treatment groups significantly increased the live body weighed and

Cost benefit analysis

The average rearing cost of broilers for group A (control) was Tk. 231.49 and Tk. 227.76 for treatment group B excluding the cost of labour because the experiment was conducted at the Department of Pharmacology research shed, Bangladesh Agricultural University, Mymensingh. Miscellaneous cost summed up Tk. 25 per broiler, which included the estimated cost of electricity and disinfectant. The average live weight/broiler in groups A and B were 1.72 kg and 1.82 kg respectively. The broilers were sold in live weight basis at the rate of Tk. 145/kg. The net profit/Kg live weight in the respective group excluding the cost of labour was found to be Tk. 9.83 Tk. and Tk. 19.85, respectively.

Effect on hematological parameters

Observation of hematological parameter (Hb, PCV) on 30th day showed significant difference among the non treated control, neem leaf and turmeric extracts treated groups (Table 4).

improvement in weekly gain in weight and feed efficiency as compared to that of control group of broilers. Growth promoting effects in broilers by using medicinal plants was reported earlier in Bangladesh by Nath et al. (2012).

Addition of herbal growth promoter neem leaves and Turmeric improved the weight gain of the broilers in this study. These results are in line with the findings of Meraj (1998), who reported that higher weight gain in broilers, drinking water supplemented with Nishyinda and Turmeric extract.

The provided drinking water supplemented with herbal growth promoters, neem, nishyinda leaves and Turmeric rhizome utilized their feed more efficiently than those supplied drinking water without addition of the growth promoters. These results are in line with the findings of Ahmad (2005), who reported higher weight gain in broilers fed rations supplemented with garlic.

The use of neem leaves and Turmeric rhizome extract with drinking water showed more increase in live weight of the birds as compared to control group in this study, which is also in agreement with the findings of Samanta and Dey (1991), who concluded that powdered garlic may be incorporated as a growth promoter in the ration of Japanese quails.

Supplementation of neem and turmeric extract also increase dressing percentage values of the broilers in this study. The results of the present study are not in line with those observed by Ahmad (2005), who reported a non-significant effect on broiler dressing percentage values due to the inclusion of garlic in the diet of broilers. Inclusion of 1% neem leaves and Turmeric extract with drinking water exerted significant effect on the mean relative heart, gizzard, liver, spleen, pancreas weights of the broilers used in this study. Use of various levels of herbal growth promoters in the rations exhibited an increase in the profit margin of the broilers as compared to those using ration without the addition of these growth promoters. Supplementation of 2% neem leaves and Turmeric with drinking water was found to be more profitable than without garlic supplementation in broiler rearing. The results of the present study are in accordance with the findings of Ahmad (2005), who reported that dietary inclusion of garlic in the rations was more beneficial in broiler production.

Increase in the profit margin of the birds supplied drinking water containing herbal growth promoters may be attributed to the better efficiency of feed utilization, which resulted in more growth and better feed to gain ratio, ultimately leading to higher profit margin in the broilers reared on neem leaves and Turmeric supplemented drinking water.

CONCLUSION

The results of the present study showed that supplementation of diet with 2% NLM+TRM improve performance, feed utilization, dressing percentage and carcass yield therefore this combination of neem Turmeric extract can serve as an effective replacement for chemical based growth promoters in broiler production. Further studies are needed to explore the mechanism of these benefits in birds.

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