



# Effects of Neem (*Azadirachta indica*) and Tulsi (*Ocimum sanctum*) Extract in the Growth Performance of Broiler with Economics of Production

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## Abstract

This experiment was conducted to check the efficacy of Neem leaves (*Azadirachta indica*) and Tulsi leaves (*Ocimum sanctum*) extract supplementation in drinking water as a growth promoter in broiler chickens. A total No. of 20 day-old Cobb-500 broiler chicks was properly reared and after seven days of acclimatization chicks were randomly divided into two groups, A and B. The group A (n=10) was kept as a control and not treated. The group B (n=10) was treated with 3% Neem and Tulsi leaves extract supplemented with feed and drinking water. Weekly observations were recorded for live body weight gain, feed consumption, feed efficiency and hematological parameter up to 30<sup>th</sup> days age of broiler to evaluate the changes between the control (A) and treatment (B) groups. After 30<sup>th</sup> days of experiment the net body weight was gained 1530 ± 33.07gm and 1700 ± 34.04gm, respectively; while weight gain at the starting point (7<sup>th</sup> days) of leaves extract supplementation of birds were 140.00 ± 18.73gm and 145.06 ± 11.06gm, respectively. So, the net profit per broiler in the respective groups excluding the cost of labor was found Tk. 9.30 and Tk. 29.20 respectively. The Feed Conversion Ratio (FCR) of treatment group B was (1.88) better than the control group (2.15). The hematological parameters of TEC, PCV, ESR values of treatment group shows significant difference, while Hemoglobin (Hb) estimation did not show any significant difference from control group. The results suggest that better growth performance could be achieved in broiler supplemented with Neem and Tulsi leaves extract.

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## Introduction

Bangladesh is an agricultural country where livestock is one of the most powerful components in the economy through contributing the gross domestic product and creating employment opportunity. Poultry industry in livestock is becoming a leading industry in the country. This sector has grown an annual rate of around 25 percent for the last two decades and has an immense potential for boosting the economic growth by supplying quality protein at the lowest price [1]. Poultry industry is most probably the only sector that can grow vertically and produce maximum amount of egg and meat using in minimum land. While there are so many sources of protein food but it is not possible to fulfill this demand without broiler as the duration of broiler rearing is very short and within 36-42 days it is ready for market. So, poultry sector will grow more rapidly and investment would be doubled within the next decade.

According to our socio-economic situation, the knowledge of our farmers is very little because most of them are not properly trained on broiler production, but unemployed young generation is coming in this business for short return of value and profit. Therefore pharmaceutical companies are taking this advantage and convincing the farmers for using more antibiotics as a growth promoter or life savings of chicken. As a result, each broiler is a depot of antibiotics. When human consume these broilers, this antibiotic residue enters into human body and causing one of the most common hazards is resistance of organism to antibiotics [2].

Studies have also been shown that the use of Antibiotic Growth Promoters (AGPs) contributes to contamination of flocks and food products by antibiotic resistant pathogens, including *Campylobacter*, *Salmonella*, *Enterococcus* and *Escherichia coli* and thereby to increased risks of human infections by these and other resistant pathogens [3,4]. Consequently there is much research interest in the possible use of natural products such as essential oils and extracts of edible and medicinal plants, herbs and spices, to develop new additives in animal and poultry feeding, which could serve as safer alternatives to increase the production, reduced toxicity and least health hazards. Biological trials of certain herbal formulations as growth promoter have shown encouraging results and many reports have demonstrated improved weight gain, feed efficiency, lowered mortality, and increased immunity and viability in poultry [5].

Bangladesh is abundant in plants that possessing interesting pharmacological properties and still awaits exploitation by scientific evidences in the field of poultry feeding. Therefore, it is a matter of great interest to try some of our indigenous medicinal plants or herbs as growth promoters in poultry diets [6]. The trees Neem (*Azadirachta indica*) and Tulsi (*Ocimum sanctum*) are indigenous plant of Asian subcontinent known for its useful medicinal properties since ancient times. Neem and Tulsi have attracted worldwide prominence due to its vast range of medicinal properties like antibacterial, antiviral, antifungal, antiprotozoal, hepato-protective and various other properties without showing any adverse effects [7]. The Neem (*Azadirachta indica*) contains azadirachtin and Tulsi (*Ocimum sanctum*) includes ursolic acid, apigenin and luteolin, those are biologically active compounds, that activates the cell mediated immune response in the body. So, the feeding of Neem and Tulsi leaves to immunosuppressed birds increase their humoral and cell mediate immune responses [8]. Indian MateriaMedica also describes the use of these plants in the treatment of a number of ailments like bronchitis, rheumatism and pyrexia [9]. From

the above points of view, this work has been undertaken with the following aims:-

- To investigate the growth performance of broiler supplemented with 3% Neem and 3% Tulsi leaves extract with economics of production.
- To check the effect of Neem and Tulsi leaves extract on hematological parameters (TEC, PCV, ESR and Hb) of broiler.

## Materials and methods

To complete the research work following steps were followed.

### Collection and preparation of plant materials

Mature and disease free Neem and Tulsi leaves were collected from BAU Botanical Garden. After washing, the fresh leaves were cut into small pieces and dried in oven at 55-60°C for 2 days. Then crushed in a mortar and pestle to make into powder form. Then 30 gm Neem and 30 gm Tulsi were measuring by weighting machine, mixed with water to made up to 1 liter and added 5gm salt as preservative. Then boiled it upto 1 hour, after boiling the extract was pour into a clean bottle and stored in a refrigerator at 4°C to preserve the active ingredients of juice. 10ml Neem and Tulsi extract was mixed with 1 liter drinking water.

### Management of experimental shed and broilers

At first the shed for rearing the broiler chickens was prepared properly. The experimental units were kept on a floor litter system in separate pens each measuring 3x4 square feet. The pens were thoroughly cleaned, washed and disinfected before putting the experimental chick into there. A total of 20 day-old Cobb 500 broiler chicks purchased from a local hatchery (Nourish Poultry & Hatchery Ltd.) and brought in the experimental shed. 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. Optimum light was provided daily throughout the experimental period. The chicks were brooded at 31°C temperature during first week and thereafter; the temperature was reduced by 3°C every week until reached to the room temperature i.e., 25 ± 1°C. The litter management was also done very carefully. A weighted 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.

### Experimental design

After 7 days all the 20 broiler chicks were randomly divided into 2 groups (A and B) for assessing the efficacy of Neem and Tulsi leaves extracts with drinking water as growth promoter. Chicks of group 'A': Were kept as control and not treated. Chicks of group 'B': Were treated with leaves extract through drinking water for next 30 days. All the chicks of treated and control groups were closely observed for 30 days and following parameters were studied.

**Clinical examinations:** The effect of the Neem and Tulsi leaves extract on body weight of broilers was recorded before and after treatment. Broiler chicks of control and treatment groups were weighted with spring weighting machine weekly. Mean live weight gain of each group of chickens were recorded on 7<sup>th</sup>, 14<sup>th</sup>, 21<sup>st</sup> and 30<sup>th</sup> days.

**The performance trial:** Within 30<sup>th</sup> days of experimental period, the growth performance was evaluated. Body weight and feed consumption were recorded and then calculated the body gain and feed conversion ratio. Mortality was also recorded throughout the study on 7<sup>th</sup>, 14<sup>th</sup>, 21<sup>st</sup> and 30<sup>th</sup> days.

**Feed consumption:** Feed consumption is the amount of feed consumed in every week; it was calculated for each treatment at weekly basis. At the end of the week, the residual amount of feed was weighted and subtracted from the known weight of feed at the beginning of week.

**Hematological parameters:** Blood samples were collected from wing vein of chicken of both control and treated groups at 30<sup>th</sup> days of study and the parameters of Total Erythrocyte Count (TEC), Hemoglobin Estimation (Hb), Packed Cell Volume (PCV), Erythrocyte Sedimentation Rate (ESR) were calculated as the methods described by Lamberg and Rothstein., [10].

**Postmortem examination for side effects:** Three broilers from each group were slaughtered to see any pathological changes present at the age of 30<sup>th</sup> days of treatment. Any significant pathological changes in the internal organs of the broilers of treatment group were not found.

**Statistical analysis:** The data were analyzed statistically between control and treated groups of chickens by paired student's "t" test. The differences were considered statistically significant at P<0.05.

## Results

### Effect of neem and tulsi leaves extract on growth in broilers

This study was conducted to know the effects of Neem (*Azadirachta indica*) and Tulsi (*Ocimum sanctum*) in the growth performance of broiler with their economics of production. So experiment was carried out according to the completely randomized design and data about per replicate body weight, weekly body weight, weekly feed consumptions and mortality during the experimental period (1 to 30 days of age). The birds of B group were supplemented with Neem and Tulsi leaves extract through drinking water and gained the higher live weight (Table 1) compared with control group.

In control group (Group A) initial average live weight on 1<sup>st</sup> day was 42.80 ± 10.31gm, final live weight on 30<sup>th</sup> days was 1530 ± 33.07gm, weight gain from 7<sup>th</sup> days was 1390.00 ± 14.34gm and feed conversion ratio (FCR) was 2.15. Whereas in Group B initial average live weight on 1<sup>st</sup> day was 40.67 ± 13.11gm, final live weight on 30<sup>th</sup> days was 1700 ± 34.04gm, weight gain from 7<sup>th</sup> day was 1554.94 ± 22.98gm, and FCR was 1.88 respectively (Table 2).

Between two groups (A and B), dressing percentages were compared and found no significant difference. Similarly, after slaughter data also not found any variations among other internal organs such as heart, gizzard, liver, spleen and pancreas weight.

Statistical analysis of data did not show any significant difference between the relative gizzard weights of two groups but 1% level of significance of relative heart, liver, spleen and pancreas weight between the birds of two groups with or without supplementation of Neem and Tulsi leaves extract were observed (Table 3).

### Economics of production

The average rearing cost of broilers in two groups were Tk. 220.20 and Tk. 225.80 respectively (Table 4), excluding the cost of labor because the experiment was conducted on the Department of Pharmacology research shed, Bangladesh Agricultural University, Mymensingh. Miscellaneous cost summed up Tk. 20 per broiler, which included the estimated cost of electricity, litter and disinfectant. 1.700 kg was the average live weight gain/broiler in group B while 1.530 kg live weight gain/broiler in group A.

So, the net profit/Kg live weight in the respective groups excluding the cost of labor was found Tk .6.08 and Tk. 17.17 respectively where the broilers were sold @ Tk. 150/kg in live weight basis. According to this Study, about 11.09 Tk. profit/kg live weight was achieved than the control group that indicate a good economic margin of profit in the broiler production similar observation was recorded in Akter et al., [11].

### Effect of neem and tulsi leaves extract on hematological parameters of broiler

The hematological observation in this study suggested that the parameters of TEC, PCV and ESR on 30<sup>th</sup> days showed significant difference (P<0.05) in Neem & Tulsi leaves extract treated groups than the control group, on the other hand Hemoglobin (Hb) estimation was non-significant (Table 5). This study also coincides with the study of Wankar et al., [12].

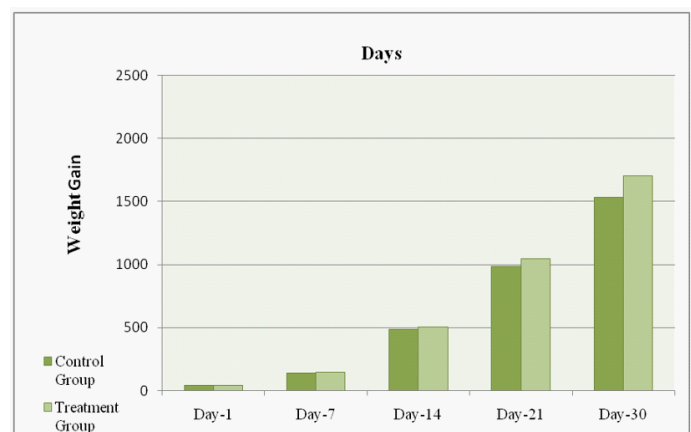


Figure 1: Body weight of experimental broiler chicken.

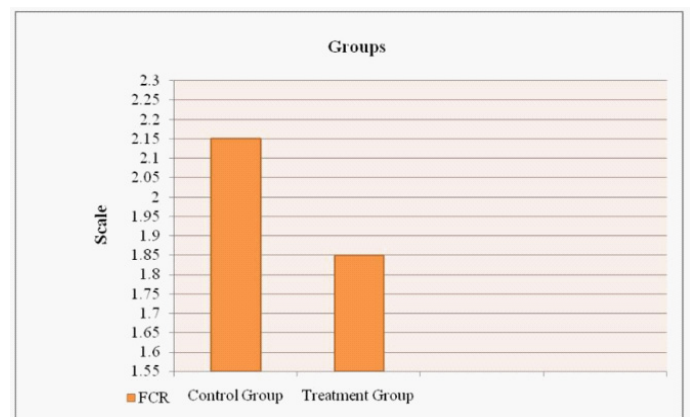


Figure 2: Comparison of Feed Conversion Ratio (FCR).

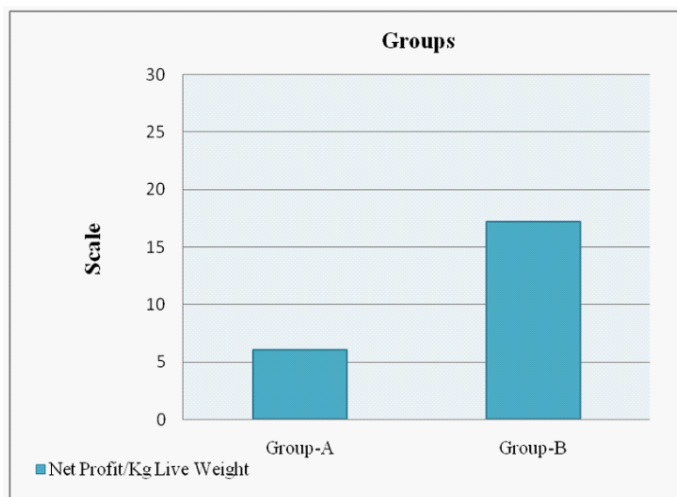


Figure 3: Net Profit/kg live weight (Taka).

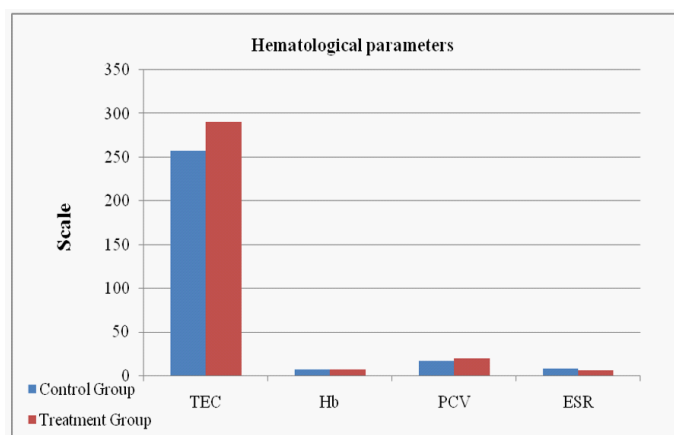


Figure 4: Different Hematological parameters of broiler.

Table 1: Body weight gain of broilers.

Body wt. gm	Day 1 Mean ± SD	Day 7 Mean ± SD	Day 14 Mean ± SD	Day 21 Mean ± SD	Day 30 Mean ± SD
Control n=10	42.80 ± 10.31	140.00 ± 18.73	486.00 ± 13.70	986.54 ± 3.07	1530.00 ± 33.07
Treatment n= 10	40.67 ± 13.11	145.06 ± 11.06	503.00 ± 17.56	1048.40 ± 94.0	1700.00 ± 34.04
% increase	0	11.82	12.14	12.64	17.23

Table 2: Initial and final live weight, weight gain, feed consumption and feed conversion ratio of broilers supplemented with or without Neem and Tulsi leaves extract.

Variables	Treatments	Average weight (Mean ± SEM)	P value	Significance level
Initial live weight (g) on 1 <sup>st</sup> day	Control	42.80 ± 10.31	0.000	**
	Neem & Tulsi	40.67 ± 13.11		
Final live weight (g) on 30 <sup>th</sup> day	Control	1530.00 ± 33.07	0.000	**
	Neem & Tulsi	1700.00 ± 34.04		
Weight gain from 7 <sup>th</sup> day (g)	Control	1390.00 ± 14.34	0.000	**
	Neem & Tulsi	1554.94 ± 22.98		
Feed consumption (g)	Control	3300.00 ± 25.45	0.000	**
	Neem & Tulsi	3200.00 ± 45.95		
FCR	Control	2.15		
	Neem & Tulsi	1.88		

Table 3: Dressing percentages, relative giblet weight (heart, gizzard, liver and spleen) and pancreas weight of broilers supplemented with or without Neem and Tulsi leaves extract from 1-30 days of age.

Variables	Treatments	Average value (Mean ± SEM)	P value	Significance level
Dressing percentage	Control	64.380 ± 0.422	0.925	NS
	Neem & Tulsi	64.420 ± 0.955		
Relative gizzard weight	Control	1.445 ± 0.044	0.604	NS
	Neem & Tulsi	1.455 ± 0.024		
Relative heart weight	Control	0.410 ± 0.028	0.001	**
	Neem & Tulsi	0.505 ± 0.035		
Relative liver weight	Control	2.510 ± 0.028	0.001	**
	Neem & Tulsi	2.550 ± 0.042		
Relative spleen weight	Control	0.110 ± 0.015	0.010	**
	Neem & Tulsi	0.120 ± 0.020		

Relative pancreas weight	Control	0.220 ± 0.015	0.001	**
	Neem & Tulsi	0.240 ± 0.017		

\*\* = Significant at 1% level of probability (0.00-0.01) & NS = Not Significant ( $\geq 0.05$ )

Relative weight (g) = Weight of organ/Live body weight of bird X 100

Dressing % = Dressing weight of bird/Live weight of bird

**Table 4:** Data showing economics of broiler production kept under treatment and control groups from day old to 30 days of age.

Description	Group-A	Group-B
Cost/chick (tk)	55	55
Average feed consumed (Kg)/chicks	3.3	3.2
Feed price/kg (tk)	44	44
Cost of herbal growth promoters (tk)	0	10
Feed cost (tk)	145.2	140.8
Miscellaneous (tk)	20	20
Total cost/broiler (tk)	220.2	225.8
Average live weight gain (Kg)	1.53	1.7
Sale price/Kg live wt. (tk)	150	150
Sale price/broiler (tk)	229.5	255
Net profit/broiler (tk)	9.3	29.2
Net Profit/ Kg live weight (tk)	6.08	17.17

## Discussion

This experiment was conducted in the Department of Pharmacology, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh. Where a total 20 day-old Cobb-500 commercial broiler chicks were randomly divided into two groups i.e. control group (A=10 chickens) and treatment group (B=10 chickens) to carry out this research work. Both Tulsi and Neem leaves extract as an herbal growth promoters, improved the weight gain of the broilers. This study has also revealed that there is a positive relationship between Tulsi and Neem leaves extract doses on the body weight (Table 1), feed conversion ratio (Table 2), and also on the hematological effects (Table 5). The performance of birds fed with Tulsi and Neem showed significantly better economic performance as compared to the control group (Table 2). similar findings were recorded in Akter et al., [11]. These results related with Chakraverty and Prasad., [13] who achieved highest body weight gain and best feed conversion ratio as compared to control when offered Tulsi and Neem leaves extract to broilers from 1 to 6 weeks. Koul et al., [14] have also reported that Neem and Tulsi extract suppresses pathogenic bacteria including *Staphylococcus aureus*, a *Salmonella paratyphi* and *Klebsiella pneumoniae*. Nagalakshmi et al., [15] and Gowda et al., [16] were also agreed that Neem bitters possess a strong influence on hematological traits particularly PCV and Hb of subjects depending on their nutritional status.

Keeping the control group (A) without any treatment only fresh water and group (B) subjected to treatment with 3% Neem and Tulsi leaves extract through feed and drinking water. The treatment group (B) was recorded statistically significant (at 1% level) increase for live body weight and about 17tk net profit/kg body weight was recorded than that of control group A. The hematological parameter TEC, PCV and ESR value of treatment group showed significant difference while hemoglobin estima-

**Table 5:** Study of Neem and Tulsi leaves extract on hematological parameters of broiler on 30th day.

Blood parameters	Treatments	Average blood parameters value	P value	Significance level
		(Mean ± SEM)		
TEC (mm <sup>3</sup> )	Control	257.67 ± 1.025	0.001	**
	Neem & Tulsi	290.49 ± 0.755		
Hb (gm/dl)	Control	6.95 ± 0.496	0.245	NS
	Neem & Tulsi	7.45 ± 0.120		
PCV (%)	Control	17.25 ± 0.136	0.011	**
	Neem & Tulsi	19.45 ± 0.222		
ESR mm in 1 <sup>st</sup> hour	Control	8.45 ± 0.368	0.003	**
	Neem & Tulsi	6.25 ± 0.454		

tion did not show any significant variations between respective groups of broiler (Table 5). Besides the Feed Conversion Ratio (FCR) of treatment group B is better (1.88) than the control group (2.15).

No published research reports of similar nature has not been found in Bangladesh, so our results could not be compared, but in others countries like India and Pakistan somewhat similar work has been conducted and our results have similarities with them [6].

## Conclusion

From this experiment, it is therefore, concluded that broiler supplemented with Neem and Tulsi leaves extract can improve the feed consumption and feed efficiency for economic production and zero mortality without any antibiotics and vaccines but only ensuring the proper bio-security. As only few trials have been performed to evaluate the medicinal value of Neem and Tulsi leaves extract and this experiment was performed in small scale basis with limited modern equipments. So, before field application of Neem and Tulsi leaves as an alternative for antibiotic growth promoter further trial on a large scale basis is needed and effective further study is essential to determine the different antibody levels in broilers of treated group.

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