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Effect of tulsi (*Ocimum sanctum*) leaves extract as a growth promoter in broiler production

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Abstract: This study was conducted to determine the efficacy of tulsi (*Ocimum sanctum*) leaves extract as a growth promoter in broilers from January to June 2013 under Dept. of Pharmacology, Bangladesh agricultural University, Mymensingh-2022, Bangladesh. Fourty number of day old broiler chicks were taken and after seven days divided into two groups A and B. The B group was supplemented with tulsi leaves extract @ 1ml/litre in drinking water. Weekly observations were recorded for live body weight gain up to 5th weeks and blood test was performed at 17th and 35th days age of broiler to study hematological changes between control A and treatment B group. No significant difference in hematological changes was observed in both treatment and control group in 1st week of age but significant change in body weight gain was observed on 35th day. They are 1500 g (control) and 1650 g (treated). The cost of production and economic study was carried out and it was observed that net profit in control group was 5.33 T.K/Kg broiler and in treatment group was 13.33 T.K/Kg broiler. Bacterial sensitivity test was positive in case of *Escherichia coli* and produced zone of inhibition 0.5 cm and other was negative.

Keywords: tulsi leaves extracts; growth promoter; broiler; weight gain

1. Introduction

Livestock plays a vital role in the rural socio-economic system as maximum households are directly involved in livestock. Around 22 core poultry are remaining in Bangladesh (DLS, 2016). About 44 percent of daily human intake of animal protein comes from livestock products. The poultry industry has been supplying quality protein to the people of Bangladesh at the lowest price in the world. Use of growth promoter is highest when the animal is in poor health and the living conditions unhygienic. If their local environment is improved, with overcrowding reduced and infection control techniques introduced, then the actual need for growth promoters may be removed (Prescott and Baggot, 1993). Antibiotic promoters is more likely that a combination of products may be considered together with a review of the various stress factors that may affect performance and disease, including nutrition, environment and management practices. For this reason, there is considerable research interest in the possible use of natural products, such as essential oils and extracts of edible and medicinal plants, herbs and spices, for the development of new additives in animal feeding. Leaves, flowers, stems, roots, seeds, fruit, and bark can all be constituents of herbal medicines. The medicinal values of these

plants lie in their component phytochemicals, which produce definite physiological actions on the human or animal body. Herbal effects of Tulsi leaves have been suggested to shorten the course of illness, clinical symptoms and biochemical parameters in patients suffering from viral hepatitis. This investigation was therefore, designed to study the hematological effects of tulsi leave extract in broiler, with a view to establishing as a growth promoter and its safety. Plants are the oldest friends of mankind. In modern animal feeding, they are forgotten because of use of Antimicrobial Growth Promoters (AGP). But due to the prohibition of most of AGP, plant extracts have gained interest in animal feed strategies (Charis, 2000). This research work will provide useful information on efficacy of tulsi leaves extract as a growth promoter and its safety in broiler chickens. The main objective was adding feed additives is to boost animal performance by increasing their growth rate, better-feed conversion efficiency, greater livability and lowered mortality in poultry birds. Considering the fact, the work has been undertaken with the objectives to know the growth performance of broilers supplemented with tulsi leaves extract and to examine the effects of tulsi leaves extract on haematological parameters (TEC, Hb, ESR and PCV) of broilers and bacterial sensitivity test.

2. Materials and Methods

2.1. Experimental birds

Forty day old chicks (DOC) were used in this study. They were kept on the floor in isolated pens and fed commercial ration and supply ad libitum water.

2.2. Experimental design

The experimental day old chicks were divided into 2 groups on 7th day consisting of 20 chicks was designated as group A and B. Chicks in group A were fed basal diet, while group B were fed basal diet supplemented with tulsi leaves during five weeks experimental period. Weekly feed consumption for each group was determined. Mean initial and weekly body weight of birds for each group was determined and then body weight gain was calculated. By the end of experimental period, 3 birds from each replicate were weighed, numbered and then slaughtered. The weight of breast, and thigh were recorded along with the vital organs (heart, liver and gizzard). Antibiotic sensitivity test on Tulsi leaves extract was conducted at the Department of Microbiology, BAU. The experiment was conducted at the Department of Pharmacology, Bangladesh Agricultural University (BAU), Mymensingh, during the period from 21 April,13 to 25 May,13.

2.3. Collection and preparation of fresh juice

Tulsi (*Ocimum sanctum*) leaves were selected to determine its efficacy as growth promoter on broilers. Mature and disease free tulsi leaves were collected from BAU. After washing, the fresh leaves were cut into small pieces by simple scissors and dried in oven and 10 gm mixed with added water made up to 1 liter. Then boiled it made up to 1 liter and stored in a refrigerator at 4°C to preserve the active ingredients of juice.

2.4. Collection and Management of broilers

At first, the shed for rearing broiler chickens was properly prepared i.e., the floor and compartment of cages and other surroundings of the shed were properly cleaned with disinfectant. Day old broiler chickens (40) were brought in the experimental shed. Then the broiler chickens were managed carefully. 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. The litter management was also done very carefully. The starter and finisher broiler rations were supplied to the broiler chicken appropriately.

2.5. Clinical examination

- i) The effect of the Tulsi leaves extracts on body weight of broilers was recorded before and after treatment.
 - ii) Broilers chicks of control and treatment groups were weighed with spring weighing machine. The weight of broiler chickens was taken weekly. The average of these weights was calculated and recorded.
- Mean live weight gain of each group of chicken on 7th, 14th, 21st, 28th and 35th days, were recorded.

2.6. Hematological parameters

Blood samples were collected from wing vein of chicken of both control and treated groups at 17th and 35th days to study the effect of the tulsi leaves extracts and the following parameters were observed:

- (a) Total Erythrocyte Count (TEC): the total number of RBC was calculated as number of cells counted x 10,000 and the result was expressed in million/ μ l of blood

(b) Hemoglobin (Hb) estimation: The procedure was matched by the Hellige hemometer method as described by Lamberg and Rothstein (1977).

(c) Packed Cell Volume (PCV): The calculation was done by using the formula as described by Lamberg and Rothstein (1977).

$$\text{PCV \%} = \frac{\text{Height of the red cell volume in cm}}{\text{Height of total blood in cm}} \times 100$$

(d) Erythrocyte Sedimentation Rate (ESR)-: The result was expressed in mm/in 1st hour

2.7. Postmortem examination for side effects

Three broilers from each group were slaughtered to see if there were any pathological changes present on 35th day after treatment. There were no significant pathological changes in any internal organs of the broilers of treatment group.

2.8. Statistical analysis

The data were analyzed statistically between control and treated groups of chicken by paired student "t" test. The differences were considered statistically significant at $P < 0.05$.

2.9. Preparation of disk papers with tulsi (*Ocimum sanctum*) leaves extract

Disk papers with a 5.8 mm diameter, were sterilised and dried. Then the dry extract prepared as described was dissolved in tulsi leaves extract to determine which of these concentrations have a inhibitory effect on bacterial growth. After which this was placed in an oven and dried at 50°C overnight.

2.10. Preparation of bacteria in media

4 samples of bacteria were collected *Escherichia coli*, *Salmonella* spp., *Bacillus* spp. and *Staphylococcus* spp. from the Laboratory of Microbiology, Department of Microbiology, BAU, Mymensingh. The bacteria were grown in Petridishes with Nutrient Agar and Eosin Methylene Blue (EMB) agar. After that the bacteria were spread over the surface of the petridishes then disk dissolved with tulsi leaves extract and inoculated in the culture media.

3. Result

This experiment was conducted to study the efficacy of tulsi leaves extract as a growth promoter in poultry. One day old chicks randomly divided into 2 groups (A and B) after 7 days for assessing the efficacy of plants leaves extract as growth promoter on broilers. The experimental units were kept on a floor litter system in separate pens. 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. Fresh and clean water was made available at all the completed randomized design and data about per replicate body wt. weekly feed consumptions and mortality were recorded during the experimental period (1-5 weeks of age). The birds using ration supplemented with 1ml of tulsi leaves extracts (group B) gained the highest live wt. than control group (group A) (Table 1 & Table 2). In Group A (Control group) live weight were measured and found as initial lives wt 155 g, final live wt 1500 g, weight gain 1345 g and FCR 1.83. In Group B initial live wt 158 g, final live wt 1650 g, weight gain 1492 g and FCR 1.73. Economies of Production: The average rearing cost of broiler kept under different treatment groups Viz A and B was 172.00 Tk and 176.00 TK (Table 3). The average live weight of broilers in group A and B was 1.500 kg and 1.650 kg respectively.

3.1. Effect of tulsi (*Ocimum sanctum*) leaves extract supplementation on growth in broilers

The observations for live body weight (g) means of A, and B groups after five weeks of the experimental period were 1500 g and 1650 g, respectively. It is observed from the results in Table 1, that supplementation of Tulsi leaves extract in A and B groups of broilers effected significant increase in mean live body weights as compared to control (A) group. The treatment groups of broilers (B) showed numerically higher body weight gain as compared to control (A) group.

Table 1. Initial and final live weight, weight gain, feed consumption and feed conversion ratio of broilers fed different levels of Tulsi leaves extract from 1 to 5 weeks of age.

Variables	Treatment	
	A (n=20)	B (n=20)
	A (n=20)	B (n=20)
	Control	Tulsi
	Mean±SEM	Mean±SEM
Initial live weight(g) on 7th day	155±5.76	158±6.32
Final live weight (g) on 35th day	1500±19.90	1650±20.87
Weight gain (g)	1345±17.98	1492±18.98
Feed consumption (g)	2750	2850
Feed conversion ratio (g feed consumed/g weight gain)	1.83	1.73

Table 2. Dressing percentages, relative weight of organs in different levels of Tulsi (*Ocimum sanctum*) leaves extract from 1-5 weeks of age.

Variables	Control	Treatment	P Value
	Mean±SEM	Mean±SEM	
	A	B	
Dressing percentage	62.88±1.07	63.00±1.08	0.692
Relative heart weight	0.43±0.067	0.44±0.056	0.00*
Relative gizzard weight	1.41±0.45	1.45±0.55	0.600
Relative liver weight	2.56±0.86	2.55±0.83	0.007*
Relative spleen weight	0.115±0.0051	0.12±0.0061	0.000*
Relative pancreas weight	0.267±0.008	0.25±0.0087	0.001*

$$\text{Relative weight (g)} = \frac{\text{Weight of Organ}}{\text{Live body weight of bird}} \times 100$$

Table 3. Data showing economics of broiler production between control group (A) and treatment group (B) from 1-day old to 5 weeks of age.

Description	A	B
Cost/chick (Taka)	55.00	55.00
Average feed consumed (Kg)/chicks	2.750	2.850
Feed price/kg (Taka)	40.00	40.00
Feed cost (Taka.)	110.00	114.00
Miscellaneous (Taka)	7.00	7.00
Total cost/broiler (Taka.)	172.00	176.00
Average live weight (Kg)	1.500±19.90	1.650±20.87
Sale price/Kg live wt. (Taka.)	120.00	120.00
Sale price/broiler (Taka)	180.00	198.00
Net profit/broiler (Taka.)	8.00	22.00
Net profit/Kg broiler (Taka.)	5.33	13.33

Mean values within the same row, which have different superscripts, were significantly different @ 1ml tulsi leaves extract. Supplementation of tulsi leaves extract was found to be more profitable than control group of broiler rearing. However, dietary inclusion of tulsi leaves extract fetched the maximum profit as compared to the control groups. Increase in the profit margin of the birds fed rations 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 tulsi supplemented rations.

3.2. Study of tulsi (*Ocimum sanctum*) leaves extract on hematological parameter of poultry

Observation of hematological parameter (RBC, Hb, PCV and ESR) on 17th day and 35th day did not show any significant difference ($P < 0.05$) between the control (A) and Tulsi leaves treated groups (B) (Table 4).

Table 4. Study of tulsi leaves extract on hematological parameter of broiler.

Tulsi leaves ext.		Treatment	Mean	Std. error Mean	P value	Sig. value
17th day	RBC	Tulsi	193.39	7.53	0.047	S
		Control	190.31	6.37		
	Hb	Tulsi	6.47	0.042	0.023	S
		Control	6.03	0.096		
	PCV	Tulsi	19.01	0.67	0.422	NS
		Control	17.32	0.86		
ESR	Tulsi	8.66	0.88	0.023	S	
	Control	10.57	0.86			
35th Day	RBC	Tulsi	276.34	11.12	0.201	NS
		Control	248.67	12.85		
	Hb	Tulsi	7.67	0.21	0.049	S
		Control	6.93	0.23		
	PCV	Tulsi	19.00	0.34	0.202	NS
		Control	18.00	0.62		
ESR	Tulsi	5.50	0.299	0.237	NS	
	Control	7.50	0.153			

Supplementation of Tulsi leaves extract in the treatment caused improvement in the feed efficiency as compared to that of control group. It is concluded that supplementation 1 ml of Tulsi leaves extract drinking water treatment groups caused significant increase in live body weight and improvement in gain in weight and feed efficiency as compared to that of control group of poultry.

3.3. Study of tulsi leaves extract on bacterial sensitivity test

Antibiotics are used in the poultry feed to protect the birds from different diseases; to promote growth of the birds; to improve feed conversion ratio (FCR); to increase weight gain; and to maximize economic returns from the individual bird.

Table 5. Study of Tulsi leaves extract on Bacterial sensitivity test.

Disk of Tulsi (<i>Ocimum sanctum</i>) leaves extract				
Bacterial culture	<i>Salmonella</i> spp.	<i>Escherichia coli</i>	<i>Bacillus</i> spp.	<i>Staphylococcus</i> spp.
Zone of inhibition	—	0.5 cm	—	—

However, *Escherichia coli* was produced zone of inhibition 0.5 cm and other bacteria did not produce zone of inhibition (Table 5). It may other positive if disk of tulsi (*Ocimum sanctum*) leaves extract will more concentration or another method. It is given in self-medication; used for preventive purposes; and employed as unauthorized.

4. Discussion

Tulsi has been safely used in Asia for hundreds of years. This study has revealed that there is a positive relationship between supplementation of tulsi (*Ocimum sanctum*) leaves extract and on the Body weight gain (growth) (Table 1) and also on the haematological effects in broiler (Table 2). This agrees with Gupta and Charan, 2007 that the clinical signs, body weight gain, biochemical changes (SGOT, SGPT, uric acid, creatinine), hematological changes (Hb, PCV, TEC, TLC), histopathological changes in visceral organs (spleen, liver, bursa) and their organ indices analysed at different intervals post-treatment with leaves extract of tulsi (*Ocimum sanctum*) as compared to the control group. No mortality was observed in broiler during experimentation because of antimicrobial, immune-stimulatory, anti-stress, fungistatic and insecticidal and liver tonic properties of tulsi leaves extract. Gupta and Charan, 2005 reported that the dried leaves powder of *O. sanctum* had the potential to be effectively utilized as a feed supplement against some of the important poultry pathogens particularly IBDV, since it was found to inhibit the virus replication in vivo. Mehta 1979 also

reported that tulsi leaves extract Offers significant natural antibacterial, antiviral and antifungal protection and is, thereby, helpful in treating many serious systemic diseases, as well as localized infections. Bhargava and Sing, 1979 showed that *Ocimum Sanctum* increases the capacity to cope and adapt to changing and challenging environments, and reduces the negative physical and psychological effects of stress (adaptogenic). Therefore, it is concluded from this experiment that broiler supplemented with tulsi (*Ocimum sanctum*) leaves extract had higher body weight and no mortality without any antibiotic and without any vaccination taking proper biosecurity. These results may be due to antimicrobial (Gupta and Viswanathan, 1955; Phadke and Kulkarni, 1989; Das et al., 1983; Mehta et al., 1979; Pushpangadan and Sobti, 1977), immunostimulatory (Mediratta and Sharma, 2002; Mediratta et al., 1987), antistress (Bhargava and Sing, 1981; Saksena, 1987), fungistatic and insecticidal (Rajeshwari, 1992), and liver tonic (Singh et al., 2002) properties of tulsi leaves, which help to reduce the microbial load of birds and improve the feed consumption and feed efficiency of the birds. Therefore concluded that tulsi leaves extract has effects as alternative growth promoter and also haematological effects on broilers and no mortality without any antibiotic and without any vaccination taking proper biosecurity. This result may be due to antibacterial, anti-inflammatory, antistress, antifungal, insecticidal and liver tonic properties of tulsi leaves which help to ensure the microbial load of birds and improve the feed consumption and feed efficiency. Care should be taken to ensure its safe use for medicinal references. Supplementation of tulsi was found to be more profitable than control group of broiler rearing. However, dietary inclusion of tulsi @ 1% fetched the maximum profit as compared to the control groups.

5. Conclusions

In Bangladesh situation, the knowledge of our farmer is very little because most of them are not properly trained for broilers production, but unemployed young generation is coming in this business for short return of value and profit. Pharmaceutical companies take this advantage. They are convincing farmers for using antibiotics as a growth promoter or life savings for chicken. As a result, each and every broiler is adapted of antibiotics. When these broilers are consumed by human this antibiotic residue enters into human body and causing serious human health hazards with drug residue. In this experiment, extract of tulsi leaves extract were studied in terms of growth promoter on broilers, this traditional medicinal plant is available throughout country, cost effective as well as growth promoter, a good alternative to chemicals, probiotics and antibiotics.

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Conflict of interest

None to declare.

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