Asian Australas. J. Biosci. Biotechnol. 2018, 3 (2), 143-149

Asian-Australasian Journal of Bioscience and Biotechnology
ISSN 2414-1283 (Print) 2414-6293 (Online)
www.ebupress.com/journal/aajbb

Article

Effects of tulsi leaves and ginger solution on growth performance and hematological profiles of broilers

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Received: 15 July 2018/Accepted: 16 August 2018/ Published: 30 August 2018

Abstract: This study was conducted to determine the efficacy of tulsi and ginger as a growth promoter in broilers. A total of thirty day old chicks (DOC) were purchased from CP Bangladesh Ltd. and after seven days divided into three groups (A), (B) and (C). No vaccination schedule was practiced and no antibiotics were added in ration. The (A) group was not supplemented with tulsi and ginger solution in drinking water. The (B) group was supplemented with tulsi solution @ 1ml/litre in drinking water and (C) group was supplemented with ginger solution @ 1 ml/litre in drinking water for consecutive 5 weeks started from 7th day of experiment. Weekly observations were recorded for live body weight gain up to 6th weeks and routine blood test was performed at 21st and 42nd days, to find out hematological changes between control and treatment groups. The FCR value of group (A) was 2.25, in group (B) was 1.99 and in group (C) was 1.90. From this initial study this may be concluded that production of broilers in by using tulsi and ginger was economic than control group. In Bangladesh broilers production is mainly organized by unemployed and its demand is very high because it supports marketing within 35–42 days. Short return of money but major problems is cost of production. The initial body weight (gm) of group (A), (B) and (C) on 7th of day experiment were 168±8.54, 166±7.95 and 166±7.90 gm respectively and after 42nd day of experiment final body weight were 1561±12.10, 1698±12.87 and 1763±13.28 gm respectively. The net body weight gain were 1393±11.07, 1533±11.98 and 1588±12.10 gm respectively and economics of production were analyzed and found that net profit per broiler was 18.82, 36.13 and 42.53 Tk respectively. It is concluded that broiler production by using herbal extract may be profitable and suitable for human consumption.

Keywords: ginger; broilers; growth promoter**;** carcass characteristics; hematological parameters

1. Introduction

Livestock plays an important role as the back-bone of agriculture. Poultry play vital role in the national economy. Demand of protein of this unbounded population is a great threat for us. There are so many sources of protein but it is not possible to meet the demand without broiler. Because the duration of broiler rearing is very short and within 36-42 days it is ready for marketing and compatible for human consumption. It also gets very short time return to farmer. The meats of broiler are nutritious, tasty and contain low fat. The poultry production systems have moved to marked increase in the production of poultry meat and eggs throughout the world (Armstrong, 1986). It has triggered the finding and widespread use of a number of 'feed additives'. The main intention of adding feed additives is to aid animal performance by increasing their growth rate, better-feed conversion efficacy, greater livability and lowered mortality in poultry birds (Noman *et al.*, 2015). These feed additives are termed as growth promoters and often called as non-nutrient feed additives (Islam *et al.,* 2016).

Many synthetic drugs and growth promoters are help out to the broilers to effect rapid growth, but their use have exhibited many disadvantages like high cost, adverse side effect on health of birds and long residual properties (Sarker *et al.,* 2018). The use of natural resources e.g. medicinal plants may prove to be useful course towards the management of stress-linked mental health problems (Madubuike and Ekeyem, 2001). *Ocimum sanctum L*. commonly known as "Tualsi" in Tamil and holy basil in English has been required to be valuable against a wide variety of diseases. Recent investigations have shown that different extracts of OS possess momentous anti-inflammatory (Singh *et al*., 1993) and antioxidant (Uma Devi and Ganasoundari, 1999) and anti-stress prominence (Sood *et al*., 2006). In tulsi biologically active compounds have been unfastened from the leaves including ursolic acid, apigenin and luteolin that activates the cell mediated immune response. So the feeding tulsi leaves to immunosuppressed bird's enhanced their humeral and cell mediated immune responses. Low dose of tulsi leaves powder have an inhibitory act on wide spectrum of microorganisms (Devakumar and Sukkt, 1993). Several herbs including ginger could help providing some defence against bacteria and provoke the immune system (Craig, 1999).

The efficacy of ginger is purported to be a result of its aromatic, carminative and absorbent prominence (Govindarajan, 1982). The operative ingredients found in Zinger (Curcuma longa) are curamine, demethoxycurcumin, bisdemethoxycurcumine, (Wuthi-Udomler *et al.,* 2000) and tetrahydrocurcuminoids (Osawa *et al.,* 1995; Talukder *et al.,* 2017). Curcuma has been demonstrated to have several biological effects, exhibiting anti-inflammatory (Holt *et al.,* 2005), antioxidant (Iqbal *et al.,* 2003) and hypolipidaemic (Ramirez-Tortosa *et al.,* 1999) activities. Curcumin has also been studied broadly as a chemopreventive agent in several cancers (Duvoix *et al.,* 2005). It is used in gastrointestinal and respiratory disorders (Anwarul *et al.* 2006). The significant biological properties of ginger powder put it a potential substitute for in feed antibiotics in livestock diets. There is growing part in developing natural alternatives to antibiotic growth promoters in order to maintain both bird's performance and health. Medicinal plants wrestle with the synthetic drugs. Majority of medicinal plants do not have the residual effects (Tipu *et al.,* 2006). Considering the present situation of poultry production, the work has been carried out to evaluate the growth performance of broiler supplemented with tulsi leaves and ginger solution.

2. Materials and Methods

2.1. Preparation of the experimental house and equipment

An open sided house was partitioned into twelve pens of equal size by using expanded wire net, wood, rod and bamboo materials. A service area was running along the middle of the pens. It was brushed, swiped properly and threshed with tap water. After washing with clean water, the pens were disinfected by using chlorine solution (500 ppm). The room was left vacant for 14 days. Later, it was again disinfected with finis solution (1gm/liter) left to dry up properly. During this time all the feeders, waters and other necessary equipment were properly cleaned, washed and disinfected with finis solution and dried before use.

2.2. Collection of experimental birds

Day old chicks marketed by CP Bangladesh Ltd. were purchased from local market for this experiment. The experiment was carried in small scale poultry farm at Basher hat, Dinajpur. Day old broiler chicks were (Thirty in number) brought in the experimental shed. The mean body weight of all selected chicken was 110±10 gm respectively.

2.3. Grouping of experimental birds

After seven days of acclimatization all the thirty chicks were randomly divided into three equal groups (A, B and C) for assessing the efficacy of tulsi and ginger as growth promoter on broilers. Group 'A': were kept as control and no treatment was given; group 'B': were treated with tulsi solution @ 1 ml/liter added in drinking water for consecutive five weeks and group 'C': were treated with ginger solution @ 1 ml/liter added in drinking water for consecutive five weeks. All the chicks of treated and control groups were closely observed for forty two days after treatment.

2.4. Management of chickens

Immediately after unloading from the chicks boxes the chicks were given Vitamin-C and glucose to forbear the stress occurring during transport. The chickens were allowed to take rest for ten days for the adaptation. The broiler chicks were bred in the same compartment for seven days and brooding temperature were correctly maintained. The litter management was also done very carefully. The starter and finisher rations were supplied to the broiler chicken appropriately.

2.5. Experimental diets
The commercial broiler starter and pre-starter diets manufactured by Nourish poultry feed Ltd. was purchased from the local agent in Dinajpur.

2.6. Litter management
Fresh and dried husk was used as a litter at a depth of two cm. The litter was disinfected with finis solution. The litter was stirred three times a week from fourteen days to prevent cake formation. Litter material when found damp was replaced by new litter.

2.7. Floor space
Each pen was 2.5 ft. x 2 ft. which was for seven birds. Therefore, the space given for each bird was one square ft.

2.8. Brooding
The bird was brooded with 100 watt electric bulb in each pen from day old to twenty one days. The bulb was just hanged just above the bird's level at the center of each pen. Brooding temperature was kept 32^{o}C at the beginning of the first week of age and decreased gradually in subsequent week until stable to the normal environmental temperature. Increasing or decreasing of temperatures were done by lowering or raising the bulbs according to the temperature persuaded and the birds behavior

2.9. Lighting
The birds were expounded to twelve hours of lighting and a dark period of one hour per day throughout the experimental period. After twenty one days only one 60 watt electric bulb was set at a height of 240 cm which provide sufficient lighting up to the end of experiment. The dark arrangement was practiced to make broilers familiar with possible darkness due to electricity failure.

2.10. Feeding and drinking
Feed was supplied four times daily for the first seven days and gradually reduced to three times. Initially feed was given on tray feeder and thereafter through feeder was used to feed the birds. Leftover feeds were mixed with fresh feed into the feeder in the morning and spoiled feed was excluded by taking weight of the waste feed. Feed was supplied adlibitum and water was made available all the items.

2.11. Collection and processing of plant material
Tulsi and ginger were selected for effectiveness as growth promoter of broilers. Mature and disease free tulsi leaves were collected from HSTU campus. Ginger was purchased from Basherhat, Dinajpur. It was identified with the help of Botanists.

2.12. Preparation of tulsi leaves solution
At first 20gm of tulsi leaves were weighted from electric balance and then thoroughly washed in tap water. The leaves were cut into small pieces with the help of knife; thereafter the fleshy parts were grinded with the help of pestle and mortar. Then grinded portion was filtered it through the filter paper with the help of beaker and funnel. From filtrate portion 5ml were measured and mixed with 495ml distilled water to prepare 500ml solution where 1% tulsi ingredients contain. Finally 5gm iodide salt was added and stored in a refrigerator at 4^{o}C to preserve the active ingredients of solution.

2.13. Preparation of ginger solution
At first 50gm of ginger were weighted from electric balance and then thoroughly washed in tap water. The ginger were cut into small pieces with the help of knife, thereafter the fleshy parts were grinded with the help of pestle and mortar. Then grinded portion was filtered it through the filter paper with the help of beaker and funnel. From filtrate portion 5ml were mixed with 495ml distilled water to prepare 500ml solution where 1% ginger ingredients contain. Finally 5gm iodide salt was added and stored in a refrigerator at 4^{o}C to preserve the active ingredients of solution.

2.14. Clinical examination
i) The effect of the tulsi leaves and ginger extract on body weight gain, feed consumption was recorded before and during administration of treatment.

ii) Chickens under treatment and control groups were weighed with electric weighing machine. The weight of each chicken was taken weekly. The average of these weights was calculated and recorded.

Mean live weight gain of each group of chickens on 7^{th}, 14^{th}, 21^{th}, 28^{th}, 35^{th} and 42^{th} days were recorded.

2.15. Hematological parameters

Blood samples were collected from wing vein of chicken of both control and treated groups at 21^{th} and 42^{th} days to study the effect of the tulsi and ginger extract. The Packed Cell Volume (PCV), Total Erythrocyte Count (TEC), Erythrocyte Sedimentation Rate (ESR) and Haemoglobin (Hb) concentrations were done as described by Lamberg SL and Rothstein R (1977).

2.16. Postmortem examinations

There was no mortality in experimental birds during the experimental period. However, at the end of the experiment (i.e. after 42^{nd} day) postmortem examinations were carried out but there was no significant change in any organ.

2.17. Statistical analysis

The data were analyzed statistically between control and treated groups of chicken by the well-known Student's *t* test ('t'test).

3. Results and Discussion

This experiment was conducted to study the efficacy of tulsi and ginger as a growth promoter in broiler chicken. This experiment was held in small scale poultry farm at Basherhat, Dinajpur. The results are described based on the following headings:

3.1. Economics of production

The average rearing cost of broiler kept under different treatment groups viz. (A), (B) and (C) were 191.88 Tk., 193.10Tk and 195.47Tk respectively (Table 3). Miscellaneous cost summed up Tk. 20 per broiler, which included the estimated cost of electricity and litter disinfectant. The average live weight of broilers in group (A), (B) and (C) were 1.561kg, 1.698kg and 1.763kg respectively. The broiler was sold in live weight basis at the rate of Tk 135/kg. The net profit/Kg live weight in the respective group was found taka 18.82, taka 36.13 and taka 42.53 respectively.

3.2. Effect of tulsi and ginger supplementation on growth in broiler

The observations for live body weight (g) means of (A), (B) and (C) groups after six weeks of the experimental period were 1561±12.10g, 1698±12.87g and 1763±13.28g respectively (Table 1). So, broilers of Group C supplemented with ginger got the maximum weight ($p<0.01$) followed by Group B (supplemented with tulsi) among all of the experimental groups and the control group (Group A) got the lowest body weight. These findings regarding on body weight has very close agreements with the study of Manwar *et al.* (2005) who performed a research on supplementation of neem leaf powder @ 1gm/kg feed and reported significant increase in the live body weight of broilers in the treated groups when compared to control group. Similarly, broilers of group B and C also gave marked positive impacts on FCR in which in group C the results were more significant. Results of dressing percentages, relative weights of heart, gizzard, liver, spleen and pancreas of broilers on 42nd day in control and treatment groups are shown in Table 2.

Table 1. Initial and final live weight, weight gain, feed consumption and feed conversion ratio of broilers feed @ 1ml/L tulsi leaves and ginger solution from 1 to 6 weeks of age.

Variables	Groups		
	A (n=10) (Mean±SEM)	B (n=10) (Mean±SEM)	C (n=10) (Mean±SEM)
Initial live weight (g) on 7^{th} day	168±8.54	166±7.95^{NS}	166±7.90 ^{NS}
Final live weight (g) on 42^{nd} day	1561±12.10	1698±12.87*	1763±13.28**
Weight gain (g)	1393±11.07	1533±11.98*	1588±12.10**
Feed consumption (g)	3140	3050	3035
Feed conversion ratio (FCR) g feed consumed/g weight gain	2.25	1.99	1.90

****=**Significant at 1% level ($p<0.01$); ***=**Significant at 5% level ($p<0.05$); ^{NS}= Non significant

Table 2. Dressing percentages, relative weights of heart, gizzard, liver, spleen and pancreas of broilers on 42nd day in control and treatment groups.

Variables	Groups		
	A (n=5) (Mean±SEM)	B (n=5) (Mean±SEM)	C (n=5) (Mean±SEM)
Dressing percentage	63.59±1.02	63.09±1.14 ^{NS}	63.01±1.02 ^{NS}
Relative heart weight	0.45±0.09	0.46±0.095 *	0.46±0.20 ^{NS}
Relative gizzard weight	1.48±0.076	1.52±0.070**	1.52±0.28 ^{NS}
Relative liver weight	2.60±0.047	2.61±0.09*	2.61±0.20 ^{NS}
Relative spleen weight	0.12±0.005	0.12±0.006 ^{NS}	0.12±0.040 ^{NS}
Relative pancreas weight	0.28±0.018	0.29±0.019*	0.29±0.029 ^{NS}

****=**Significant at 1% level ($p<0.01$); ***=**Significant at 5% level ($p<0.05$); ^{NS}= Non significant

Table 3. Economics of broiler production among the groups.

Description	Groups		
	A (Control)	B (Tulsi)	C (Ginger)
Cost/DOC (Taka)	40	40	40
Average feed consumed (Kg)/broiler	3.140	3.050	3.035
Feed price/Kg (Taka)	42	42	42
Cost of herbal growth promoters (Taka)	0.00	5	8
Feed cost (Taka.)	131.88	128.10	127.47
Miscellaneous (Taka)	20	20	20
Total cost/broiler (Taka)	191.88	193.10	195.47
Average live weight (Kg)	1.561	1.698	1.763
Sale price/Kg live wt. (Taka.)	135	135	135
Sale price/broiler (Taka)	210.70	229.23	238.00
Net profit/broiler (Taka.)	18.82	36.13	42.53
Profit/Kg live weight (Taka)	12.05	21.27	24.12

Supplementation with ginger was found to be more profitable than the control (A) and treatment group (B) of broiler rearing. The results of the present study are in live with the findings of Hernandez *et al.* (2004), who reported that dietary inclusion of tulsi and ginger @ 0.5% in the rations were more beneficial in broilers production.

3.3. Study of tulsi and ginger on hematological parameters of broilers

Observation of hematological parameters (RBC, Hb, PCV and ESR) on 21st day and 42nd day did not show any significant difference ($P<0.05$) among the control (A), tulsi treated group (B) and ginger treated group (C) (Table 4).

Table 4. Hematological parameters of broiler.

Days of post treatment	Treatment		Mean ± SEM	Significance value
21st day	RBC (million/mm$^{3)}$	Control	191.35±6.37	NS
		Tulsi	197.30±7.52	
		Ginger	197.32±7.54	
	Hb (gm%)	Control	6.00±0.14	
		Tulsi	6.46±0.06	
		Ginger	6.47±0.07	
	PCV (%)	Control	16.33±0.88	
		Tulsi	19.00±0.59	
		Ginger	19.10±0.60	
	ESR (mm in 1st hour)	Control	10.67±0.86	
		Tulsi	8.66±0.88	
		Ginger	8.65±0.87	
42nd day	RBC (million/mm^{3})	Control	248.70±13.87	NS
		Tulsi	297.66±12.11	

	Ginger	297.67±12.12	
	Control	6.92±0.27	
Hb (gm%)	Tulsi	7.62±0.19	NS
	Ginger	7.64±0.2	
	Control	17±0.61	
PCV (%)	Tulsi	20.70±0.33	NS
	Ginger	20.71±0.34	
	Control	7.00±0.60	
ESR (mm in 1st hour)	Tulsi	4.00±1.00	NS
	Ginger	4.00±1.01	

The above values represent the mean ± standard error of Mean (SEM) of hematological parameters of broiler chickens of different groups (n = 5).
NS= Non significant

Supplementation of ginger in the treatment caused improvement in the feed efficiency as compared to that of tulsi treated group (B). Similarly, Nagalakshmi *et al.* (1996) reported increase in feed efficiency in ginger fed groups, which is in agreement with the findings of the present study. Birds supplemented with ginger had higher body weight, weekly gain in weight, feed consumption and feed efficiency. These results may be due to antimicrobial and anti-zymotic properties which help to reduce the microbial load of birds and improved the feed consumption and feed efficiency of the birds. It is concluded that supplementation with 1 ml of ginger in drinking water of the treatment groups caused significant increase in live body weight and improvement in weight gain and feed efficiency as compared to that of tulsi treated group of poultry.
Ginger has effects as alternative growth promoter. The extract showed no mortality, without any antibiotic and vaccination and also taking proper bio-security. This result may be due to antibacterial, anti-inflammatory, anti-stress, antifungal, insecticidal and liver tonic properties of ginger extract 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. Similar results have been reported by Sharma and Reddy (2002), where the broilers fed rations with added kalongi, fetched more profit than those using rations without supplementation of this herbal growth promoter. 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 ginger supplementation.

4. Conclusions

This research work shows that incessant treatment with ginger produced a significant ($p<0.01$) increase in live body weight but there is no significant ($p<0.05$) change on blood parameters.It can be concluded that ginger and tulsi may be used as growth promoter but ginger is more effective and economic in broiler production. Further study is necessary to investigate the biochemical and molecular test to investigate any adverse effect in future.

Conflict of interest

None to declare.

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