



Use of neem leaf and ginger extracts for cost effective broiler production

Mohammad Afazur Rahman^{1*}, Md. Ashraf Ali², Biddut Kumar Saha¹, Md. Abdullah-Al-Hasan³, Md. Abdur Rahman¹, Mahbub Mostofa¹

¹Department of Pharmacology, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

²Department of Pathology and Parasitology, Jhenidah Government Veterinary College, Jhenidah, Bangladesh

³Department of Parasitology, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

ABSTRACT

This study was conducted to determine the effects of neem leaf and ginger extracts as a growth promoter of broiler. A total of forty day-old broiler chicks were divided into four groups viz. I₀, I₁, I₂ and I₃ which were supplemented with a mixture of extracts from neem leaf and ginger @ 0 ml, 1 ml, 2 ml and 3 ml/liter of drinking water, respectively. Weekly observations were recorded for live body weight, weight gain, feed consumption, feed efficiency and blood parameters of broilers for up to six weeks. The initial mean body weight of group I₀, I₁, I₂ and I₃ on first week chicks were 165 ± 5.00, 166 ± 3.00, 163 ± 3.00 and 164 ± 4.00 gm, respectively. At the end of the experiment (42nd day) final mean body weight were 1550 ± 10.00, 1720 ± 10.00, 1651 ± 1.00 and 1782 ± 2.00 gm, respectively. The net body weight gains were 1385 ± 5.00, 1554 ± 7.00, 1488 ± 2.00 and 1618 ± 2.00 gm, respectively. Cost benefit analysis revealed that net profit per broiler was 24.04, 51.05, 35.12 and 56.64 taka, respectively. It is, therefore, concluded that the broiler production by using mixture of neem leaf and ginger extracts may be profitable with a safety health issue for human consumption.

Key words: Neem leaf, ginger, growth promoter, feed additive, broiler

*Corresponding author. Tel.: +8801719002750

E-mail address: afaz.vet@gmail.com (MA Rahman)

@2015 Int. J. Nat. Soc. Sci. all right reserved.

INTRODUCTION

Bangladesh is a highly populated country and growth of population is increasing day by day. Demand of protein of this booming population is a great threat for us. There are so many sources of protein. Broiler can be an alternative potential source to fulfill this demand. Because the duration of broiler rearing is very short and within 36-42 days it is ready for marketing and suitable for human consumption. It also brings very short time return to farmer. Broilers meat is popular to all and there is no religious restriction to consume broiler meat. Improving profitability, reducing environmental impact and enhancing animal welfare are key priorities for the agriculture sector. The major constrain of broiler production is cost of feed that accounts for up to 70% of the total production cost. The feed additive could be added to the ration with the purpose to boost animal

performance by increasing their growth rate, better-feed conversion efficiency, greater livability and lowered mortality in poultry birds (Feltwell and Fox, 1979). These feed additives are termed as “growth promoters” and often called as non-nutrient feed additives (Singh and Panda, 1992). Many synthetic drugs and growth promoters are supplemented to the broilers 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 etc. Growth promoters are chemical and biological substances, which are added to livestock food with the aim to improve the growth of chickens in fattening, improve the utilization of food and in this way realize better production and financial results. 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

How to cite this article: MA Rahman, MA Ali, BK Saha, MAA Hasan, MA Rahman and M Mostofa (2015). Use of neem leaf and ginger extracts for cost effective broiler production. International Journal of Natural and Social Sciences, 2(2): 11-16.

natural antimicrobial products as indispensable resources.

It is concerned that many pharmaceutical companies are convincing farmers for using antibiotics as a growth promoter to get more return within a short period. Through consumption of antibiotic fed broiler the antibiotic residues enters into human body and may cause serious human health hazards with drug residues (Kibria et al. 2009). Throughout the world, the use of antibiotics as dietary growth promoters in poultry diets differs dramatically. Antimicrobial resistance in zoonotic enteropathogens including *Salmonella*, *Escherichia coli*, and *Enterococci* in food animals is of special concern to human health because these bacteria are likely to transfer from the food chain to humans.

Consequently 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. Craig (1999) stated that several herbs could help providing some protection against bacteria and stimulate the immune system. Neem (*Azadirachta indica*) has vast range of medicinal properties including promoting the growth and feed efficiency of birds because of its antibacterial and hepatoprotective properties (Padalwar, 1994). Neem preparations fed to laying hens have been reported by Sadre et al., (1984) and Gowda et al. (1998) to significantly reduce the content of hemoglobin, erythrocyte count and packed cell volume. Furthermore, neem showed immune modulator actions that induce cellular immune reaction (Devakumar and Suktt, 1993)

Ginger (*Zingiber officinale*) is another potent herb that feed on broiler chicks improved feed intake and feed conversion ratio (Javed et al., 2009). Ginger has immunostimulant effect that activates the cell mediated immune response and therefore, creates an enhanced response to any future challenges occurred by disease organisms. Feeding of neem leaves and ginger extract to immunosuppressed birds increase their humoral and cell mediate immune responses (Sadekar et al., 1998). Considering the advantages of both neem and ginger the present study was conducted to

determine the effect of their extracts in broiler diets as a possible alternative to antibiotic feed additives to avoid human health hazards as well as economic broilers production to sustain small scale broiler farming in Bangladesh.

MATERIALS AND METHODS

Collection and processing of plant material

Mature and disease free neem leaves were collected from university campus and ginger was purchased from local Market of Bangladesh Agricultural University, Mymensingh. The leaves were dried to prepare fine dust and preserved in airtight plastic container until used. About 10g leaves powder and 10g ginger extract was added to 80ml of distilled water and was shaking overnight at room temperature, filtered and distilled water was added up to 100ml to make 10% extract.

Experiment

Fourty broilers of one day old were randomly selected and allowed to acclimatize for 3 days in the experimental shed. During acclimatization the chicken were supplied with recommended feed and water. The broilers were divided into 4 equal groups (I₀, I₁, I₂ and I₃). Group 'I₀' was kept as control and was not treated. Group 'I₁' 'I₂' and I₃ were treated with combined extract of neem leaf and gingers @ 1ml/liter, 2ml/liter and 3ml/liter drinking water for consecutive six weeks, respectively. All the birds of treated and control groups were closely observed for 42 days after treatment. The experimental units were kept on a floor litter system in separate pens.

Data collection

The effect of the neem leaf and ginger extracts on body weight, feed consumption and water consumption and changes in blood profile were recorded before and during administration of treatment. The weight of each chicken was taken before feeding in the morning, in noon and afternoon. The average of these three weights was calculated and recorded. Mean live weight gain of each group of broilers on 7th and 42th days was recorded. The feed conversion ratio (FCR) was determined through the relationship between

amount of feed consumed (FC) to the body weight gain (BWG) under each group of birds ($FCR = FC \text{ g}/BWG \text{ g}$).

Blood samples were collected from wing vein of broilers of both control and treated groups at pre-feeding and during feeding period at 21st and 42nd days to study. Total Erythrocyte Count (TEC), Hemoglobin Estimation (Hb), Packed Cell Volume (PCV), and Erythrocyte Sedimentation Rate (ESR) were performed according to the methods described by Lamberg and Rothstein (1977). Postmortem examinations of three broilers from each group were done on 7th, 35th and 42th days of treatment.

Statistical analysis

The data were analyzed statistically between control and treated groups of broiler by the analysis of variance (ANOVA) technique in completely randomized design (CRD).

RESULTS AND DISCUSSION

Effect of neem leaf and ginger on growth performance

The effect of combined herbal extract of neem leaf and ginger on the body weight of broiler is presented in table 1. The maximum weight gain was observed in group I₃ where birds were treated with 3ml of combined herbal extract/liter drinking water for consecutive six weeks whereas in control group the weight gain was 1385 ± 5.00 gm. The

differences in weight gain between the treated and control group was statistically significant ($P > 0.05$). This study was in accordance with the findings of Onimisi et al. (2005) and Ademola et al. (2009) who observed that ginger increased body weight when included in the diet up to 2% level in the diet. Several workers have reported that supplementation of neem leaf meal increases body weight gain in broilers (Verma et al., 1998, Chakravarty and Prasad, 1991, Onyimonyi et al., 2009).

The mean cumulative feed consumption of broilers as influenced by dietary inclusion levels of mixed aqueous extract of neem and ginger supplemented to drinking water is presented in Table 2. Analysis of data on mean cumulative feed consumption revealed no significant differences between treatment and control groups ($p < 0.05$). Similar findings were observed Ademola et al. (2009) and Doley et al. (2009) who observed no difference in feed intake in broilers fed with ginger and pepper extract for a period of six weeks.

Supplementation of neem leaf and ginger extracts in the treatment caused improvement in the feed efficiency as compared to that of control group. Similar results were observed by Nemade et al. (1993) who reported increase in feed efficiency in neem leaf and ginger extracts fed groups. The results in this study coincide with those of Chakravarty (1991) who achieved highest body weight gain and best feed conversion ratio as compared to control when offered neem leaf and ginger extracts to broilers from 1 to 6 weeks.

Table 1
Effect of treatment on the growth performance of broiler

Variables	Treatment (Mean \pm SD)			
	Control I ₀ (n=10)	I ₁ (n=10)	I ₂ (n=10)	I ₃ (n=10)
Initial live weight (g) at 7 th day	165 \pm 5.00a	166 \pm 3.00a	163 \pm 3.00a	164 \pm 4.00a
Final live weight (g) at 42 nd day	1550 \pm 10.00a	1720 \pm 10.00b	1651 \pm 1.00c	1782 \pm 2.00d
Weight gain (g)	1385 \pm 5.00a	1554 \pm 7.00b	1488 \pm 2.00c	1618 \pm 2.00d
Feed consumption (g)	3138 \pm 2.00 ^a	3047 \pm 3.00 ^a	3140 \pm 5.00 ^a	3041 \pm 1.00 ^a
Feed conversion ratio (g)	2.02 \pm 0.01b	1.77 \pm 0.01a	1.90 \pm 0.00b	1.71 \pm 0.00a

Same letter (s) within a raw indicate non significant and different letter (s) indicate significant at 5% level ($p < 0.05$).

Table 2
Study of neem leaf and ginger extracts (3ml/liter) on hematological parameter of broilers.

Neem	Treatment	Mean	Std. error Mean	
21 st day	RBC	Treatment	190.37a	7.51
		Control	189.30a	6.35
	Hb	Treatment	6.55a	0.05
		Control	6.05a	0.12
	PCV	Treatment	21.00b	0.59
		Control	18.30a	0.85
ESR	Treatment	9.50a	0.87	
	Control	11.50b	0.86	
42 nd day	RBC	Treatment	289.65b	12.10
		Control	259.65a	12.82
	Hb	Treatment	7.11a	0.20
		Control	6.99a	0.24
	PCV	Treatment	22.50b	0.34
		Control	18.00a	0.60
ESR	Treatment	5.11a	1.00	
	Control	6.00b		

Same letters within a column for each parameter indicate non significant and different letters indicate significant at 5% level ($p < 0.05$).

Table 3

Data showing economics of broiler production kept under different treatment groups from 1-day old to 6 weeks of age.

Description	I ₀	I ₁	I ₂	I ₃
Cost/chick (Taka)	65.00a	65.00a	65.00a	65.00a
Average feed consumed (Kg)/chicks	3.14a	3.05a	3.14a	3.04a
Feed price/kg (Taka)	39.00a	39.00a	39.00a	39.00a
Cost of treatment (Taka)	0.00	2.00a	4.00b	6.00c
Feed cost (Taka.)	122.46a	118.95a	122.38a	118.37a
Miscellaneous (Taka)	21.00a	21.00a	21.00a	21.00a
Total cost/broiler (Taka.)	208.46a	206.96a	212.38b	210.37b
Average live weight (Kg)	1.55a	1.72bc	1.65b	1.78c
Sale price/Kg live wt. (Taka.)	150.00a	150.00a	150.00a	150.00a
Sale price/broiler (Taka)	232.50a	258.00b	247.50ab	267.00c
Net profit/broiler (Taka.)	24.04a	51.05c	35.12b	56.64d
Profit/ Kg live weight (Taka)	15.51a	29.68d	21.28b	31.51c

Same letters within a raw indicate non significant and different letters indicate statistically significant at 5% level ($p < 0.05$).

Koul et al. (1990) have also reported that neem leaf and ginger extracts suppresses pathogenic bacteria including *Staphylococcus aureus*, *Salmonella paratyphi* and *Klebsiella pneumonia*. It is assumed that the body weight gain of broilers supplemented with neem leaf and ginger may be due to antimicrobial and anti-protozoal properties of neem leaf and ginger extracts, which help to reduce the microbial load of birds, thus improve the feed consumption and feed efficiency of the birds (Kale et al. 2003). Due to the active ingredients in these additives, the formation of more stable intestinal flora and improved feed conversion efficiency in consequence of a better digestion (Tekeli, 2011).

Post mortem examination revealed that there was no significant pathological change in any internal organs of the broilers of treated groups.

Effect of neem leaf and ginger extracts on hematological parameters of broilers.

ESR and PCV value significantly ($P < 0.05$) different between control and treated groups (Table 2). The Hb content differed significantly on at 42nd day between control and treated groups (Table 2). The ESR value decreased in broiler after treatment whereas other parameters were increased following treatment with mixture of neem leaf and ginger extract. This study is in accordance with Bui et al. (2009) and Akbari et al. (2008) where hemoglobin concentration in neem fed group was significantly ($p < 0.05$) increased compared to control group. Feeding of neem and its combination with turmeric and vitamin E significantly ($p < 0.05$) increased PCV values as compared to control (Nayaka et al., 2013).

Cost benefit analysis of broiler production by using neem leaf and ginger extract

The average rearing cost broiler are kept under different treatment groups viz. I_0 , I_1 , I_2 , I_3 was 208.46, 206.95, 212.38 and 210.365 taka respectively (Table 3), excluding the cost of labour because the experiment was conducted on the Pharmacology research shed, Bangladesh Agricultural University, Mymensingh without any cost involve in building structure. Miscellaneous cost summed up Tk 21 per broiler, which included the cost of electricity, gas, litter, disinfectant. The average live weight/broiler in group I_0 , I_1 , I_2 , and I_3 was 1.55, 1.72, 1.65 and 1.78 kg, respectively. The broiler was sold in live weight basis at the rate of Tk 150/kg. The profit/Kg live weight in the respective group was found to be taka 15.51, 29.68, 21.28 and 31.61, respectively.

CONCLUSION

From this experiment I found that between the control group and the treatment group of broilers, the treatment groups are more profitable. Besides these, treatment groups are suitable for human health because there is no residual effect of medicine and also cost effective. Our preliminary study showed that our formulations could be used as an alternative to commercially available growth promoters. However, further studies are essential to assess the impact of this feed additive on quality

of broiler meat and immune status to ensure the safety of human consumption.

REFERENCES

- Ademola SG, Farinu GO and Babatunde GM. (2009). Serum lipid, growth and hematological parameters of broilers fed garlic, ginger and their mixtures. *World Journal of Agricultural Science*, 5(1): 99-104.
- Akbari MR, Kermanshahi H and Moghaddam N (2008). Effect if wheat-soybean meal based diet supplementation with Vitamin A, Vitamin E and Zinc on blood cells, organ weights and humoral immune response in broiler chickens. *Journal of Animal and Veterinary Advances*, 7(3):291-298.
- Bui AA, Yusufu SD and Rabo JS (2009). Studies on the effects of aqueous leaf extracts of neem (*Azadirachta indica A. Juss*) on hematological parameters in chicken. *African Scientist*, 10(4):189-192.
- Chakravarty BK (1991). Effects of herbal drugs on broiler production. *Indian Journal of Poultry Science*, 39(3): 255-267.
- Chakravarty A and Prasad J (1991). Study on the effect of Neem leaf extract and Neem cake extract on the performance of broiler chicks. *Poultry Advance*, 24(9):37-38.
- Craig WJ (1999). Health-promoting properties of common herbs. *American journal of clinical nutrition*, 70 (3): 491-499.
- Devakumar C and Suktt DV (1993). Neem research and development. *Indian Journal of Poultry Science*. 3(3): 63-96.
- Doley S, Gupta JJ and Reddy PB (2009). Effect of supplementation of ginger, garlic and turmeric in broiler chicken. *Indian Veterinary Journal*, 86(6): 644-645.
- Feltwell R and Fox S (1979). *Practical poultry feeding*. English language book society, Great Britain: 92-105.
- Gowda SK, Verma SVS, Elangovan AV and Singh AD (1998). Neem (*Azadirachta indica*) kernel meal in the diet of white leghorn layers. *British Poultry Science*. 39(3): 648-652.
- Javed M, Durrani F, Hafeez A, Khan RU and Ahmad I (2009). Effect of aqueous extract of plant mixture on carcass quality of broiler chicks. *ARNP Journal of Agricultural and Biological Science*, 4:37-40.
- Kale BP, kothekar MA, Tayade HP, Jaju JB and Mateeddin M (2003). Effect of aqueous extract of Neem (*Azadirachta indica*) leaves on offensive and defensive gastric mucosal factors in Lab animal. *Indian Journal of Pharmacology*, 35-177.

- Koul S and ascher K RS (1900). Natural pesticides from the Neem tree (*azadirachta indica*. A. Juss) and other tropical plants. British poultry science. 103- 114.
- Kibria KRC and Verma SVS (2009). Feed additives. Poultry nutrition. Kalyani Publication. Delhi,140-148.
- Lamberg SL and Rothstein R (1977). Laboratory Manual of Hematology and Urinalysis. AVi. Inc Westport Connecticut, USSR, 67(5-6):78-112.
- Nayaka HBS, Umakantha B, Wilfred Ruban S, Murthy HNN and Narayanaswamy HD (2013). Performance and hematological parameters of broilers fed neem, turmeric, vitamin e and their combinations, Emirates Journal of Food and Agriculture, 25 (6): 483-488.
- Nemade PP and Kukde RJ (1993): Efficacy of *Nigella sativa* and *Allium sativum* as growth promoters in broilers. Indian poultry, 24(1): 30-32.
- Onimisi PA, Dafwang II and Omage JJ (2005). Growth performance and water consumption pattern of broiler chicks fed graded levels of ginger waste meal. Journal of Agriculture, Forestry and the Social Sciences, 3(2): 113-119.
- Onyimonyi AE, Adeyemi O and Okeke GC (2009). Performance and economic characteristics of broilers fed varying dietary levels of neem leaf meal (*Azadirachta indica*). International Journal of Poultry Science, 8:256-259.
- Padalwar RV (1994). MVSc Thesis. Promoters in broiler production. Biotechnology in animal husbandry. 25 (5-6): 387-397.
- Sadekar RD, Kolte AY, Barmase BS and Desai VF (1998). Immunopotentiating effects of *Azadirachta indica* (Neem) dry leaves extract in broiler, naturally infected with virus. Indian Journal of Experimental Biology, 36(11): 1151-1153.
- Sadre NL, Deshpande VY, Mendulkar KN and Nandal DH (1984). Male anti-fertility activity of *Azadirachta indica* A. Juss (Neem) in different species. Schmutterer H and Ascher KRS, eds. 1984. Natural Pesticides from the Neem Tree (*Azadirachta indica* A. Juss.) and other tropical plants. Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), Eschborn, Germany, pp 473-482.
- Singh KS and Panda B (1992). Feed additives. Poultry Nutrition. 2nd. Kalyani publ. Delhi, 134-143.
- Tekeli A, Kutlu HR and Celik L (2011). Effect of *Zingiber officinale* and propolis extracts on the performance, carcass and some blood parameters of broiler chicks. Current Research in Poultry Science, 1(1): 12-23.
- Verma SVS, Gowda SK, and Elangovan AV (1998). Responses of single comb white leghorn layers to dietary inclusion of raw or alkali treated neem kernel meal. Animal Feed Science and Technology, 76:169-75.