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Original Article

Effects of kalo jeera seeds and neem leaf supplementation on the growth performance of Cobb 500 broiler

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ABSTRACT

Objective: This experiment was conducted to evaluate the effects of Neem (*Azadirachta indica*) and Kalo Jeera (*Nigella sativa*) powdered supplementation in drinking water as a growth promoter in broiler chickens.
Materials and Method: A total of 20 day-old Cobb 500 broiler chicks were purchased from local hatchery (Nourish Poultry & Hatchery Ltd.) and after seven days of acclimatization chicks were randomly divided into two groups, A and B. The group A was kept as a control and not treated. The group B was supplemented with Neem and kalo jeera powder with feed and water. Weekly observations were recorded for live body weight gain up to 5th weeks and hematological tests were performed at 35th day's age of broiler to search for hematological changes between control (A) and treatment (B) groups.
Results: The initial body weight of groups A and B on 1st day of this experiment were 42.30±2.56 gm and 42.90±3.35 gm, respectively and after 35th day of experiment final body weight were 1500±47.39 gm and 1765±58.96 gm, respectively; the net body weight gain were 1458±43.59 gm and 1723±54.30 gm, respectively and economics of production were analyzed and found that net profit per broiler was Tk. 11.33 and Tk. 23.48, respectively. The treatment group B was recorded statistically significant (at 1% level) increase for live body weight than that of control group A.
Conclusion: The results suggest that better growth performance could be achieved in broilers supplemented with Neem and kalo jeera.

Key words: Broiler, growth performance, Neem, Kalojeera, efficacy

INTRODUCTION

Bangladesh is a developing country. Poultry is an emerging and important sector that has been contributing progressively to Bangladesh for the past decade. Poultry production and poultry related industry contribute 20.65 (%) per cent of the total livestock contribution. Poultry industries play an important role in poverty alleviation and economic development of Bangladesh. Animal protein is one of the most important requirements for human health, which preliminary come from poultry meat and egg. According to the Food and Agriculture Organization, each person should take 56 kg of meat and 365 eggs every year. But in Bangladesh, per head intake of meat is only 11.27 kg and 30 eggs per year. As a result, people suffer from malnutrition. It is evident that a substantial majority of the population suffers from varying degrees of malnutrition, including protein-energy malnutrition, micro-nutrient deficiencies, iodine deficiency disorder, iron deficiency, anemia, and vitamin deficiencies. Broilers are chickens produced

specifically for meat production, these includes small fryers to large roaster type chicken. Broiler production has grown dramatically in the past two decades; these improvements are largely due to numerous researches and breeding programs which further enhanced feed utilization, growth rate and low levels of activity. Current commercial hybrids with high performance require high energy diets which would enable the maximum expression of their genetic potential (Sadeghi, 2005), in order to achieve this poultry farmers make use of synthetic growth promoters to enhance feed utilization and growth performance of broilers.

The term "antibiotic growth promoter" is used to describe any medicine that destroys or inhibits bacteria and is administered at a low, sub-therapeutic dose. 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 Butaye et al. (2003). 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. Medicinal plants are cheap and renewable sources of pharmacologically-active substances and are known to produce certain chemicals that are naturally toxic to bacteria Basile et al. (1999).

Medicinal plants have been used for curing diseases for many centuries in different indigenous systems of medicine as well as folk medicines. Moreover, medicinal plants are also used in the preparation of herbal medicines as they are considered to be safe as compared to modern allopathic medicines. Many researchers are focusing on medicinal plants since only a few plant species have been thoroughly investigated for their medicinal properties, potential, mechanism of action, safety evaluation and toxicological studies. Neem tree as one of the most researched tree in the world has attracted world-wide 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 Kale et al. (2003). Due to adverse side effects arising from the use of synthetic forms of growth promoters, consideration should be given to alternative natural supplements. Among various medicinal plants, *Nigella sativa* (*N. sativa*) (Family Ranunculaceae) is emerging as a miracle herb with a rich historical and religious background since many researches revealed its wide spectrum of pharmacological potential. *N. sativa* is commonly known as black seed. *N. sativa* is native to Southern Europe, North Africa and Southwest Asia and it is cultivated in many countries in the world like Middle Eastern Mediterranean region, South Europe, India, Pakistan, Syria, Turkey, Saudi Arabia. The seeds of *N. sativa* and their oil have been widely used for centuries in the treatment of various ailments throughout the world. And it is an important drug in the Indian traditional system of medicine like Unani and Ayurveda. Among Muslims, it is considered as one of the greatest forms of healing medicine available due to it was mentioned that black seed is the remedy for all diseases except death in one of the Prophetic hadith. It is also recommended for use on regular basis in Tibb-e-Nabwi (Prophetic Medicine). *N. sativa* has been extensively studied for its biological activities and therapeutic potential and shown to possess wide spectrum of activities *viz.* as diuretic, antihypertensive, antidiabetic, anticancer and immunomodulatory, analgesic, antimicrobial, anthelmintics, analgesics and anti-inflammatory, spasmolytic, bronchodilator, gastroprotective, hepatoprotective, renal protective and antioxidant properties.

The seeds of *N. sativa* are widely used in the treatment of various diseases like bronchitis, asthma, diarrhea, rheumatism and skin disorders. It is also used as liver tonic, digestive, anti-diarrhea, appetite stimulant, emmenagogue, to increase milk production in nursing mothers to fight parasitic infections, and to support immune system Borris et al. (1996). Most of the therapeutic properties of this plant are due to the presence of thymoquinone (TQ) which is a major active chemical component of the essential oil. Black seeds are also used in food like flavoring additive in the breads and pickles because it has very low level of toxicity. In view of these, the present work has been undertaken with the two objectives one to investigate

the growth performance of broilers supplemented with Neem and Kalo jeera and another to examine the effect of Neem and Kalo jeera on hematological parameters (TEC, ESR and Hb) of broilers.

MATERIALS AND METHODS

Ethical approval: The work has been conducted by following international standard and ethical issues particularly during doing the haematological examination.

The experimental site: This study was executed at broiler farm of the Department of Pharmacology, Bangladesh Agricultural University (BAU), Mymensingh, during the period from 26th July 2014 to 5th October 2014. To complete the research work following steps were followed.

Management of Experimental Shed and Broilers: At first the shed for rearing broiler chickens (experimental shed at BAU campus governed by Department of Pharmacology) was properly prepared. The experimental units were kept on a floor litter system in separate pens each measuring 3 x 4 square feet. The pens were thoroughly cleaned, white washed and disinfected before putting the experimental chick into these. A total of 20 day-old Cobb 500 broiler chicks purchased from a local hatchery (Nourish Poultry & Hatchery Ltd.). Day-old broiler chicks, 20 in number, were brought in the experimental shed. 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. Optimum light was provided daily throughout the experimental period. The chicks were brooded at 35°C during first week and thereafter; the temperature was reduced by 3°C every week until the temperature reached to the room temperature i.e., 25±1°C. 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 finisher 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.

Collection and Processing of Kalo jeera and Neem leaves: Young, fresh and blooming Neem, leaves were harvested green from the Bangladesh Agricultural University, Pharmacology Medicinal plants garden, the leaves were washed, chopped and air dried in a well ventilated room for 10 days. The dried leaves were ground separately using the Mixture blender to produce Neem Leaf meal (NLM) and stored in air-tight bags. Kalo jeera seeds was purchased from local K.R. Market, BAU, Mymensingh, washed and dried and crushed in mortar and pestle to paste.

Experimental Design: A total of 20 broiler chicks were randomly divided into 2 groups (A and B) for assessing the effect of Neem and Kalo jeera as growth promoter on broilers. Treatment group B- Basal diet + mixture of Neem and Kalo jeera (1% each in drinking water). All the chicks of treated and control groups were closely observed for 35 days and following parameters were studied.

Clinical Examination: The Effect of Neem leaf and Kalo jeera on body weight of broilers was recorded before and after treatment. Broilers chicks of control and treatment groups were weighed with spring weighing machine. The weight of broiler chickens was taken weekly. Mean live weight gains of each group of chicken on 1st, 7th, 14th, 21st, 28th and 35th days were recorded.

Hematological Parameters: Blood samples were collected from wing vein of chicken of both control and treated groups at 35th day to study the Neem and Kalo jeera the following parameters were observed:
(a) Total Erythrocyte Count (TEC)
(b) Hemoglobin estimation (Hb)
(c) Erythrocyte Sedimentation Rate (ESR)

Determination of Total Erythrocyte Count (TEC): Total erythrocyte count was done following the method described by **Lamberg and Rothstein (1977).** Well-mixed blood sample was drawn with red blood cell diluting pipette exactly up to 0.5 marks of the pipette. Outside of the tip of the pipette was wiped with cotton. Then the pipette was immediately filled with the red cell diluting fluid (Hayem's solution) up to 101 marks. The free end of the pipette was wrapped around with the rubber tube stretching to both the ends and held with thumb and middle finger. The content of the pipette was mixed thoroughly by shaking with 8-knot motion for 3-5 minutes. Then the counting chamber was placed with special cover glass under microscope using low power (10x) objectives. After discarding 2 or 3 drops of fluid from the pipette, a small drop was placed to the edge of the cover glass on the counting chamber as the entire area under the cover glass was filled by the fluid. One-minute time was spared to allow the cells to settle on the chamber under the cover glass. Taking 5 larger squares (4 in the 4 corners and the central one) of the central large square, the cells were counted from all the 80 small squares (16 x 5) under high power objectives (45x). After completion of counting, the total number of RBC was calculated as number of cells counted x 10,000 and the result was expressed in million/µl of blood.

Determination of Hemoglobin Concentrations (Hb): The N/10 hydrochloric acid (HCL) was taken in a graduated tube up to 2 marks with the help of a dropper. Well-homogenized blood sample was then drawn into the Sahli pipette up to 20 cm. mark. The tip of the pipette was wiped with sterile cotton and the blood of the pipette was immediately transferred into the graduated tube containing hydrochloric acid. This blood and acid were thoroughly mixed by stirring with a glass stirrer. There was a formation of acid hematin mixture in the tube by hemolysing red blood cells by the action of HCL. The tube containing acid hematin mixture was kept standing in the comparator for 5 minutes. After that distilled water was added drop by drop. The solution was mixed well with a glass stirrer until the color of the mixture resembled to the standard color of the comparator. The result was read in daylight by observing the height of the liquid in the tube considering the lower meniscus of the liquid column. The result was then expressed in g%. The above procedure was matched by the Hellige hemometer method as described by **Lamberg and Rothstein (1977).**

Determination of Erythrocyte Sedimentation Rate (ESR): The fresh anticoagulant blood was taken into the Wintrobe hematocrit tube by using special loading pipette exactly up to 0 marks. Excess blood above the mark was wiped away by sterile cotton. The filled tube was placed vertically undisturbed on the wooden rack for one hour. After one hour the ESR was recorded from the top of the pipette. The result was expressed in mm/in 1st hour.

The performance trial: The birds were reared by the method described by **Sarker et. al. (2001)** and during the 35 days experimental period, growth performance was evaluated. Body weight and feed consumption were recorded weekly and body gain and feed conversion were then calculated. Mortality was recorded throughout the study.

Feed consumption: Feed consumption is the amount of feed consumed every week; it was calculated for each treatment at weekly basis. At the end of the week, the residual amount of feed was weight and subtracted from the known weight of feed at the beginning of week. The product was divided by the total number of birds.

RESULTS AND DISCUSSION

Effect of Neem and Kalo Jeera Supplementation on Growth in Broilers: This experiment was conducted to study the effect of Neem and Kalo jeera as a growth promoter in broilers. The experiment was held under the Department of Pharmacology, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh. A total of 20 day-old Cobb 500 broiler chicks were randomly divided into 2 groups (A and B) for assessing the effect of Neem and Kalo jeera with drinking water as growth promoter on broilers. The experimental units were kept on a floor litter system in separate pens. A weight 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 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 (1-5 weeks of age). The birds using drinking water were supplemented with Neem and Kalo jeera in B group and gained the higher live weight **(Table 1)**. **Table 2** revealed that, in control group (Group A) initial average live weight on 1st day was 42.30±2.56 gm, final live weight 1500± 47.39 gm, weight gain 1458± 43.59 gm and feed conversion ratio (FCR) was 2.13. In Group B initial average live weight on 1st day was 42.90±3.35 gm, final live weight 1765±58.96 gm, weight gain 1723± 54.30 gm and FCR 1.81. The birds of group B using drinking water were supplemented with 1% Neem and Kalo jeera utilized their feed statistically significantly (at 1% level) more efficiently than control group **(Table 2)**. Statistical analysis of the data shows non significant between the dressing percentages of the birds of two groups **(Table 3)**. Statistical analysis of the data did not show any difference between the relative gizzard weights of the birds of two groups **(Table 3)**. Statistical analysis of the data shows 1% level of significance of relative heart, liver, spleen and pancreas weight between the birds of two groups using drinking water with or without supplementation of Neem and Kalo jeera **(Table 3)**. Economies of Production: The average rearing cost of broilers in two groups were Tk. 178.00 and Tk. 188.00 for A and B groups 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. The average live weight/broiler in groups A and B were 1.500 kg and 1.765 kg respectively. The broilers were sold in live weight basis at the rate of Tk. 130/kg. The net profit/Kg live weight in the respective group excluding the cost of labour was found to be Tk.11.33 and Tk. 23.48 respectively.

Table 1. Body weight pattern of experimental broilers

Body wt. g	Day 1 mean±SD	Day 7 mean±SD	Day 14 mean±SD	Day 21 mean±SD	Day 28 mean±SD	Day 35 mean±SD
Control, n=10	42.45±3.80	160.67±4.80	560.89±8.90	950.60±10.90	1370±18.00	1500±32.00
Treatment n=10	42.89± 4.84	170.90± 5.67	620.65± 21.09	1050±16.98	1550± 43.09	1765.98± 35.89
% increase	0	9.41	9.67	10.52	13.13	17.66

Table2. Initial and Final Live Weight, Weight Gain, Feed Consumption and Feed Conversion Ratio of Broilers Supplemented With or Without Neem and Kalo jeera on 35th Day of Age

Variables	Treatments	Average weight (Mean ± SEM)	P value	Significance level
Initial live weight (g) on 1th day	Control	42.30± 2.56	.000	**
	Neem and Kalo jeera	42.90 ± 3.35		
Final live weight (g) on 35th day of age	Control	1500 ± 47.39	.000	**
	Neem and Kalo jeera	1765 ± 58.96		
Weight gain (g) on 35th day of age	Control	1458 ± 43.59	.000	**
	Neem and Kalo jeera	1723 ± 54.30		
Feed consumption (g) on 35th day of age	Control	3200 ± 35.49	.000	**
	Neem and Kalo jeera	3200 ± 52.29		
FCR	Control		2.13	
	Neem and Kalo jeera		1.81	

Supplementation of Neem and Kalo jeera in the treatment group caused improvement in the feed efficiency as compared to that of control group. Birds supplemented with Neem and Kalo jeera had higher body weight, weekly gain in weight, feed consumption and feed efficiency. These results may be due to antimicrobial and anti-protozoal properties of Neem and Kalo jeera 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 of Neem and Kalo jeera of treatment groups caused significant increase in live body weight and improvement in weekly gain in weight and feed efficiency as compared to that of control group of broilers.

Table 3. Dressing Percentages, Relative Giblet Weight (heart, gizzard, liver and spleen) and Pancreas Weight of Broilers Supplemented With or Without Neem and Kalo jeera from 1-5 Weeks of Age

Variables	Treatments	Average value (Mean ± SEM)	P value	Significance level
Dressing percentage	Control	64.400 ± 0 .404	0.939	NS
	Neem and Kalo jeera	64.470 ± 0.961		
Relative heart weight	Control	0.420 ± 0.032	0.002	**
	Neem and Kalo jeera	0.511 ± 0.032		
Relative gizzard weight	Control	1.460 ± 0.034	0.606	NS
	Neem and Kalo jeera	1.440± 0.014		
Relative liver weight	Control	2.530±0.034	0.001	**
	Neem and Kalo jeera	2.610±0.032		
Relative spleen weight	Control	0.120±0.011	0.011	**
	Neem and Kalo jeera	0.130± 0.015		
Relative pancreas weight	Control	0.230± 0.011	0.001	**
	Neem and Kalo jeera	0.250± 0.017		

** = Significant at 1% level of probability (0.00-0.01), **NS** = Not significant (≥ 0.05), **Relative weight (g) =** Weight of organ / Live body weight of bird X 100, **Dressing % =** Dress weight **/** Live weight of bird

Table 4. Data Showing Economics of Broiler Production Kept Under Treatment and Control Groups From Day Old to 5 Weeks of Age

Description	Group-A	Group-B
Cost/chick (Taka)	30.00	30.00
Average feed consumed (Kg)/chicks	3.200	3.200
Feed price/kg (Taka)	40.00	40.00
Cost of herbal growth promoters (Taka)	0.00	10.00
Feed cost (Taka)	128.00	128.00
Miscellaneous (Taka)	20.00	20.00
Total cost/broiler (Taka)	178.00	188.00
Average live weight (Kg)	1.500	1.765
Sale price/Kg live wt. (Taka)	130.00	130.00
Sale price/broiler (Taka)	195.00	229.45
Net profit/broiler (Taka)	17.00	41.45
Profit/ Kg live weight (Taka)	11.33	23.48

Table 5: Study of Neem and Kalo jeera supplementation on Hematological Parameters of Broiler on 35th day

Group	TEC(million/mm³)	ESR(mm infirsthour)	Hb (gm/dl)
Control	2.01±0.102	4.69± 0.58	7.09± 0.13
Treatment	2.06±0.23	4.83±0.64	7.34±0.13
P value	-	-	-
Level of sig	NS	NS	NS

Values shows in the same column differ significantly (P<0.05)

Addition of herbal growth promoter Neem and Kalo jeera 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 Neem and Kalo jeera utilized their diets better which was evidenced by their higher carcass values. The percentages of back, wing, head and shank did not differ significantly across the treatments more so, these parts carry less value in terms of meat yield and consumer preference. The values for liver, heart, gizzard and lungs did not differ significantly, this could be linked to the absence of anti-nutritional factors in the diets, because higher physiological activities by these organs is triggered by the presence of anti-nutritional factors and their concomitant effect. In conclusion, results of the present study showed that supplementation of diet with 1% (Neem and Kalo jeera) improved performance, feed utilization, dressing percentage and carcass yield therefore this combination of Neem and Kalo jeera can serve as an effective replacement for chemical based growth promoters in broiler production. The birds supplied drinking water supplemented with herbal growth promoters Neem and Kalo jeera 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 garlic 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 garlic may be incorporated as a growth promoter in the ration of Japanese quails. Better feed conversion ratio of the broilers using drinking water supplemented with Neem and Kalo jeera may be attributed to the antibacterial properties of these supplements, which resulted in better absorption of the nutrients present in the gut and finely leading to improvement in feed conversion ratio of the rations. Supplementation of Neem and Kalo jeera did not exhibit any effect on the dressing percentage values of the broilers in this study.

The results of the present study are in line with those observed by (Ahmad, 2008), who reported a non-significant effect on broiler dressing percentage values due to the inclusion of garlic in the diet of broilers. Inclusion of garlic 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 1% Neem and Kalo jeera with drinking water was found to be more profitable than without Neem and Kalo Jeera supplementation in broiler rearing. The results of the present study are in line with the findings of (Ahmad, 2005 and Navid, 2011), 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 and Kalo Jeera supplemented drinking water. In our recent studies by using various medicinal plants as an alternative source of growth promoters in broilers showed the increased weight gain as reported Begum et al. (2010), Kibria et al. (2009), Khatun et al. (2013), Islam et al. (2013), Molla et al. (2012), Nath et al. (2012), Rahman et al. (2014), Sarker et al. (2009 & 2014).

CONCLUSION

Medicinal plants compete with the synthetic drugs. As the world is becoming more advanced, new diseases are emerging in animals and human beings by irrational use of antibiotics and antimicrobial growth promoters which have the risk of antibiotic resistance to poultry and human health. Now it is the need of the hour to work more extensively on the medicinal plants in the greater interest of mankind antibiotics and inorganic growth promoters 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. As the alternative to antibiotics, the continuous treatment with 1% Neem and Kalo jeera with drinking water of treatment group significantly increased of the live body weight and significantly effects on blood parameters **(Table 5)** as compared to that of control group of broilers found in this research. Finally we can say that supplementation of Neem and Kalo jeera with drinking water may be used for economical and efficient production of broilers.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

AUTHORS' CONTRIBUTION

KSM and MM implemented the study design. KSM, RRR, and SA participated in data collection. KSM and RRR performed all the tests. KSM and RRR drafted, HK, SA and SMR revised the manuscript. HK critically checked the article and corrected the manuscript. All authors read and approved the final version of manuscript.

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