

IMMUNOMODULATORY AND GROWTH PROMOTING EFFECTS OF NEEM LEAVES INFUSION IN BROILER CHICKS

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ABSTRACT

A research study was conducted to investigate growth promoting and immunomodulatory effects of neem leaves' infusion on broilers at the NWFP Agricultural University, Peshawar, Pakistan during June and July. One hundred and sixty day-old chicks were randomly divided into four groups, designated as A, B, C and D. Each group was replicated four times with 10 chicks per replicate, reared in open sided house. Birds of group A, B and C were given 4% concentrated neem leaves' (*Azadirachta indica*) infusion @ of 30ml, 40ml and 50ml L⁻¹ of fresh drinking water respectively, and group D was kept as control. Mean feed and water intake were higher ($P<0.05$) in control group as compared to others. Group C exhibited better ($P<0.05$) mean body weight gain, feed conversion ratio (FCR) and dressing percentage. Although, weight of giblet and other body organs (thigh, leg, intestine and abdominal fat) were same, significantly ($P<0.05$) higher mean breast weight was recorded in group C than in other groups. Mean feed cost was significantly higher for group D than A, B and C. Mean gross return for group C was significantly higher than other groups. Significantly ($P<0.05$) higher mortality was observed in group D as compared to group A, B and C. Mean antibody titer against Infectious Bursal Disease (IBD) virus for group C was significantly ($P<0.05$) higher than rest of three groups. It was found that Neem (*Azadirachta indica*) infusion successfully improved antibody titer, growth performance and gross return at the level of 50 ml/liter of fresh drinking water.

Key Words: *Azadirachta indica*, Broiler Chicks, Growth Promoters, Immunomodulatory Effect, Neem

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INTRODUCTION

A variety of non-nutritive feed additives mostly antibiotics are used in broiler production to improve the overall performance and immune status by eliminating stress. Some of these additives are recommended for chemotherapeutic and prophylactic purpose, while other are reported to have growth promoting effect. Continuous use of sub therapeutic levels of such feed additives in feed may result in the presence of their residues in animal products and the development of drug resistant microorganisms in humans. Antibiotics growth promoters have been banned in developed countries. This ban on the use of synthetic feed additives has triggered intensive research to find and develop alternative strategies to maintain health and performance in intensive poultry production system. Researches have identified several beneficial chemical compounds in medicinal plants, which play an important role in improving production and immune system of birds against different diseases and have strong medicinal value and could be effectively utilized as natural growth promoters to replace antibiotics and other synthetic feed additives.

Azadirachta indica, commonly known as neem, has attracted worldwide attention in recent years, owing to its wide range of medicinal properties. Neem has been extensively used in Ayurveda, Unani and homoeopathic medicine and has become a cynosure of modern medicine (Subapriya and Nagini., 2005; Koul and Opendar, 1990). In Pakistan, it is cultivated throughout Sindh, lower Balochistan, Southern Punjab and Southern NWFP. Neem elaborates a vast array of biologically active compounds that are chemically diverse and structurally complex. More than 140 compounds have been isolated from different parts of neem. All parts of the neem tree-leaves, flowers, seeds, fruits, roots and bark have been used traditionally for the treatment of inflammation, infections, fever, skin diseases and dental disorders. The medicinal utilities and wide range of pharmacological activities have been described especially for neem leaf. Neem leaves and its constituents have been demonstrated to exhibit immunomodulatory, anti-inflammatory, antihyperglycaemic, antiulcer, antimalarial, antifungal, antibacterial, antiviral, antioxidant, antimutagenic and anticarcinogenic properties (Subapriya and Nagini, 2005). The leaves extract contain nimbin, nimbinene, 6-desacetylnimbiene, nimbandiol, nimbolide and quercetin (Mitra *et al.*, 2000). Leaves are carminative and aid in digestion. The tender leaves along with piper nigrum Linn are found to be effective in intestinal helminthiasis. An aqueous extract (10%) of tender leaves is reported to possess anti-viral

properties against, fowl pox, IBD and New Castle disease virus (NDV) and significantly enhances the antibodies production against the IBD and NDV (Sadekar *et al.*, 1998). The infusion of fresh leaves is stated to be an antiseptic. The hot infusion of leaves is used as anodyne for fomenting swollen glands, bruises and sprains (Sharma, 1997). Based on these medicinal properties a study was planned to explore the effects of neem leaves infusion on the immunity, growth performance and economics of broiler production.

MATERIALS AND METHODS

This research study was conducted at the NWFP Agricultural University, Peshawar, Pakistan using a completely randomized design (CRD). One hundred and sixty (160) day-old broiler chicks were randomly divided into four groups A, B, C and D (each group representing four replicates and 10 chicks per replicate). All the chicks were reared in an open sided house, using separate places for each replicate and sand as bedding material. Strict sanitation practices were maintained in the house before and during the course of the experiment. Group A, B and C was given neem infusion @ 30, 40 and 50ml/liter of drinking water respectively, and group D was kept as control.

Preparation of 4% (w/v) Concentrated Neem Leaves Infusion

Neem leaves infusion was prepared according to the method described by Leila (1977). Fresh neem leaves were collected from the local area of District Peshawar and dried for 24 hours at 37°C in oven. Exposure to sunlight was avoided to prevent the loss of active components. Dry leaves were then ground and 40 g of dried ground leaves were taken in a non-metallic jar. One liter of hot boiled distilled water was poured on it and kept at room temperature for 5-8 hours to prepare an infusion.

Antibody Titer Determination

At the end of experiment, blood samples were collected from all birds in test tubes. Test tubes were kept in slanting position to separate serum. Serum was then taken in small size labeled plastic bottles and stored in iceboxes. The serum samples were then sent to the Grand parent Laboratories Lahore for antibody titer determination against infectious bursal disease (IBD) using ELISA Kit techniques as described by Synder *et al.* (1984).

Data Collection and Analysis

Data on body weight, feed intake, water intake, dress-weight and weight of different body organs (giblets, intestine and abdominal fat) were recorded. Antibody titer against IBD was also worked out using ELISA Kit techniques as described by Synder *et al.* (1984). Statistical package M STAT C was used for data analysis using CRD design. Means were compared using Duncan's multiple-range test (Steel and Torrie., 1980)

RESULTS AND DISCUSSION

Feed Consumption and Feed Conversion Ratio

Mean feed intake for group A, B, C and D was 2375, 2404, 2359 and 2416 g respectively (Table I). Feed intake for group D was significantly ($P < 0.05$) higher than group A, B and C (Table I). The results of the present study are in agreement with Gowda *et al.* (1998), who reported significantly lower feed intake ($P < 0.01$) for diets with NKM at 150 and 200g/kg diet in White Leg horns. On the other hand lower ($P < 0.05$) feed conversion ratio for group C as compared to the control and other two groups (Table I), suggested economical gains on lower feed consumption supplemented with neem leaves infusion. Chakeravarty and Prasad (1991) also reported that better feed conversion ratio of broilers fed commercial ration and water containing neem (*A. indica*) infusion than others.

Table I. Mean Body weight gain, Feed intake, Water intake and FCR in broilers given neem leaves extract in drinking water

Group	Neem leaves infusion litter ⁻¹ of water (ml)	Mean body weight gain chick ⁻¹ (gm)	Mean feed intake chick ⁻¹ (gm)	Mean water intake chick ⁻¹ (ml)	Mean FCR value chick ⁻¹
A	30	1407 ^c	2375 ^b	7210 ^b	1.69 ^c
B	40	1463 ^b	2404 ^b	7173 ^b	1.64 ^b
C	50	1521 ^a	2359 ^b	7071 ^b	1.55 ^a
D	Control	1320 ^d	2416 ^a	7750 ^a	1.88 ^d

Means in column with different superscripts are significantly different at $\alpha = 0.05$.

Body Weight Gain

Group C had significantly ($P < 0.05$) higher body weight gain than rest of three groups (Table I). An increasing trend was found in body weight gain with increased levels of neem leaves infusion. The results of present study are in agreement with the study of Chakeravarty and Prasad (1991), who reported that boilers fed on diet containing neem (*A. indica*) leaves, had higher body weight gain. Similar findings have been reported by Tipu *et al.* (2002), who used salinomycin and neem (*A. indica*) fruit as feed additive and anticoccidial in broilers and reported better results in terms of weight gain. The higher body weight gain in broilers consuming neem leaves infusion could be due to its diversified effect on intestinal micro flora, thereby avoiding stressful conditions.

Water Intake

Mean water intake is given in Table I. Significantly ($P < 0.05$) higher amount of water was consumed by broilers in group D than in group A, B and C. However, differences in water intake amongst group A, B, and C were not significant (Table I). The lower amount of water consumption in treated groups could be due to some metabolic effects of the neem infusion that needs to be figured out for more profitable production.

Dressing Percentage

Dressing percentage was significantly ($P < 0.05$) higher in group C than all other groups (Table II). Results are opposed to the findings of Elangovan *et al.* (2001), who reported that neem treated groups have no changes in carcass characteristics.

Table II. Mean Dressing percentage and Mortality in broilers given neem leaves extract in drinking water

Group	Neem leaves infusion litter ⁻¹ of water (ml)	Mean dressing percentage chick ⁻¹	Percent Mortality group ⁻¹
A	30	57.63 ^{bc}	2.5 ^b
B	40	58.24 ^{ab}	2.5 ^b
C	50	58.59 ^a	2.5 ^b
D	Control	57.28 ^c	10 ^a

Means in column with different superscripts were significantly different at $\alpha = 0.05$.

Weight of Different Body Organs

Weight of different body organs was not influenced in both treated and untreated groups, except breast weight that was found higher ($P < 0.05$) in group C as compared to others (Table III). Mean weights of gizzard, intestine and abdominal fat were also same for all groups (Table IV). Elangovan *et al.* (1996) also reported that dietary treatment of alkali-treated neem did not cause any significant change in liver, heart, gizzard, intestine and abdominal fat. The results are also in agreement with that of Hernandez *et al.* (2004), who reported no differences in the mean weight of proventriculus, gizzard, intestine, liver and pancreas in broilers fed on two herbal plants extract.

Table III. Mean weight of different body organs in broilers given neem leaves extract in drinking water

Group	Neem leaves infusion litter ⁻¹ of water (ml)	Mean breast weight chick ⁻¹ (gm)	Mean thigh weight chick ⁻¹ (gm)	Mean leg weight chick ⁻¹ (gm)
A	30	271.2 ^b	67.16 ^a	61.08 ^a
B	40	273.9 ^b	70.33 ^a	62.33 ^a
C	50	285.7 ^a	74.91 ^a	67.08 ^a
D	Control	261.7 ^c	63.25 ^a	62.59 ^a

Means in column with different superscripts were significantly different at $\alpha = 0.05$.

Table VI. Mean gizzard, intestine and abdominal fat weight in broilers given neem leaves extract in drinking water

Group	Neem leaves infusion litter ⁻¹ of water (ml)	Mean Liver weight chick ⁻¹ (gm)	Mean heart weight chick ⁻¹ (gm)	Mean gizzard chick ⁻¹ (gm)	Mean intestine weight chick ⁻¹ (gm)	Mean abdominal weight chick ⁻¹ (gm)
A	30	43.58	7.67	29.91	148.75	16.99
B	40	43.66	7.92	31.16	162.50	14.75
C	50	43.41	6.83	30.01	156.58	13.99
D	Control	41.83	7.25	28.50	132.57	17.92

Mortality

Significantly ($P < 0.05$) higher mortality was observed in group D than group A, B and C (Table II). The results of this research study are in agreement to the findings of Guha *et al.* (1991), who reported that feeding medicinal herbs to broilers prevented losses as compared with control. Tipu *et al.* (2002), who used salinomycin and neem (*A. indica*) fruit as feed additive and anticoccidial in broiler also reported that neem treated group had excellent activity in terms of oocysts count and smaller mortality. Lower mortality in treated groups could be due to efficient use of neem leaves extract in preventing losses and eliminating stress.

Antibody Titer against IBD Virus

Mean antibody titer against IBD was higher for group C than all other groups (Table V) suggesting better immunomodulatory effect of neem leaves extract against IBD virus. The results of this research study are in agreement with Sadekar *et al.* (1998), who fed powdered dry leaves of *A. indica* to broilers (2g/kg), which significantly enhanced the antibody titers against IBD and Newcastle Disease Virus antigens. Subapriya and Nagini (2005) also reported that Neem leaf and its constituents have been demonstrated to exhibit antiviral properties.

Table V. Mean Antibody Titer against IBD in broilers given neem leaves extract in drinking water

Group	Neem leave infusion litter ⁻¹ of water (ml)	Mean Antibody Titer
A	30	5940 ^c
B	40	5147 ^d
C	50	6768 ^a
D	Control	6558 ^b

Means in column with different superscripts were significantly different at $\alpha = 0.05$

Economics of the Research Study

Mean feed cost was significantly ($P < 0.05$) higher for group D as compared to all other groups (Table VI). On the other hand mean gross return for group C was significantly ($P < 0.05$) higher than all other groups. The findings suggested efficient and economical utilization of giving 50ml of neem leaves extract per liter of drinking water in broiler production.

Table VI. Mean feed cost and gross return chick⁻¹ in broilers given neem leaves extract in drinking water

Group	Neem leaves infusion litter ⁻¹ of water (ml)	Mean feed cost chick ⁻¹ (Rs)	Mean Gross return chick ⁻¹ (Rs)
A	30	32.07 ^b	91.47 ^c
B	40	32.45 ^b	95.17 ^b
C	50	31.86 ^b	99.99 ^a
D	Control	35.32 ^a	85.82 ^d

Means in column with different superscripts were significantly different at $\alpha = 0.05$

CONCLUSION

From the present research study it is concluded that 4% neem leaves infusion @ 50ml L⁻¹ of fresh drinking water could be effectively used as a potential natural growth promoter and as immune stimulant contributing to better body weight gain, FCR, gross return, lower mortality and higher antibody titer against IBD.

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