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Effects of Nishyinda, black pepper and cinnamon extract as growth promoter in broilers

M. R. Molla, M. M. Rahman*, F. Akter and M. Mostofa
Department of Pharmacology, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

Abstract

An extract of nishyinda (*Vitex negundo*) leaves, black pepper (*Piper nigrum*) and cinnamon (*Cinnamomum verum*) (polyherbal extract) were used as growth promoter in broilers. A total of 20 day-old broiler chicks were purchased and after seven days of acclimatization randomly divided into two equal groups. No vaccination schedule was practised and no antibiotics were added in rations. Group A served as control while group B was supplemented with polyherbal extract 1 mL/litre in drinking water. Weekly body weight gain up to six weeks was measured and blood tests were performed at 21 and 42 days. Polyherbal extract significantly ($P<0.05$) improved weight gain. There was no change in haematological parameters. It can be concluded that the polyherbal extract was safe as a growth promoter in broiler production without adverse effects on chicken health. (*Bangl. vet*. 2012. Vol. 29, No. 2, 69 – 77)

Introduction

Medicinal plants compete with synthetic drugs, and the majority have no residual effects (Tipu *et al.,* 2006). Emerging health hazards are evident in animals and man by irrational use of antibiotics and antimicrobial growth promoters.

Herbal agents could serve as safer alternatives as growth promoters due to lower cost, reduced toxicity and minimum health hazards. Biological trials of certain herbal formulations as growth promoter have shown encouraging results and some of the reports have demonstrated improved weight gain and feed efficiency, lowered mortality, and increased immunity and viability in poultry (Kumar, 1991). Some herbal growth promoters exert therapeutic effects against liver damage due to feed contaminants like aflatoxin (Ghosh, 1992). Bangladesh is abundant in plants possessing interesting pharmacological properties, which await exploitation. Various herbal products are being used as growth promoters in poultry rations like nishyinda, black pepper and cinnamon. Antibiotics promote growth because of an effect on gut flora (de Man, 1975). The use of antibiotics as dietary growth promoters in poultry diets has reduced dramatically (WHO, 1997). Antimicrobial resistance in zoonotic pathogens including *Salmonella*, *Escherichia coli* (*E. coli*), and *Enterococci* in food animals is of special concern to human health because these are likely to transfer to humans (Endtz *et al.,* 1991). In 2006 the European Commission banned the last four

* Corresponding author:- *E-mail*: mahmud_ubc@yahoo.ca

feed antibiotics (monensin sodium, salinomycin sodium, avilamycin, flavophospholipol). To minimize resistance, different agencies are in favour of banning these feed antibiotics (Hileman, 2002). The phasing out of antibiotic growth promoters will affect the poultry industry. There is a need to find alternatives. There are a number of alternatives such as enzymes, inorganic acids, probiotics, prebiotics, herbs, immunostimulants and management practices (Banerjee, 1998). Herbs and their essential oils have long been known for their antimicrobial activity (Juven *et al*., 1994; Chang, 1995). More recently, medicinal plant extracts have been developed or proposed for use in food as natural antimicrobials (Hsieh *et al.,* 2001). Polyherbal extracts have been used worldwide for a range of medicinal properties like antibacterial, antiviral, antifungal, antiprotozoal, or hepato-protective without adverse effects (Kale *et al*., 2003; Chowdhury *et al*., 2009). Polyherbal products promote growth and feed efficiency of birds because of their antibacterial and hepato-protective properties (Wankar, 2009).

Nishyinda *(Vitex negundo* L.) is a hardy plant, flourishing mainly in the Indian subcontinent. It possesses phyto-chemical secondary metabolites, which impart a variety of medicinal uses. The leaves of nishyinda may be applied locally to swellings from rheumatoid arthritis and sprains. The juice of the leaves is used for the treatment of foetid discharges. The principal constituents of the leaf juice are casticin, isoorientin, chrysophenol D, luteolin, p–hydroxybenzoic acid and D-fructose. Black pepper (*Piper nigrum*) is a flowering vine in the family Piperaceae, cultivated for its fruit, and used as a spice and seasoning. Dried ground pepper has been used for both its flavour and as a medicine, which is due to presence of piperine. Cinnamon (*Cinnamomum zylenicum*) is commonly used in the food industry. It has strong antibacterial, anti-candida, anti-ulcer, analgesic, antioxidant and hypocholesterolaemic activities (Mastura *et al.,* 1999; Lin *et al.,* 2003).

In Bangladesh, no comprehensive work has been done on the effects of plant extracts on body weight and performance in poultry. This study was designed to determine the effect of a polyherbal extract on live weight as a possible alternative to antibiotic feed additives.

Materials and methods

Preparation of polyherbal extract

The leaves of nishyinda were sun-dried for 10 days and oven-dried at 55-60°C for two days. The dried nishyinda leaves, black pepper and cinnamon were pulverized with a blender. A 25 (holes/inch) mesh diameter sieve was used to obtain fine dust, which was preserved in an airtight plastic container. Ten grams of nishyinda leaf powder mixed with 10g black pepper and 10g cinnamon was added to four litres distilled water, and boiled until the volume was reduced to three litres. Thus 30g plant material in 3 litres of water that resulting the final concentration 1%.

Collection and management of chickens

Twenty day-old broiler chicks were collected from Nourish Hatchery and allowed to acclimatize for seven days. The body weights were taken. The birds were randomly divided into two equal groups. Group A was kept as control without any supplement while group B was supplemented with polyherbal extract 1 mL/litre in drinking water. The rations consisted of broiler starter mash from two to four weeks of age and broiler finisher mash from five to six weeks.

The birds were kept on a floor litter system in separate pens each measuring 0.9 x 1.2 metres. The pens were thoroughly cleaned, white-washed and disinfected before use. All the birds were provided same management. The chicks were brooded at 35°C during first week and the temperature was reduced by 3°C every week until the temperature reached room temperature at 25 ± 1°C. A weighed amount of the ration was offered twice a day and the left over feed was weighed to calculate feed consumption. Fresh clean water was made available at all times.

Experimental design

Body weight and feed consumption were measured weekly. Weekly growth rate, efficiency of feed utilization and mortality were calculated. Cost of production per kg in each group was calculated. At the end of the experiment, three birds from each group were picked randomly and slaughtered. The slaughtered birds were scalded in water at 82 - 88°C (Jull, 1976) then manually plucked. The weight of each carcass was recorded and dressing percentage calculated on the basis of dressed meat including giblets and skin. The heart, liver, gizzard, spleen and pancreas were weighed.

Haematological parameters

Blood samples were collected from wing vein of chicken of both groups at 21st and 42nd day and the following parameters were measured:

(a) Total erythrocyte count (TEC)
(b) Haemoglobin (Hb)
(c) Packed cell volume (PCV)
(d) Erythrocyte sedimentation rate (ESR)

Determination of total erythrocyte count (TEC)

Total erythrocyte count was done as described by Lamberg and Rothstein (1977). Well-mixed blood sample was drawn with red blood cell diluting pipette up to 0.5 marks. Outside of the tip of the pipette was wiped with cotton. 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 a rubber tube stretching to both ends and held with thumb and middle finger. The content of the pipette was mixed thoroughly by shaking for 3 - 5 minutes. The counting chamber was placed with special cover glass under microscope using low power (10x) objective. After discarding 2 or 3 drops of fluid from the pipette, a drop was placed to the edge of the

cover glass on the counting chamber. Taking five larger squares (4 in the 4 corner and the centre) of the central large square, cells were counted from 80 small squares (16 × 5) under high power objective (45x). TEC was calculated as number of cells counted × 10, 000 and the result expressed in million/µL of blood.

Determination of haemoglobin concentrations (Hb)

Hydrochloric acid (HCl) N/10 was taken in a graduated tube up to two marks with the help of a dropper. Well-homogenized blood sample was drawn into a Sahli pipette up to 20 cm mark. The tip of the pipette was wiped with sterile cotton and the blood immediately transferred into a graduated tube containing hydrochloric acid. This blood and acid were thoroughly mixed by stirring with a glass stirrer. Acid haematin mixture formed. The tube was kept standing in the comparator for five minutes. Distilled water was added drop by drop. The solution was mixed well with a glass stirrer until the colour of the mixture resembled the standard colour of the comparator. The result was read in daylight by observing the height of the liquid in the tube. The result was expressed in g%. The procedure was matched by the Hellige haemometer method as described by Lamberg and Rothstein (1977).

Determination of packed cell volume (PCV)

Citrated well mixed blood was drawn into a Wintrobe pipette. The tip of the pipette was inserted up to the bottom of a clean, dry Wintrobe haematocrit tube, which was filled from the bottom. The tip of the pipette was kept under the column of blood to avoid foaming and the tube was filled to the 10 cm mark. The Wintrobe haematocrit tube was centrifuged for 30 minutes at 3000 rpm. The PCV was recorded by reading the graduation mark; the percent volume occupied by the haematocrit was calculated by using the following formula as described by Lamberg and Rothstein (1977).

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

Determination of erythrocyte sedimentation rate (ESR)

Fresh anticoagulant blood was taken into a Wintrobe haematocrit tube using special loading pipette up to zero mark. Excess blood above the mark was wiped away by sterile cotton. The filled tube stood vertically undisturbed for one hour, when the ESR was recorded from the top of the pipette. The result was expressed in mm/hour.

Postmortem examination

Three chickens from each group were slaughtered on 42nd day of treatment. There was no significant pathological change.

Statistical analysis

The data were analysed statistically between control and treated groups of chicken by Student's *t-test*.

Results and Discussion

Effects of polyherbal extract supplementation

The live weight gain of groups A and B for five weeks were 1550 ± 21.2 and 1660 ± 32·8g, respectively. Supplementation of polyherbal extract resulted in significant ($P<0.05$) increase in mean live weight (Table 1). Similarly, Manwar *el al.* (2005) supplemented pearl millet extract 1-2 mL/kg feed and reported significant increase in the live weight of broilers compared with control group.

Table 1. Live weight, weight gain, feed consumption and feed conversion ratio of broiler supplemented with polyherbal extract 1 ml/Litre of drinking water from 2 to 6 weeks of age

Variable	Control (A) Mean ± SD	Treatment (B) Mean ± SD
Initial live weight (g) on 7th day	110 ± 8.8 (n = 10)	110 ± 8.7 (n = 10)
Final live weight (g) on 42nd day	1550 ± 21.2 (n = 8)	1660 ± 32·8* (n = 8)
Weight gain (g)	1440 ± 21.2	1550 ± 22·0*
Feed consumption (g)	3000 ± 26.7	3100 ± 43.2*
Feed conversion ratio	1.94	1.87

*Mean values within the same row were significantly different ($P<0.05$)

The birds supplemented with polyherbal (group B) gained higher live weight than the control group (Table 1). Supplementation of polyherbal had a significant effect on feed intake compared to the control (Table 1). There was no difference ($P>0.05$) in dressing percentage or relative gizzard and spleen weights between groups (Table 2).

Table 2. Dressing percentages, relative giblet and pancreas weights of broiler supplemented with polyherbal extract from 2 to 6 weeks of age

Variables	Control (A) (n = 3)	Treatment (B) (n = 3)
Dressing percentage	65.7	64.9
Relative heart weight	0.5	0.5
Relative gizzard weight	1.4	1.4
Relative liver weight	2.6	2.6
Relative spleen weight	0.1	0.1
Relative pancreas weight	0.3	0.3

Supplementation with polyherbal was more profitable than control group (Table 3) but the difference was not significant ($P>0.05$). Ahmad (2005) reported that dietary

inclusion of polyherbal in the rations was beneficial in broiler production. Ihsan (2003) found that broilers fed turmeric fetched more profit than those without. Increase in the profit margin of birds fed rations containing herbal growth promoters may be attributed to better feed utilization.

Table 3. Economics of broiler production in polyherbal treated and control groups from 2 to 6 weeks of age

Descriptions	Control (A)	Treatment (B)
Cost/chick (Taka)	50.0	50.0
Average feed consumed (Kg)/chicks	3.0	3.1
Feed price/kg (Taka)	40.0	40.0
Cost of herbal growth promoter (Taka)	0.0	3.0
Feed cost (Taka)	120.0	124.0
Miscellaneous (Taka)	16.0	16.0
Total cost/broiler (Taka)	186.0	194.0
Average live weight (Kg)	1.6 ± 21.2 (n = 8)	1.7 ± 32.8* (n = 8)
Sale price/Kg live wt. (Taka)	140.0	140.0
Sale price/broiler (Taka)	217.0	232.4
Net profit/broiler (Taka)	31.00	38.40
Profit/ Kg live weight (Taka)	20.0	23.1

*Mean values within the same row were significantly different (P<0.05)

Effects of polyherbal extract on haematological parameters of broiler

Haematological parameters (RBC, Hb, PCV, ESR) on 21st and 42nd day did not show any significant difference (P>0.05) between the control and treated groups (Table 4).

Supplementation with polyherbal improved the feed efficiency compared to control but the difference was not significant (P>0.05). Wankar *et al.* (2009) reported increased feed efficiency. Birds supplemented with polyherbal had significantly (P<0.05) higher body weight, gain in weight and feed consumption. These results may be due to antimicrobial and anti-protozoal properties (Kale *et al*., 2003; Bishnu *et al*., 2009), which help to reduce the microbial load in the gut of birds and improve the feed consumption of the birds.

Our results are in line with those reported by Siddig and Abdelati (2001) who fed rations containing turmeric and cinnamon, which produced higher weight gain. The improvement in weight gain of the birds using cinnamon in their rations may be due to the fact that cinnamon extract inhibits growth of intestinal bacteria such as *S. aureus* and *E. coli* as reported by Hanafy and Hatam (1991). When the load of these bacteria in the intestine is low, birds may absorb more nutrients, thus leading to the

improvement in weight gain. The birds fed rations supplemented with polyherbal showed increased live weight compared to control, in agreement with Samanta and Dey (1991), who suggested that powdered cinnamon may be incorporated as a growth promoter in the ration of Japanese quails. Supplementation with polyherbal extract did not exhibit any effect on the dressing percentage. Broilers supplemented with nishyinda, black pepper and cinnamon from 2 – 6 weeks showed significantly better performance as compared to the control group. These results could be explained by the finding that the extract suppresses pathogenic bacteria including *Staphyloccoccus aureus*, *Mycobacterium* sp., *Salmonella paratyphi* and *Klebsiella pneumoniae* (Kale *et al*., 2003; Bishnu *et al*., 2009; Mode *et al*., 2009).

Table 4. Effects of polyherbal extract on haematological parameters (RBC, Hb, PCV, ESR) of broiler

Days	Parameters	Treatment	Mean ± SEM (n = 10)	P value
21st day	RBC (mm^3)	Control	190.3 ± 6·4	0.14
		Polyherbal	190.9 ± 7·5	
	Hb (g%)	Control	6.0 ± 0·10	0.11
		Polyherbal	6.5 ± 0·1	
	PCV (%)	Control	17·4 ± 0·8	0.419
		Polyherbal	20·0 ± 0·6	
	ESR mm in 1st hours	Control	11·6 ± 0·8	0.126
		Polyherbal	8·8 ± 1·0	
42nd Day	RBC (mm^3)	Control	249.6 ± 12·8	0.238
		Polyherbal	277·6 ± 12·1	
	Hb (g%)	Control	7.0 ± 0·2	0.149
		Polyherbal	7·7 ± 0·2	
	PCV (%)	Control	17.1 ± 0·6	0.218
		Polyherbal	22·0 ± 0·3	
	ESR mm in 1st hours	Control	7.1 ± 0·6	0.236
		Polyherbal	5.3 ± 1·0	

Polyherbal had no significant effect on the haematological parameters (Table 4). Nagalakshmi *et al.* (1996); Gowda *et al.* (1998), however, reported that bitter principles of medicinal plants possess a strong influence on haematological traits particularly PCV and Hb, depending on their nutritional status. The short duration of the

experiment could explain this difference, as the lifespan of RBC is approximately 120 days. Our experiment was limited to 42 days in comparison to other work.

Conclusions

Treatment with nishyinda, black pepper and cinnamon extract produced a significant ($P<0.01$) increase in the live body weight. However there was no significant change in blood parameters in the treatment group suggesting that the herbal extracts had no harmful effect. It is concluded that supplementation with nishyinda, black pepper and cinnamon extract 1 mL/L drinking water caused significant increase in live body weight and improvement in weight gain as compared to control group. Thus, polyherbal supplementation in broiler rations may be useful for the production of broiler as an alternative to commercial growth promoters.

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