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Comparative Efficacy of *Nigella sativa* and *Allium sativum* as Growth Promoters in Broilers

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ABSTRACT

The present work was aimed at knowing the effect of various levels of garlic (*Allium sativum*) and kalongi (*Nigella sativa*) as herbal growth promoters on the (i) growth performance of broilers and on the (ii) dressing percentage, relative weight of heart, gizzard, liver, spleen and pancreas of the broilers. One hundred and fifty day old broiler (Hubbard) chicks were divided in five groups viz., A, B, C, D and E. Group A served as control and was fed ration without any supplementation. Whereas group B and C were fed ration supplemented with 0.5% and 1.0% kalongi, respectively. Similarly the birds in group D and E were fed ration supplemented with 0.5% and 1.0% garlic, respectively. The experimental rations consisted of broiler starter mash and broiler finisher mash, which were fed from 2-4 and 5-6 weeks of age, respectively. The supplementation of kalongi and garlic in the broiler ration significantly ($P<0.05$) improved the weight gain of the birds of various groups as compared to those of control group. The birds' (in group D) using ration supplemented with 0.5% garlic gained the highest live weight (1588 g) among the treated groups and the best-feed conversion ratio (1.91). Different levels of the herbal growth promoters did not exhibit any significant influence upon the feed intake values of the experimental groups. There was no difference ($P>.05$) between the average dressing percentages, relative giblet weight (heart, gizzard, liver & spleen) and relative pancreas weight of the broilers fed rations with or without supplementation of garlic or kalongi. It is therefore concluded that dietary inclusion of garlic or kalongi in the rations may be used for economical and efficient production of broilers.

Key Words: Broiler herbal growth promoter; *Nigella sativa; Allium sativum;* Feed efficiency

INTRODUCTION

It is conceivable that herbal agents could serve as safer alternatives as growth promoters due to their suitability and preference, lower cost of production, reduced risks toxicity and minimum health hazards. Interestingly recent biological trials of certain herbal formulations in India as growth have shown encouraging results and some of the reports have demonstrated improvement with respect to weight gain, feed efficiency, lowered mortality, increased immunity and increased livability in poultry birds (Kumar, 1991). Also these herbal growth promoters have shown to exert therapeutic effects against liver damage due to feed contaminants like aflatoxin (Ghosh, 1992).

Indo-Pak subcontinent is abundant in herbal wealth and innumerable medicinal plants possessing interesting pharmacological properties and still awaits exploitation by scientific evidences in the field of poultry feeding. Therefore, it is a matter of great interest to try some of our indigenous medicinal plants or herbs as growth promoters in poultry diets. Various herbal products are being used as growth promoters in the poultry rations like garlic (Ahmad, 2005) and Kalongi (Ihsan, 2003).

The present work was aimed at knowing (i) the effect of various levels of garlic (*Allium sativum*) and kalongi (*Nigella sativa*) as herbal growth promoters on the growth performance of broilers and (ii) the effect of these herbal growth promoters on the dressing percentage, relative weight of heart, gizzard, liver, spleen and pancreas of the broilers.

MATERIALS AND METHODS

This study was executed at the Poultry Research Center, University of Agriculture Faisalabad. One-day old 220 broiler (Hubbard) chicks were purchased from a local hatchery and were reared in a group for two weeks (adaptation period). At day eight all the birds were weighed individually and 150 chicks of middle weight range ($\mu \pm 1\delta$) were selected and employed for the study, whereas the chicks on both the extremes were discarded. During the adaptation period the birds were fed a commercial broiler starter mash *ad libitum*. These chicks were randomly divided into fifteen experimental units (replicates) having ten chicks each. These experimental units were further allotted to five treatment groups *viz.*, A, control; B, 0.5% kalongi; C, 1.0% kalongi; D 0.5% garlic and E, 1% garlic

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such that each treatment received three replicates.

The experimental birds were fed (*ad libitum*) an experimental ration with or without supplementation of kalongi and garlic. Group A served as control and was fed ration without any supplementation. Whereas group B and C were fed ration supplemented with 0.5% and 1.0% kalongi, respectively. Similarly the birds in group D and E were fed ration supplemented with 0.5% and 1.0% garlic, respectively. The experimental rations consisted of broiler starter mash and broiler finisher mash, which were fed from 2-4 and 5-6 weeks of age, respectively.

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. All the birds were provided same management conditions like floor space, temperature, relative humidity, ventilation and light. Twenty-three hours light was provided daily through out 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. 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. 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 initial body weight, weekly body weight, weekly feed consumption and mortality were recorded during the experimental period (3-6 weeks of age). The data collected were utilized to calculate weekly growth rate, efficiency of feed utilization and mortality percentage. The data collected on the production cost of broilers were used to find the commercial viability of the herbal growth promoters. Cost of production of the broilers in each group was calculated on per kg basis to work out the economics of production of the birds for each group.

All the birds were vaccinated against Newcastle disease (ND) through intra-ocular rout at the age of seven days and through water at the age of thirty days. Vaccination against Gumboro disease (IBD) was also administered at fourteenth and twenty-eighth day of age through intra-ocular and water rout, respectively

At the end of experiment, three birds from each replicate were picked up randomly and slaughtered for their dressing percentage and giblet weight (heart, liver, gizzard & spleen). The weight of pancreas was also recorded. The slaughtered birds were scalded by immersing them into the water at temperature ranging from 180-190°F (Jull, 1976). After that, the birds were manually plucked by hanging them on shackles by their feet.

The weight of each carcass was recorded and dressing percentage was calculated on the basis of dressed meat including giblets and skin. After evisceration, the heart, liver, gizzard, spleen and pancreas of the slaughtered birds were taken out and weighed for their absolute weight. The data thus obtained were used for the calculation of (a) dressing percentage (%) (Dress weight of bird/Live weight of bird) × 100) (b) relative weight of (i) heart (ii) liver (iii) gizzard (iv) spleen and (v) pancreas. After evisceration, relative weights (g) [(weight of organ/live body weight) X 100] of various internal organs such as liver, heart, gizzard, spleen and pancreas of the slaughtered bird were recorded.

The data thus collected regarding weight gain, feed consumption, feed conversion ratio, dressing percentage and relative weights of heart, gizzard, liver, spleen and pancreas were subjected to the analysis of variance (ANOVA) technique in completely randomized design. The differences in the means were compared by the Duncan's Multiple Range following Steel *et al.* (1996).

RESULTS

The birds using ration supplemented with 0.5% garlic (group D) gained the highest live weight among the treated groups (Table I). Statistical analysis of the data revealed that the supplementation of kalongi and garlic in the broiler rations did not exhibited any significant effect on the feed intake of the birds of various treatment groups when compared to those of the control group (Table I). The birds of group D, using ration supplemented with 0.5% garlic utilized their feed statistically significantly ($P<.05$) more efficiently among the treatment groups. Statistical analysis of the data did not show any difference ($P<0.05$) between the dressing percentages of the birds of different feeding groups (Table II). Statistical analysis of the data did not show any difference between the relative gizzard weights of the birds of different feeding groups (Table II). Statistical analysis of the data did not show any difference between the relative spleen weight of the birds of different feeding groups using ration with or without supplementation of kalongi or garlic (Table II).

Economics of production. The average rearing cost/broilers kept under different treatment groups viz., A, B, C, D and E was Rs. 73.47, 73.42, 75.44, 72.76 and 74.08, respectively (Table III), excluding the cost of labour, because the experiment was conducted on the Poultry Research Center, University of Agriculture, Faisalabad. Miscellaneous cost summed up Rs.14/broiler, which included the estimated cost of electricity, gas, litter, disinfectants, vaccination and medication. The average live weight/broiler in group A, B, C, D and E was 1.393 1.533, 1.443, 1.588 and 1.505 kg, respectively.

The broilers were sold on live weight basis at the rate of Rs.60.00 per kg. The net profit per kg live weight in the respective groups excluding the cost of labour was found to be Rs. 7.29, 12.22, 7.72, 14.18 and 10.46, respectively. The balance sheet indicated that the net profit on per kg live

Table I. Initial and final live weight, weight gain, feed consumption and feed conversion ratio of broilers fed different levels of kalongi and garlic from 1to 6 weeks of age

Variables	Treatments					Standard
	A	B	C	D	E	Error
Initial live weight (g)	168	166	165	166	165	7.4
Final live weight (g)	1561	1698	1608	1763	1673	20.6
Weight gain (g)	1393[a]	1533[c]	1443[b]	1588[d]	1505[c]	18.9
Feed consumption (g)	3146	3055	3144	3038	3080	21.2
Feed conversion ratio (g feed consumed/g weight gain)	2.25[c]	1.99[b]	2.18[c]	1.91[a]	2.04[b]	0.035

Mean values within the same row, which have different superscripts, were significantly different (P<0.05). In this and other tables, A = control, B = 0.5% kalongi, C = 1% kalongi, D = 0.5% garlic and E = 1% garlic.

Table II. Dressing percentages, relative giblet weight (heart, gizzard, liver and spleen) and pancreas weight of broilers fed different levels of kalongi and garlic from 1-6 weeks of age

Variables		Treatments				Standard
	A	B	C	D	E	Error
Dressing percentage	64.49	63.94	63.20	64.58	64.53	2.133
Relative heart weight	0.44	0.45	0.48	0.45	0.44	0.007
Relative gizzard weight	1.43	1.62	1.59	1.49	1.45	0.032
Relative liver weight	2.59	2.57	2.56	2.58	2.57	0.030
Relative spleen weight	0.10	0.10	0.12	0.11	0.12	0.003
Relative pancreas weight	0.26	0.25	0.25	0.24	0.25	0.003

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

Description	A	B	C	D	E
Cost/chick (Rs)	17.00	17.00	17.00	17.00	17.00
Average feed consumed (Kg)/chicks	3.146	3.055	3.144	3.038	3.080
Feed price/kg (Rs)	13.50	13.50	13.50	13.50	13.50
Cost of herbal growth promoters (Rs.)	0.00	1.00	2.00	0.75	1.50
Feed cost (Rs.)	42.47	41.24	42.44	41.01	41.58
Miscellaneous (Rs.)	14.00	14.00	14.00	14.00	14.00
Total cost/broiler (Rs.)	73.47	73.24	75.44	72.76	74.08
Average live weight (Kg)	1.393	1.533	1.443	1.588	1.505
Sale price/Kg live wt. (Rs.)	60.00	60.00	60.00	60.00	60.00
Sale price/broiler (Rs.)	83.58	91.98	86.58	95.28	90.30
Net profit/broiler (Rs.)	10.11	18.74	11.14	22.52	16.22
Profit/ Kg live weight (Rs.)	7.26	12.22	7.72	14.18	10.46

weight basis was more in the birds fed rations supplemented with the 0.5% garlic than those using ration with the addition of 1% garlic and 0.5% or 1% kalongi.

The levels of garlic and kalongi used in the rations also exhibited their effect on the profit margin of the broilers. The birds using 0.5% level of the garlic fetched the maximum profit in the treatment groups followed by that of 0.5% of kalongi. However, the profit margin decreased with increase in the level of garlic or kalongi used.

DISCUSSION

Addition of herbal growth promoters, both garlic and kalongi improved the weight gain of the broilers in this study. These results are in line with the findings that higher weight gain in quails and broilers, respectively fed rations supplemented with garlic. The improvement in weight gain may be due to the action of allicin (an antibiotic substance found in garlic), which inhibits the growth of pathogenic bacteria and aflatoxin producing fungi (Meraj, 1998).

The results of the study also showed higher weight gain in broilers using ration supplemented with kalongi when compared to those of control group. These results are in line with those reported by Siddig and Abdelati (2001) in broilers fed rations containing kalongi. The improvement in weight gain of the birds using kalongi in their rations may probably be due to the fact that ethyl ether extracts of *Nigella sativa* inhibits growth of intestinal bacteria such as *S. aureus* and *E. coli* as reported by Hanafy and Hatam (1991). Resultantly, when the load of these bacteria in the intestine is low, birds may absorb more nutrients, thus leading to the improvement in weight gain of the birds using rations supplemented with *Nigella sativa.*

The birds fed rations supplemented with herbal growth promoters, both garlic and kalongi utilized their feed more efficiently than those feed ration 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 of garlic @ 0.5% showed more increase in live weight of the birds as compared to 1% level in this study, which is also in agreement with the findings of Samanta and Dey (1991), who concluded that powdered garlic at 0.5% level may be incorporated as a growth promoter in the ration of Japanese quails.

Better feed conversion ratio of the broilers using rations supplemented with garlic or kalongi 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 different levels of garlic and kalongi 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, 2005), who reported a non-significant effect on broiler dressing percentage values due to the inclusion of garlic and kalongi in the diet of broilers.

Dietary inclusion of various levels of garlic and kalongi did not exert any effect on the mean relative heart, gizzard, liver, spleen, pancreas weights of the broilers used in this study. The results of the study are consistent with those observed by Soliman *et al.* (1999) and (Ahmad, 2005), who reported that the dietary inclusion of various levels of garlic and kalongi did not exhibit any effect on the relative heart weight of broilers.

Economics of production. 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 both garlic and kalongi @ 0.5% was found to be more profitable than 1.0% level in broiler rearing. However, dietary inclusion of garlic @ 0.5% fetched the maximum profit as compared to the other treatment groups.

The results of the present study are in line with the findings of Ahmad (2005), who reported that dietary inclusion of garlic and kalongi @ 0.5% in the rations was more beneficial in broiler production. Similar results have been reported by (Ihsan, 2003), 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 garlic or kalongi supplemented rations.

CONCLUSION

Supplementation of garlic or kalongi in the rations may be useful for economical and efficient production of broilers. This is expected to lead to a better gain in monetary terms

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