Comparative Effect of Different Commercial Herbal Growth Promoters on Performance, Minor Body Parts Weight and Immune Response in Broilers

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Abstract Antibiotics have been used in poultry to improve growth performance but due to their side effects European Union has banned use of antibiotic as growth promoters in animal feed in 2006. Such situations has resulted in search for natural and safe alternatives, therefore, this study was undertaken to compare the efficacy of commercial herbal growth promoter as dietary inclusion on performance, minor body parts weight and immune response in broiler. A total of 120 healthy day old Hubbard chicks of uniform body weight were divided into 12 experimental units of 10 chicks each. These experimental units were further allotted to 4 treatment groups (T₁, T₂, T₃ and T₄) such that each treatment received 3 replicates. Group A was fed ration without supplementation of commercial herbal products i.e. control whereas group B, C and D were fed ration supplemented with commercial herbal products i.e. Bio-Mix, Respecine and A one Formula respectively each @ 100 g/ 50 kg of commercial feed. Each experimental unit of the chicks was reared in a separate pen. The birds were kept under similar managerial conditions. Feed intake, weight gain and FCR was better in group C fed respecine supplemented diet (P<0.05) whilst immune response against ND and IBD was higher in group B fed diet supplemented with Bio-mix (P<0.05) whereas dressing percentage, liver weight, heart weight, gizzard weight, spleen weight, pancreas weight and intestinal weight were not significantly affected by commercial herbal growth promoters (P>0.05). Use of various commercial herbal growth promoters in the ration exhibited an increase in the profit margin of broilers. Broilers reared on respecine fetched maximum profit as compared to other groups.

Keywords Growth Promoters, Bio-Mix, Respecine, A One Formula, Broiler, Performance, Immune Response

1. Introduction

Poultry industry is continuously progressing through improvement of genetic potential of new broiler strains to provide high biological value protein for the human population [16]. Poultry meat is an important source of nutrients as it contains all the essential amino acid, essential long chain fatty acids, vitamins and minerals especially selenium, iodine, phosphorus, potassium, iron and zinc in desirable concentrations. The vitamins and minerals present in poultry meat help to boost the immune system, digestion and metabolism, strengthen bones and skin, build, maintain and repair body tissues.

Commercial poultry farming in Pakistan is challenged with many problems like Coccidiosis, salmonellosis etc. and huge losses due to pathogenic bacteria in feed which may cause poor weight gain or even increased mortality [23]. Antibiotic have been used in poultry for the past four decades to improve growth performance and the total use of antibiotics as a growth promoter is estimated to be 4500 tons per year provided by 137 million tons of poultry feed production however their usage in poultry industry is intensively controversial because of the development of bacterial resistance and potential consequence on human health [8,15]. European Union has banned use of antibiotic as growth promoters in animal feed in 2006. Such situations has resulted in search for natural and safe alternatives in form of prebiotic, probiotic, enzymes, herbal products, immune modulators, organic acid etc. to maintain optimum growth rates [4,17].

As an alternative of antibiotic medicinal plants like garlic, ginger, kalongi, mint, neem, savory, sea-buckthorn and turmeric etc. are the most popular option for growth promoters [21]. Different parts of plants, their extracts viz. oil, leaves, bark, seed, roots and other vegetative parts etc. have been experimentally used in poultry as a growth

promotor, antibacterial, anti coccidial, anti-parasitic, anti-fungal, anti-tumor, anti-cancer, pesticide, immune booster and immunogenic [28].

Certain herbal formulations have showed encouraging results reported significant improvement with respect to weight gain, feed efficiency, lowered mortality and increased livability in poultry [18,3] as well as better resistance against feed contaminants like aflatoxin, drug [10].

Our country abounds in herbal wealth and innumerable plants of pharmacological properties therefore it is matter of interest to try some of our indigenous medicinal plants/herbs as commercial products. Thus the project has been planned to envisage the comparative efficacy of commercial herbal products: Bio – mix , Responcine and A-one formula on performance and immune response of broilers.

2. Materials and Methods

The experiment was conducted at Poultry Research Center, University of Agriculture, Faisalabad. One hundred twenty healthy day old Hubbard broiler chicks were divided into 12 experimental units having 10 chicks each. These experimental units were further allotted to 4 treatment groups (T₁, T₂, T₃ and T₄) such that each treatment recieved 3 replicates. Group A was fed ration without supplementation of commercial herbal products i.e. control wherease group B, C and D were fed ration supplemented with commercial herbal products i.e. Bio-Mix, Respecine and A one Formula respectively each @ 100 g/ 50 kg of commercial feed. Duration of the trial was 40 days. Each experimental unit of the chicks was reared in a separate pen. The birds were kept under similar managemental conditions like space, light, temperature, ventilation and relative humidity. Fresh and clean water was available to the birds at all the times. All the birds will be vaccinated according to the recommended schedule.

Data on initial body weight, weekly body weight, weekly feed intake and mortality was collected. The data regarding feed intake and weight gain was used to calculate feed conversion ratio and growth rate of broilers. Immune response for each replicate was checked on 30-35 days of age. To find out the antibody titer against Newcastle disease and

Gumboro disease, a method described by Buxton and Fraser (1977)[7] was used. At the end of experiment two birds from each replicate was selected randomly and slaughtered for their carcass response and relative organ weight. Data on live weight, dressed weight, heart weight, gizzard weight, liver weight, spleen weight, pancreas weight and intestinal weight was also collected. At the end of experiment economics of each group was calculated. The data thus collected was subjected to statistical analysis using completely randomized design. The differences in the means were compared by least significance difference test [27].

3. Results

The mean values of the broiler performance kept on commercial feed without any supplementation (control) was taken as reference point for comparsion with other birds under different treatment i.e control, Bio – mix , Responcine and A-one formula. The average weight gain of broiler chicks in groups A, B, C and D was 1604, 1733, 1814 and 1695g, respectively (Table 1), during 42 days of experimental period (0-6 weeks of age). Statistical analysis of data exhibited that birds using ration supplemented with herbal growth promoters gained signicantly ($P < 0.05$) more weight than those of control group. The highest weight gain was recorded in the birds of group C fed ration supplemented with respecine.

The mean values for feed consumption of the birds during the experimental period for treatment groups, A, B, C and D were 3487, 3477, 3636 and 3533g, respectively (Table 1). Statistical analysis of the data revealed that supplementation of herbal growth promoters in the broiler ration exhibited significant effects on the feed intake of the birds. Birds of groups C utilized feed more efficiently whereas poorest feed conversion ratio was observed in the birds of groups A (control).

Mean values for feed conversion ratio of the broiler in groups, A, B, C and D were 2.17, 2.00, 1.97 and 2.08, respectively. Difference in feed Conversion ratio was found to be significant ($P < 0.05$). The birds of groups C (using ration supplemented with respecine) showed significantly better FCR.

Table 1. Final live weight, weight gain, fed consumption and feed conversion ratio of broiler fed different herbal growth promoters from 0-42 days.

Parameters	Treatments			
	A Control	B Bio-mix	C respecine	D A-one Formula
Initial weight (g)	43.00	42	42.33	42.33
Final live weight (g)	1647	1775	1856	1737
Weight gain (g)	1604 ^c ± 59.7	1733 ^{ab} ± 38.4	1814 ^a ± 43.4	1695 ^b ± 36.6
Feed consumption (g)	3487 ^c ± 99.4	3477 ^{bc} ± 95.6	3636 ^a ± 38.4	3533 ^c ± 10.2
Feed conversion ratio (g feed /g gain)	2.17 ^c ± 0.025	2.00 ^{ab} ± 0.025	1.97 ^a ± 0.012	2.08 ^b ± 0.015

Dressing Percentage and Relative Organ Weight

Statistical analysis of the data revealed that the supplementation of herbal growth promoters in the broiler ration did not exhibit any significant effect on the dressing percentage, liver weight, heart weight, gizzard weight, spleen weight, pancreas weight and intestinal weight of the experimental birds (table 2).

Immune Response

The results of the study revealed significant ($P < 0.05$) effect of commercial herbal growth promoters on the immune response of broilers. Antibody titer against ND at 30th day of age was maximum in-groups B (873.33) followed by group D (783.33), A (558.33) and control, respectively. Analysis of variance of the data showed significant differences among the treatment groups with respect to antibody titer at 30th day of age (Table 3). The maximum value for antibody against IBD titer was recorded in the birds of group C fed ration supplemented with Respecine which was 1030, followed by those using Bio-mix (873.33), A-one formula (770) and control (470), respectively.

Mortality

The total number of birds died during the experiment were

four i.e. two in group A, one in group B and one in group D. Percent mortality in group A, B, and D was 6.66%, 3.33 % and 3.33% respectively. Whereas, no mortality was recorded in group C. Overall mortality percentage was found to be 3.33% during the experimental period. The postmortem findings of all the dead birds revealed that reason of mortality was heat stress because of electric failure.

Economics

The average cost of production per broiler kept under different treatment groups A, B, C, and D was Rs. 68.98, 68.84, 71.00 and 69.65, respectively (Table 4) excluding the cost of labour. Miscellaneous cost summed up Rs. 10/broiler, which included the estimated cost of electricity, gas, litter, disinfectants, vaccination and medication. The average live weight gain of broiler chicks in groups A, B, C, and D was 1.604, 1.733, 1.813, and 1.694 Kg, respectively. The broilers were sold on live weight basis at the rate of Rs. 42.00 per Kg. The net profit per bird was found to be Rs. 0.32, 5.92, 6.70, and 3.01 in the respective treatments excluding the cost of labour. Net profit on per bird basis was more from the birds fed ration supplemented with Respecine followed by Bio-mix, A-one formula, and Control, respectively.

Table 2. Average values of dressing percentages, relative giblet weights (g organ wt. /100g body wt.) pancreas and ingestinal of broilers fed difference herbal growth promoters from 0-42 days

Parameters	Treatments			
	A Control	B Bio-mix	C respecine	D A-one Formula
Dressing percentage	61.04 $\pm$ 4.5	62.15 $\pm$ 4.5	62.18 $\pm$ 4.56	61.39 $\pm$ 4.5
Liver weight	1.88 $\pm$ 0.018	1.64 $\pm$ 0.018	2.16 $\pm$ 0.019	2.27 $\pm$ 0.0199
Heart weight	0.39 $\pm$ 0.0066	0.42 $\pm$ 0.0066	0.41 $\pm$ 0.0066	0.45 $\pm$ 0.0066
Gizzard weight	1.53 $\pm$ 0.014	1.64 $\pm$ 0.014	1.54 $\pm$ 0.014	1.48 $\pm$ 0.012
Spleen weight	0.10 $\pm$ 0.005	0.11 $\pm$ 0.0052	0.10 $\pm$ 0.005	0.10 $\pm$ 0.005
Pancrease weight	0.21 $\pm$ 0.01	0.17 $\pm$ 0.008	0.20 $\pm$ 0.01	0.19 $\pm$ 0.02
Intestinal weight	3.27 $\pm$ 0.032	3.28 $\pm$ 0.032	3.53 $\pm$ 0.032	3.25 $\pm$ 0.032

NS = Non significant

Table 3. Mean values of antibody titer against Newcastle disease (ND) and infections disease (IBD) fed different herbal growth promoters from 0-42 days

Parameters	Treatments			
	A Control	B Bio-mix	C Respecine	D A-One Formula
ND Antibody titer	558.33 ^d $\pm$ 25.7	873.33 ^b $\pm$ 30	1032.00 ^a $\pm$ 32.3	783.33 ^c $\pm$ 7.5
IBA Antibody titer	470.00 ^d $\pm$ 12.14	873.33 ^b $\pm$ 20	1030.33 ^a $\pm$ 22.77	770.00 ^c $\pm$ 17.6

Mean values with in the same row which have different superscriptes, were significantly different ($P < 0.05$)

Table 4. data showing economics of various treatments

Parameters	A	B	C	D
Cost / chick (Rs.)	12.00	12.00	12.00	12.00
Total feed consumed/ bird(kg)	3.48	3.47	3.63	3.53
Feed cost/ kg (Rs.)	13.5	13.5	13.5	13.5
Feed cost/ bird (Rs.)	46.98	46.84	49.00	47.65
* Miscellaneous charges/ bird(Rs.)	10.00	10.00	10.00	10.00
Total cost/ bird (Rs.)	68.98	68.84	71.00	69.65
Average live weight (kg)	1.65	1.78	1.85	1.73
Sale price/ kg(Rs.)	42	42	42	42
Sale price/ bird(Rs.)	69.3	74.76	77.7	72.66
Net profit (Rs.)	0.32	5.92	6.7	3.01

4. Discussion

Performance

Supplementation of herbal growth promoters in broilers ration significantly improved the weight gain of the birds. Similar findings are reported by Samanta and Dey (1991) and Meraj (1998) that supplementation of garlic powder improved the weight gain of broilers and Japanese quails, respectively [24,19]. The improvement in weight gain might be due to inhibition in growth of pathogenic bacteria such as *Staphylococcus aureus* and *Escherichia coli* [13]. Chicory as a herbal growth promoters in broiler ration significantly improved the weight gain [25,22]. Similarly, Guler *et al.* (2003) observed higher weight gain in Japanese quails fed *Coriandrum sativum* seeds [11]. Positive effect of turmeric and Moringa oliefera leaf extract as herbal growth promoter on weight gain of broiler was also observed [2]. Contrary to the finding of the present study Bolukbasi *et al.* (2006) and Soliman *et al.* (1999) reported a non-significant effect of herbal extracts on weight gain of broilers [5,26] however difference in the results might be due to the different products used as herbal growth promoter.

Herbal growth promoters in the ration improved the feed consumption of broiler. The result are in line with the finding of Soliman *et al.* (1999) who observed that inclusion of the natural herbal growth promoters in broiler ration did not improve feed consumption [26]. The result also coincide with the findings of El-Sheikh *et al.* (1998) , Guler *et al.* (2006) who reported that feed consumption of the birds remained unaffected due to dietary inclusion of herbal growth promoter, kalongi [9]. Similarly, Samanta and Dey (1991) and Bozkurt *et al.* (2012) observed nonsignificant difference in feed intake by addition of garlic in the ration of Japanese quails and herbal oils in layers respectively [24,6]. In contrast to our finding, Siddig and Abdelati (2001) reported significant effect of Chicory extract on feed consumption of broiler ration [25]. Similar result have also been reported by Osman and Barody (1999) in broilers [22]. Supplementation of the herbal growth promoters exhibited a significant effect on the feed conversion ratio of the broilers.

Similarly Molla *et al.* (2012) reported that herbal supplementetation in diet of broilers increase production without adverse effects on chicken health [20]

The result are in line with the finding of Osman and Barody (1999), Siddig and Abdelati (2001), Ihsan (2003) and Ahmad (2005) who observed a significant effect of kalongi on feed conversion ratio in broiler [22,25,1]. The improvement in feed conversion ratio of the birds might be due to suppressing of growth of intestinal bacteria such as *Staphylococcus aureus* and *Escherichia coli* (Hanafy and Hatam, 1991) which caused increased absorption of nutrients leading to better feed conversion ration of the birds using rations supplemented with herbal growth promoters [13].

Dressing Percentage and Organs Weight

Supplementation of commercial herbal growth promoters did not exhibit any effect on the dressing percentage values of the broilers in this study. The result of the present study are in line with Samanta and Dey (1991) who reported that dietary inclusion of garlic did not affected dressing percentage in Japanese quiles [24]. Similar finding have been observed by Siddig and Abdelati (2001) and Ihsan (2003) in broilers fed Chicory leaves extract in their ration [25,14]. Dietary inclusion of commercial herbal growth promoters did not exert effect on the relative heart weight of the broiler use in this study. The result of the study are consistent with those observed by Soliman *et al.* (1999) and Ahmad (2005) who reported that the dietary inclusion of natural herbal growth promoters (garlic and kalongi) did not exhibit any effect on the relative heart weight of broilers [26,1]. Similar effects have been observed when garlic or kalongi were used in different trials on different species of birds. Siddige and Abdelati (2001) and Ihsan (2003) observed non-significant effect of garlic on relative weight of heart in broilers [25,14].

Result of the study showed that supplementation of herbal growth promoters did not influence the relative liver weight, spleen weight, intestinal weight and gizzard weight of the broilers used in this study. These results are similar to those reported by Meraj (1998), Siddig and Abdelati (2001), Ihsan

(2003) [19,25,14,]. However Ahmad (2005) observed that supplementation of garlic turmeric and kalongi exhibited a significant effect on relative intestinal weight of the broilers [1].

Immune response against Necastle and infectious Bursal Diseases

Dietary inclusion of herbal product in the broiler ration exhibited a significant effect on the immune response of birds against Necastle and infectious Bursal diseases. Similar findings are reported by Soliman *et al.* (1999) and Ahmad (2005) that kalongi and garlic have significant effect on immune response of the broilers [26,1]. The exact reason of enhancement in immunity is not known. However it might due to the polysaccharides and ether extracts of herbs such as *Nigella Sativa* (kalongi) which have been found to cause hyperplasia of lymph-nodes and increase in the percentage of lymphocytes and neutrophils in blood. Meraj (1998) also reported significant boost in antibody titers against Newcastle and infectious Bursal diseases in broiler using garlic supplemented ration [19]. Similar results have been observed by Al-Sultan (2003) when turmeric was used as herbal growth promoter in the ration broilers [2].

Economics of Production

Use of various commercial herbal growth promoters in the ration exhibited an increase in the profit margin of broilers as compared to those using ration without supplementation. Dietary inclusion of commercial herbal growth promoters was found to be more profitable than control. Broilers reared on Respecine fetched maximum profit as compared to other groups.

Increase in the profit margin from the birds which were fed ration containing commercial herbal growth promoters might be attributed to the better efficiency of feed utilization, which results in more growth and better feed conversion ratio, ultimately leading to a higher profit margin the broilers reared on ration supplemented with commercial herbal products.

Conclusion and Future Prospects

Based upon the results of the study, it may be concluded that supplementation commercial herbal growth promoters in the broilers ration can improve efficiency of broiler's feed utilization resulting in better growth results to efficient and economical production. These findings will help the poultry producers to save expenditure from pocket snatching prices of antibiotics, which they have to utilize for better health and growth of their birds. Above all, the use of commercial herbal growth promoters in the broilers rations will help in the production of organic broilers and save the health of mankind from ill effects of residual antibiotics present in the meat. However, determination of digestibility of various nutrients of the rations containing these herbal products, haemato-chemical profile and blood chemistry of the birds are the important question, which need to be addressed.

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