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Review

Effect of organic bio-stimulators on broiler performance: A review

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Present review article was designed with the aim to see the effect of organic bio-stimulator on the performance of broilers. Due to rapid urbanization and industrialization, the demand for meat, particularly tender chicken poultry meat (broiler) is rapidly increasing day by day. The cost of feeding in poultry production alone accounts for 60 to 70% of the total farm expenditure. This cost can be minimized to some extent by adding some of the growth stimulators in the broiler chicken feed. Result revealed that a large number of growth promoting agents and herbal products are occasionally being used in poultry feed to produce lower feed intake, higher growth rate, disease resistance and higher live weight gain in the poultry. Beside, above biochemical and heamotological attributes including carcass traits is also improved. Further, the ban on the use of synthetic growth promoters in farm animals due to its residual effects on consumers and resistance build up by pathogens or bacteria necessitates the use of natural symbiotic growth promoters.

Key words: Biochemical, broiler, carcass, growth, heamotological.

INTRODUCTION

India is the fifth largest producer of poultry meat in the world after USA, China, Brazil and Mexico (Executive guide, 2006). Poultry meat production increased from 81 thousand tonnes in 1961 to 1900 thousand tonnes in 2005. Poultry meat production increased by 8.7 and 6% per annum during the eighties and nineties (Mehta et al. loc cit.). In a recent study, Fairoze et al. (1995 to 2005) reported a growth rate of 13.9% for poultry meat for the period 1995 to 2005. Chickens are one of the major sources of animal meat. Broiler meat is the cheapest source of animal protein available in the country. Broiler farming is a profitable venture due to continuous increasing demand of the meat in the market. The most flourishing industry with highest growth rate (15% in broiler and 8% in layer sector). It is world's 3rd in egg production and 6th in chicken meat production. Feed is a major component, affecting net return from the poultry business, because about 65% of the total expenditure in term of cash is spent on feed purchase. To ensure more net return and to minimize high expenditure on feed are the main challenges, for which many research strategies have been practiced such as introducing feed supplements and feed additives (Pervez, 1992). Therefore, the aim of this review is to collect the

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information regarding the impact of organic bio-stimulator on feed intake, growth rate, carcass production, cure for diseases haemotological and biochemical attributes of broiler production. The pioneer that worked in this aspect has been reported.

FEED INTAKE

Majdanski (1991) conducted a trial on broiler chickens maintained in cages and on the straw litter fed complete feeds (starter, grower, and finisher) supplemented with 0.6 and 1.0% commercial blends of herbs (Herbagal). Finally, body weight of chickens given herbal additive was slightly higher with better feed conversion efficiency (kg/kg + 11%) in series 2, best results were obtained at 1.0% supplements of herbs to starter feed mixture and 0.6% supplement to grower and finisher. Chickens fed herbal additives had final body weight 63 gm higher and F.C.E. by 6.3% than control. Further, Muhammad et al (2000) observed that the effect of Digestarcom, (an herbal feed additive) on the performance of broiler chicks fed different levels of rapeseed cake was investigated. Fourteen experimental rations containing 7 rapeseed (0, 2, 4, 6, 8, 10 and 12%) × 2 Digestarcom (0 and 150 g per ton feed) levels were formulated and fed to 14 treatment groups, 3 replicates of 10 chicks each. A higher weight gain per bird was observed for all the levels of rapeseed treated with Digestarcom as compared to non-supplemented control group.

The maximum feed intake observed in the group fed 10% rapeseed cake and maximum weight gain was observed at 6% level. More feed was consumed and more weight was gained by broilers fed the ration supplemented with Digestarcom which also exhibited better feed to gain ratio than the non-supplemented control. Thereafter, Wekhe et al. (2007) conducted the experiment to determine the effect of consumption of *Rhizophora racemosa* (Mangrove) incorporated feed on feed intake, body weight gain, and some visceral organs of broiler chicks. Sixty day-old Hubbard broiler chicks were randomly allocated into four treatment groups, A, B, C and D of 15 birds per group and 5 birds per replicate. The dosages of the groups were 0 (control), 10, 20 and 30 g per kilogram of feed, respectively. Results obtained showed that there were no significant differences ($P > 0.05$) among the treatment means with respect to feed consumption/efficiency, and body weight gain.

However, a lineal body weight gain was observed. There was obvious hypertrophy of the bursa of Fabricus of groups B, C, and D, indicative of defensive reaction to *R. racemosa* (foreign body) and increase of antibody production. The observed atrophy of the ovaries and the converse hypertrophy of the testes are analogous to decreased ovarian and increased testicular functions, respectively. Further, Ram et al. (2012) conducted a trial of 35 days on herbal drug (*Livkey* at 50 ml/kg diet) and found the better feed intake than the control one.

GROWTH RATE

Reddy and Rao (1988) reported that acid treatment of decorticated Neem cake and acid plus alkali treatment of all Neem cake improved growth and achieved a significant weight gain and feed efficiency of broilers. Thereafter, Osei et al. (2000) experimented on 288 three-week-old mixed-sex broiler which was randomly divided into three dietary treatment groups and fed diets containing wheat bran 170 g/kg and 0, 100 or 200 g/kg of enzyme preparation (primarily xylanase and pentosanase, plus galactomannase, beta-glucanase, cellulase and pectinase), respectively, for four weeks. Feed and water were supplied *ad libitum*.

The parameters studied included growth rate, feed consumption, feed conversion ratio, carcass evaluation, and the economics of production. The addition of enzymes reduced feed consumption and increased feed conversion efficiency and growth rate ($P < 0.05$). The reduction in feed intake compared with birds on the control diet ranged from approximately 10 to 15%. At seven weeks of age, birds on 100 and 200 g/kg enzyme were respectively 1.9 and 5.8% heavier than their counterparts on the diet with no added enzyme. Birds fed diets containing the highest level of enzyme were 21.1% more efficient in converting feed to body constituents. Carcass dressing percentage increased with added enzyme ($P < 0.05$). Dietary enzyme significantly decreased the total cost of feed per bird and the cost per kg gain. Enzyme added at 200 g/kg diet was the most economical.

Further, Abaza et al. (2003) studied that the effect of some dried medicinal plants, such as *Nigella sativa* seeds (N.S.), German chamomile flower heads (*Matricaria chamomilla Chamomilla recutita*, CH.F), thyme flowers (*Thymus vulgaris*, TH.F) and harmala seeds (*Peganum harmala*, H.S.), as feed supplements as well as that of antibiotics such as zinc bacitracin (ZnB) and virginiamycin (VIR) as growth promoters on the performance of broiler chicks. The N.S., CH.F, TH.F and H.S. were added at levels of 0.25, 0.25, 0.5 and 0.25%, respectively. A total of 240 broiler chicks were randomly divided into 16 treatments with 3 replicates (5 chicks each). ZnB and VIR were added at a level of 20 mg/kg diet. The weight gain, feed intake, feed conversion and blood serum constituents were measured. At the end of the experiment, digestibility values and carcass characteristics were measured. The use of N.S., TH.F, H.S. and CH.F improved the performance of broilers compared to antibiotic-treated and control groups. The use of 0.25% CH.F plus 0.25% N.S. improved the body weight, body weight gain, feed conversion, and carcass traits in broilers. Moreover, it proved to be more economical than the other treatments or control. Das and

Bora (2004) studied the performance of six genetic groups (SC, NZW, SN, NS, SL, NL) of 120 broiler birds feed supplemented with 2ycox, (a herbal anticoccidial growth promoter). Average daily weight gain, feed utilization and survivability percentage were higher ($P > 0.05$) at 0.4% level of zycox supplementation indicating its better efficacy as anticoccidial as well as growth promoter. Emenalom et al. (2005) again observed effect of velvet bean (*Mucuna pruriens*) which was cracked, soaked and cooked meal (CSCM) was included in a broiler mash at 0, 20, 25 and 30%, respectively. None of three dietary levels of seed meal significantly ($P > 0.05$) affected the performance of the birds in terms of feed intake and growth rate. At 30% dietary level, the feed conversion ratio was significantly ($P < 0.05$) decreased as compared to the control. Further Ram et al. (2011 and 2012) conducted a trial of 35 days on broiler bird with herbal drug (Livkey at 50 ml/kg diet) and found the better growth rate than the control one.

CARCASS PRODUCTION

An experiment was conducted under completely randomized design with five replicates and 150 chicks per experimental unit was used to evaluate the effect of growth promoters on feed intake, liveweight gain and feed:weight gain ratio of broilers (Correa et al., 2003). The experimental diets were: I - initial diet (20.2% of crude protein and 2931 kcal of metabolizable energy) from 1 to 20 days of age (ID) and final diet (18.5% of crude protein and 2993 kcal of metabolizable energy) from 21 to 40 days of age (FD); II - ID plus 0.02% of Calsporin 10 probiotic and FD plus 0.02% of Calsporin 10 probiotic; III - ID plus 2.0% of probiotic Estibion and FD plus 0.63% of probiotic Estibion; and IV - ID plus 0.013% of Zinc bacitracin and FD plus 0.013% of Zinc bacitracin. During the initial period, broilers fed on probiotic diets showed lower feed intake and better feed efficiency. However, growth promoters had no effect on the studied traits in the final and total periods. Higher thigh yields were observed for males fed on polyprobiotic diets.

Santos et al. (2004) studied that the performance of broiler chickens, placed to the diets containing different additives. It used 2160 birds distributed in a randomized completely experiment with 6 treatments (T) with 8 repetitions of 45 birds each: T1 without growth promoter, T2 and T3 with antimicrobials, T4, T5 and T6 with probiotics. Feed consumption, body weight gain, food conversion and mortality, and carcass yield, cutting, visceras, factor and cost of production were determined. Significant differences between the treatments were not observed in majority of the treatments.

The birds that received antimicrobial growth promoters showed the best feeding conversion in relation to the birds that received control and probiotic ration. The feeding conversion difference reflected in the production cost. Thereafter, Sirvydis et al. (2004) observed the influence of feed additives of plant origin Digestarom-1317 and Aviance on the growth and meat quality of broiler chickens. Three groups of 100 day-old chicks each (50 males and 50 females) were fed a standard feed mixture (Group I), feed supplemented with Digestarom-1317 at 150 g/tonne feed (Group II) or feed supplemented with Aviance (500 g/tonne feed) until 42 days of age. Liveweight was measured at 1, 7, 21, 35 and 42 days of age, after which the birds were slaughtered for meat quality determination. It was shown that the growth; liveweight gains; carcass composition, yield and weight and meat quality of broilers in the feed additive groups were better than the control group, where the best results were obtained by Group II birds for both males and females.

In conclusion, the use of Digestarom-1317 as a feed additive is more advantageous since it is economical and promotes better growth, liveweight gain, carcass yield and meat quality in broiler chickens. Sarica et al. (2005) again reported that the effects of an antibiotic growth promoter (flavomycin) and two herbal natural feed additives (garlic and thyne) with and without a xylanase-based enzyme complex in wheat-based diets on 112 days-old male broiler chicks raised from 1 to 42 days of age. During the 42 days growth period there were no significant differences in body weight gain, feed intake and feed conversion ratio of the broilers between dietary treatments. Feeding the diet supplemented with the antibiotic plus the enzyme significantly increased hot and cold carcass yield compared to the diets supplemented with thyme, garlic, enzyme and garlic plus enzyme. Total plasma, cholesterol concentration and relative weight of the heart, pancreas, liver, gizzard and spleen were not significantly influenced by dietary treatments.

Im et al. (2007) found the effect of dietary krill meal in one day-old male broiler chicks (Rurs**) were fed basal meal (0.0% krill meal), or diets containing 0.5%, 1.0% and 2.0% krill for 3 weeks. Acute phase response induced a significant reduction in ($P < 0.05$) daily weight gain and feed intake and increases in liver and spleen weight. However, it was not affected by dietary krill meal levels.

Furthermore, Buchanan et al (2008) observed that the use of subtherapeutic levels of Biostrong 505+ and Biostrong 510 as natural growth promoters in broiler chickens. Assessment was based on the performance and carcass quality of broilers fed either a maximum-yield or a least-cost commercial broiler diet. The maximum-yield diet improved broiler performance and carcass quality. Biostrong 505+ can be used to improve feed conversion and breast yield when incorporated into diets devoid of antibiotics. This improvement in feed conversion and breast yield was accentuated when Biostrong 505+ was used in conjunction with a maximum-yield diet. Biostrong 510 improved feed conversion when used in poultry diets containing antibiotics.

CURE FOR DISEASES

Dickens et al. (2000) reported that herbal protecta II extract on an NaCl carrier was evaluated in a 30 min 1 x C simulated chill for its effectiveness of lowering microbial counts on broiler carcasses. Mani et al. (2000) again revealed that the effects of 3 commercial Newcastle disease lentogenic vaccines were studied in broilers during experimental aflatoxicosis. Broilers were fed a diet containing 0.20 ppm of aflatoxin B_1 or aflatoxin B-free diet for 8 weeks. Control birds showed higher immune response after vaccination against Newcastle disease, body weight and feed consumption and feed efficiency than aflatoxin-fed birds. Enlargement of liver, atrophy of bursa and reduced eviscerated yields were observed due to aflatoxicosis in broilers. The aflatoxin-fed birds had reduced packed cell volume, and concentrations of haemoglobin, serum protein and cholesterol and elevated concentration of serum glucose, alanine aminotransferase and aspartate aminotransferase compared with the control group.

Thereafter, Das et al. (2001) studied that the efficacy of herbal anticoccidials IHP-250C and herbal immunostimulant Immu-21 (containing *Ocimum tenuiflorum, Withania somnifera, Tirospora cordifolia* and *Phyllanthus emblica* extracts) against experimental *Eimeria tenella* infection in broiler chicks. IHP-250C + Immu-21 provided highest protection against virulent *E. tenella* infection. Total leukocyte count, total serum protein and serum globuline values of Immu-21-treated birds were significantly higher and recommended Immu-21 to be incroperated in broiler rations to augment the immune response against coccidiosis and other infections and increase the economic returns. Christaki et al. (2004) evaluated that the commercial preparation of herbal extracts Apacox (Apa-CT) on the performance of Cobb-500 chicks experimentally infected with 6 x 104 sporulated oocysts of *E. tenella* at 14 days of age. Dietary supplementation with Apacox attained higher body weight gain and feed conversion ratio values than the non-supplemented challenged control group. Bloody diarrhea was absent in Apacox group and mortality in Apacox group was 13.4% whereas in control group 23.4%.

HAEMATOLOGICAL ATTRIBUTES

Akinleye et al. *(*2008) observed that Eight weeks feeding trial was carried out on hematological of one hundred and twenty day old Ross breed broiler chicks maintained on diets containing 1 g/kg biomin - a growth promoter, at both starter and finisher phases. Oral biomin (20 mg/bird) were also given at both phases for three consecutive days. The starter mash fed contained 22% crude protein (cp) and 3,000 kcal metabolizable energy (ME) per kg of feed while the finisher's mash contained 17% cp and 3,020 kcal ME/kg of feed. Control diets without biomin were allowed at both phases. The difference in the haemotological parameters of birds on both treatments were not significant ($P > 0.05$) after eight weeks of feeding. Further, Ozduven et al. (2009) reported to evaluate the effects of organic acid mixture and/or mannanoligosaccharides (MOS) on growth performance, blood parameters and intestinal microbiota in 120 Ross 308 male broiler chicks, over a period of 21 days. Birds were maintained in battery brooders confined in an environmentally controlled experimental room. There were 4 dietary treatments, each consisting of 6 replicates.

Dietary treatments were: (i) basal diet (as a control), (ii) basal diet+MOS 2 kg/ton feed, (iii) basal diet+organic acid mixture 3 kg/ton feed and (iv) basal diet+MOS 2 kg/ton feed+organic acid mixture 3 kg/ton feed. Result revealed that the performance of biochemical attributes was better than the control one. Furthermore, Yalcnkaya et al. (2010) studied the effects of rations containing organic selenium and Vitamin E on live weight, live weight gain, feed consumption, feed efficiency, internal organ weights and blood parameters of broiler chicks. A total of 120, one day old Ross 308 male broiler chicks were used in this study. There were 4 treatment groups each containing 10 chicks of 3 replicates. The control group (K) was fed with basal diet without supplemented organic selenium (Se) and Vitamin E. Treatment groups were fed with 0.6 ppm organic selenium (Sel-Plex) (Se); 150 IU/kg Vitamin E (E) and 0.6 ppm organik selenium (Sel-Plex) +150 IU Vitamin E (Se+E).

The experiment lasted 42 days. There were no significant differences live weight, feed consumption, feed efficiency and relative internal organ weight among the groups ($P > 0.05$). Serum vitamin E levels were higher in vitamin E (E) supplemented group than in other groups ($P < 0.05$).

BIOCHEMICAL ATTRIBUTES

Asma and Nagra (2008) observed the effect of organic (OP) and conventional premix (CP) and found that the Serum alkaline phosphatase, aspartate aminotransferase, alanine aminotransferase activities were within normal physiological range in both treatments. The level of antibody titre against Newcastle disease and infectious bursal disease vaccination due to inclusion of supplements was also statistically similar in both CP and OP group. The hepatic ribonucleic acid (RNA) and Vitamin-C was significantly higher in OP group when compared with CP group. The OP group significantly reduced the intestinal harmful bacteria (*Bacteroides* spp. and *Escherichia coli*). It is suggested that broiler can be reared on organic premix without any adverse effect on their performance. Thereafter Lagana et al. (2007) studied to evaluate the effect of diets supplemented with Vitamins C and E and organic

minerals Zn and Se on serum biochemical parameters in broilers under cyclic heat stress (HS) (25 to 35°C) or termoneutral environment (TN) (21 to 25°C), both with 70% humidity. A 4x2 factorial design was used with four levels of vitamin mineral supplementation (T1 - control diet: 60/30 UI vitamin E in starter and grower diets, respectively; no vitamin C, 80 ppm of inorganic Zn e 0.3 ppm of inorganic Se; T2 - control diet+100 UI vit E and 300 ppm vit C/kg; T3 - control diet+40 ppm of organic Zn and 0.3 ppm of organic Se/kg and T4 - control diet+supplementation levels of T2 and T3) and two environments: cyclic heat stress and termoneutral, from the 14 degrees day of age. The experimental period was from 1 to 35 days of age and noted the reduction in the hemoglobin concentration. In the other hand, types of vitamin and/or mineral supplementation did not affect serum biochemical parameters of broilers under cyclic heat stress.

CONCLUSION

Finally, it is concluded that the enhancement of parameters such as feed intake, growth rate, carcass production, cure for diseases, haemotological and biochemical attributes of broiler production with eco-friendly by using the organic bio-stimulator.

Conflict of Interests

The authors have not declared any conflict of interests.

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