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Influence of Dietary Incorporation of Polyherbal Mixture on Feed Intake, Haemato-biochemical Parameters and Carcass Traits in Broiler Chicken

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A B S T R A C T

The present study was conducted to discern the influence of dietary incorporation of polyherbal mixture (turmeric, mangrail, ashwgandha and punarnava) as feed additive on feed intake, haemato-biochemical parameters and carcass traits in "Vencobb 400Y" strain for 42 days. Day old broilers chicks(n=210) were procured and randomly divided into seven groups with six replicates of five chicks each.T_1 and T_2 were control (basal diet) and negative control (basal diet + antibiotics), respectively.T_2, T_3, T_4, T_5, T_6 and T_7 were the treatment groups, supplemented with 0.25, 0.5, 1.0, 1.5 and 2 percent polyherbal mixture along with basal diet, respectively. Body weight, feed intake, haemato-biochemical parameters and carcass traits were observed. At the end of the six weeks the body weight gain was significantly highest in 2% polyherbal mixture supplemented group (T_7). The feed intake of all the groups was significantly lower than control group, however it was significantly lowest in antibiotic supplemented group. Gain to feed ratio was significantly ($P<0.05$) higher in polyherbal supplemented groups than control, and was similar to negative control group broilers. The hemoglobin level and PCV % in T_6 and T_7 was significantly ($P<0.05$) higher than all groups except, control group and was highest in T_7 group birds. The mean WBC count was significantly higher in all the groups than T_1. The H: L ratio was lower in all the groups in comparison to control group and was lowest in T_7 among the polyherbal groups. The total serum cholesterol level was significantly ($P<0.05$) lower in T_6 and T_7 group than all other groups. The carcass parameters viz; dressed, eviscerated, giblet, drawn, liver, heart gizzard and drumstick yields were similar among the treatments. Therefore, incorporation of 2% polyherbal mixture in broiler chicken diet improved feed intake and performance. Lower values of biochemical parameters and increased carcass parameters with incorporation of 2% polyherbal mixture indicated the better health condition of the broilers.

Keywords

Broiler chicks, polyherbal mixture, feed intake, haemato-biochemical paremeters and carcass traits

Introduction

The basic objective of modern broiler faming is faster growth, high feed conversion efficiency and livability. Commercial poultry is being genetically selected for even increasing growth performance and efficiency. This selection for increased growth rate has resulted to changes in the gastrointestinal development

(Mehala and Murti, 2008) and poor immune response during growth due to negative correlation between production traits and immune responses (Demir *et al.,* 2003). So to cope up the losses by reducing the disease condition in birds, antimicrobial compounds produced by microorganisms have been used. However, use of antibiotics as growth promoter leads to drug resistance, residual toxicity and other side effect of synthetic growth promoters and health maintaining drugs like antibiotics (Lee *et al.,* 2004). Herbal feed additives, as an alternative for antibiotics, meet the requirements of consumers in terms of food safety and solve the problem of bacterial resistance that occurs as a result of using antibiotics as growth promoters (Silva Cardoso *et al.,* 2012). Furthermore, these herbal feed additives have no side effect on health of the birds and increase the performance of birds by increasing live weight gain, feed conversion ratio (Samarth *et al.,* 2002) and immunity (Kumari *et al.,* 2012).

Turmeric (*Curcuma longa*), mangrail (*Nigella sativa*), ashwagandha (*Withania sominifera*) and punarnava (*Boerhavia diffusa*) are commonly used medicinal herbs in India and have various functions like antibacterial, antiseptic, anti-inflammatory and immune-modulatory activities. Turmeric has a wide spectrum of the biological actions, including antioxidant, antibacterial, antifungal, antiprotozoal, anti-inflammatory and hypo-cholesteremic activities (Chattopadhyay *et al.,* 2004). Birds fed turmeric powder had lower feed intake and feed conversion ratio (Durrani *et al.,* 2007), improved growth rate (Zeinali *et al., 2009).* Mangrail (*Nigella sativa)* has a significant effect on mean body weight, weight gain, feed intake and feed conversion ratio on broiler chicks (Mahmood *et al.,* 2009), improves immunity and reduces plasma cholesterol (Hassan *et al.,* 2004). Ashwagandha (*Withania somnifera*) possesses antistress, adaptogenic and immunomodulatory (Desmukh, 1998) and hypo-cholesterolemic (Mushtaq and Durrani, 2007) properties. The major active principle present in the roots of Punarnava (*Boerhaavia diffusa*) is alkaloidal and is known as punarnavine. It has anti-stress, anti-inflammatory, hepato-protective (Mahesh *et al.,* 2012), anti-nematodal (Vijayalakshmi *et al.,* 1979) and anti-bacterial properties (Olukoya *et al.,* 1993).Therefore, the present study was planned to observe the effect of polyherbal mixture (turmeric, mangrail, ashwgandha and punarnava) on feed intake, haemato-biochemical parameters and carcass traits in broilers.

Materials and Methods

The present study was carried out at Instructional livestock farm complex, Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad, Uttarpradesh, India. Two hundred ten commercial, straight run day old Vencobb 400Y broiler chicks were purchased from local hatchery and were wing banded, weighed and then randomly allotted to seven groups with six replicate of five chicks each. All the birds reared under standard management conditions throughout the experimental period of six weeks. The broiler starter and finisher diets were fed *ad libitum* from 0-3 and 4-6 weeks as per BIS, 1992, respectively (Table 1). Control group T_1 and negative control group T_2 were fed a basal diet and basal diet + commercial antibiotic supplement, respectively. T_3, T_4, T_5, T_6 and T_7 were supplemented with 0.25, 0.50, 1.0, 1.5 and 2 percent polyherbal mixture along with basal diet, respectively. The birds were raised on *adlib* feed and water with continuous lighting. The mixture of polyherbal powder was premixed and

then added successively to the whole lot. The basal diet was analyzed for proximate principles (AOAC, 2000)

Body weight and feed consumption recorded at weekly intervals and from this body weight gain and gain to feed ratio (Gain:Feed) were calculated. Blood samples were collected from six experimental birds of each group i.e one broiler chick from each replicate. For haematological parameters blood samples were collected aseptically from wing vein on 42nd day of trial in vials containing ethylene diamine tetra acetic acid (EDTA) as anticoagulant. The red blood cells (RBCs) and white blood cells (WBCs) were determined by using Neubauer's chamber (Jain 1993). The haemoglobin (Hb) concentration was evaluated by matching acid hematin solution against standard colour solution found in Sahli's haemoglobinometer. Packed cell volume (PCV) was estimated by microhaematocrit method (Jain, 1986). Mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) and was calculated from TEC, PCV and Hb (Albokhadaim, 2012). For analysis of biochemical parameters the blood samples were collected in sterile tubes without anticoagulant for collection of serum.

The serum samples were separated by centrifugation at 2500 rpm for 10 minutes and stored at -20^{0}C until further analysis. Serum glucose was determined by o-toluidine method (Hultman, 1959). Total serum protein and albumin was estimated by the biuret method (Hiller *et al.,* 1948) and bromocresol green (BCG) dye binding method (Gustaffson, 1976), respectively. Total serum globulin was calculated by difference between total protein and albumin in the serum.

At the end of the trial, one bird from each replicate (6 birds/treatment) was randomly slaughtered for carcass trait studies. The live weight and individual weight after slaughter of broilers was recorded. Dressed weight was measured after the removal of blood and feather and the dressing percentage was calculated as the proportion of dressed carcass weight to live weight. Eviscerated carcass weight was determined and the eviscerated percentage was calculated as the proportion of eviscerated carcass weight to live weight. Drumstick, heart, liver and gizzard were separated, weighed and calculated as a percentage of live weight.

The data was analyzed statistically by using SPSS, version-20 software with the simple analysis of variance (ANOVA) technique and means were compared using Duncan's multiple range test ($P< 0.05$).

Results and Discussion

The performance data of broilers has been given in Table 2. Overall body weight gain of all the groups was significantly ($P<0.05$) higher than control group. It was highest in

T_7 group followed by T_6, T_5, T_4, T_3, T_2 and T_1 group. The growth rate of broilers revealed that similar to body weight gain. The feed intake of treated groups broiler was significantly ($P<0.05$) lower than control group.

The feed consumption of T_4, T_5 and T_6 group broilers was significantly ($P < 0.05$) lower than T_7 group broilers but higher to T_3 (0.25% Polyherbal mixture) and T_2 (negative control) group broilers. Gain: Feed ratio was significantly ($P<0.05$) higher in all the treatment groups than control groups, however similar to the negative control group. The positive effects of antibiotics on body weight development; body weight gain

and growth rate was might be due to the fact that antibiotics reduce pathogenic bacteria in intestine and results in thinning of muscularis mucosa (Miles *et al.,* 2006). This could lead to an increased absorption efficiency of nutrients and lead to a better performance (Leeson, 1984). The improvement in performance due to incorporation of polyherbal mixture in broilers might be due to the synergistic action of the active principles of turmeric, mangrail, ashwagandha and punarnava. The growth-promoting herbs stabilizing the ecosystem of the gastrointestinal microbiota (Windisch *et al.,* 2008) by decreasing microbial activity and controlling potential pathogenic microorganisms in the gastrointestinal tract of animals (Castillo *et al.,* 2006).

The values of haematological parameters have been presented in Table 3. The hemoglobin level in T_6 and T_7 group was significantly ($P<0.05$) higher than T_2, T_3, T_4 and T_5 group, but similar to the control group broilers. In the herbal treated groups PCV was significantly ($P<0.05$) higher than negative control group (T_2) however, it was in comparison to control (T_1) group and MCHC concentration of all the groups was significantly ($P<0.05$) lower than negative control T_2 group.

The higher hemoglobin level might be due to improvement of fat digestion by herbs. In turmeric, curcumin is present that can stimulating the production of bile (Al-sultan and Gameel, 2004), *Nigilla sativa* seed oil also increase the bile flow (Mahfouz *et al.,* 1962), which can accelerate emulsification of fat that aid in the optimum digestion of fat.The WBC count was significantly ($P<0.05$) higher in all the treatment groups in comparison to control group birds, however it was in comparison to the WBC count of negative control group (T_2). In differential leukocyte counts it was found that the total heterophil in T_3, T_4, T_5, T_6 and T_7 groups broilers was significantly ($P<0.05$) higher than control (T_1) and negative control (T_2) group. The mean lymphocyte concentration in all group was significantly ($P<0.05$) higher than control (T_1) group broilers. The concentration of WBC was found within the normal range e.g. 9-31 thousands per mm^3 (Banerjee, 1998) in all the groups. The ratio of heterophil and lymphocyte indicate stress in birds. The lower value of heterophil and lymphocyte ratio (H:L) in the 2% polyherbal supplemented groups than control group birds showed that 2% level of polyherbs helps to reduce stress in the birds.

The serum glucose, total protein, albumin, globulin and cholesterol level are presented in Table 3. The glucose level in serum of different group broilers showed no effect of either antibiotic or herbs. The total serum protein concentration was significantly ($P>0.05$) lower in T_7 group and higher in T_4 group than control (T_1) and negative control (T_2).

The mean albumin concentration was significantly ($P<0.05$) higher in T_1 and T_4 group than other groups. The globulin concentration was found highest in 0.5 % polyherbal mixture (T_4) group and lowest in 2.0 % polyherbal mixture group (T_7). The total serum cholesterol level was significantly ($P<0.05$) lower in 1.5% polyherbal mixture (T_6) and 2.0% polyherbal mixture (T_7) than control and other treatment group. The lowest serum cholesterol level 2.41 ± 0.10 mM/l was found in T_7 group birds. Lower value of cholesterol in 1.5 and 2.0 percent polyherbal groups was might be due to hepatostimulatory and antioxidative property of herbs that metabolizes the fat properly.

Table.1 Ingredient (kg/100kg) and Chemical Composition (% DM basis) of basal diets

Composition	Starter (0-3 wk)	Finisher (3-6 wk)
Ingredient (kg/100 kg)		
Maize	56.00	65.50
Soybean meal	38.00	29.80
Deoiled rice bran	2.00	1.00
Oystre Shell grit	1.23	1.37
Dicalcium phosphate	1.95	1.60
Common salt	0.40	0.40
DL-Methionine	0.17	0.08
Choline chloride	0.10	0.10
Vitamin premix*	0.05	0.05
Mineral premix*	0.10	0.10
Chemical composition (% DM basis)		
Dry Matter (%)	87.82	87.62
Crude protein (%)	23.05	20.75
Crude fiber (%)	3.25	3.45
Ether extract (%)	3.45	3.85
Total ash (%)	10.35	9.65
Metabolizable energy** (Kcal/kg)	2835.50	2909.00

*Supplies per kg diet: Vitamin A, 16,500IU; Vitamin D_3, 3200IU; Vitamin E, 12mg; Vitamin K, 2 mg; VitaminB_2, 10mg; Vitamin B_6, 2.4 mg ; Vitamin B_{12},12µg; Niacin, 18 mg; Pantothenic acid, 12 mg; Mn, 90mg ; Zn, 72mg; Fe, 60mg; Cu, 10 mg; I, 1.2mg. **Calculated value

Table.2 Performance of broilers fed ration containing different level of poly herbal mixture

Attributes	T1	T2	T3	T4	T5	T6	T7
Initial body Weight (g)	41.90 ±0.13	41.64 ±0.40	42.33 ±0.20	41.19 ±0.09	41.98 ±0.08	41.93 ±0.09	42.02 ±0.17
Final Body Weight (g)	1896.33^{a} ±13.05	1939.8^{b} ±28.05	1979.07^{b} ±6.63	2098.1^{c} ±9.16	2109.7^{c} ±17.83	2115.5^{c} ±2.99	2222.9^{d} ±11.95
Mean Body Weight. gain (g)	1854.42^{a} ±13.05	1898.2^{b} ±28.08	1936.73^{b} ±6.72	2056.0^{c} ±9.14	2067.7^{c} ±17.82	2073.6^{c} ±2.95	2180.9^{d} ±12.00
Average feed intake (g)	4511.67^{e} ±18.51	3847.1^{a} ±24.56	4041.17^{b} ±26.97	4250.0^{c} ±29.52	4221.5^{c}± 49.48	4187.5^{c} ±49.47	4378.3^{d} ±24.07
Growth Rate	191.34^{a} ±0.06	191.58^{b} ±0.14	191.62^{b} ±0.05	192.11^{c} ±0.03	192.19^{c} ± 0.06	192.22^{c} ± 0.01	192.57^{d} ±0.05
Gain: Feed ratio	411.05^{a} ±3.05	493.52^{bc} ±7.98	479.31^{b} ±1.83	483.89^{bc} ±4.40	490.00^{bc} ±4.66	495.57^{c} ± 6.31	498.21^{c} ±4.17

Values with different small letter superscripts in a row differ between groups significantly (P<0.05).

Table.3 Serum haemato-biochemical profile of broilers fed ration containing different level of poly herbal mixture

Attributes	T1	T2	T3	T4	T5	T6	T7
Hb (g/dl)	9.60^{c} ±0.23	7.30^{a} ±0.57	7.90^{ab} ±0.05	8.20^{b} ±0.11	8.26^{b} ±0.13	9.20^{c} ±0.20	9.76^{c} ±0.14
PCV (%)	30.60^{c} ±0.69	22.00^{a} ±1.73	25.46^{b} ±0.29	26.26^{b} ±0.37	27.00^{b} ±0.11	29.33^{c} ±0.54	31.66^{c} ±0.33
MCHC (g/dl)	31.37^{a} ±0.04	33.18^{b} ±0.01	31.02^{a} ±0.28	31.22^{a} ±0.16	30.61^{a} ±0.51	31.36^{a} ±0.16	30.85^{a} ±0.58
TLC (x 10^{6} ul)	14.72^{a} ±0.36	22.40^{c} ±0.73	20.50^{bc} ±0.43	19.33^{b} ±0.22	22.33^{c} ±0.65	20.25^{bc} ±0.43	21.66^{bc} ±1.50
Heterophils	5.45^{a} ±0.22	4.86^{a} ±0.42	7.73^{bc} ±0.40	6.58^{b} ±0.29	7.90^{c} ±0.42	6.89^{bc} ±0.38	6.82^{bc} ±0.23
Lymphocytes	8.38^{a} ±0.12	16.72^{c} ±0.48	11.95^{b} ±0.08	11.66^{b} ±0.15	13.31^{b} ±0.19	12.14^{b} ±0.02	13.19^{b} ±1.20
Ratio (H/L)	0.65^{c} ±0.01	0.29^{a} ±0.01	0.64^{c} ±0.02	0.56^{bc} ±0.03	0.59^{bc} ±0.02	0.57^{bc} ±0.02	0.52^{b} ±0.03
Hb (g/dl)	9.60^{c} ±0.23	7.30^{a} ±0.57	7.90^{ab} ±0.05	8.20^{b} ±0.11	8.26^{b} ±0.13	9.20^{c} ±0.20	9.76^{c} ±0.14
PCV (%)	30.60^{c} ±0.69	22.00^{a} ±1.73	25.46^{b} ±0.29	26.26^{b} ±0.37	27.00^{b} ±0.11	29.33^{c} ±0.54	31.66^{c} ±0.33
Glucose (mmol/l)	11.35 ±0.38	10.84 ±0.10	11.48 ±0.17	11.74 ±0.17	11.56 ±0.36	11.27 ±0.36	11.14 ±0.27
Total Protein (g/l)	43.75^{bc} ±0.90	42.24^{b} ±3.86	49.11^{cd} ±2.59	55.22^{d} ±1.05	39.92^{ab} ±2.44	41.87^{b} ±2.32	34.11^{a} ±1.11
Albumin (g/l)	18.08^{b} ±1.77	13.91^{a} ±0.92	14.44^{ab} ±1.21	17.82^{b} ±1.49	16.73^{ab} ±1.23	15.47^{ab} ±0.35	13.41^{a} ±0.76
Globulin (g/l)	25.67^{a} ±2.41	28.34^{ab} ±4.03	34.66^{cd} ±2.32	37.39^{d} ±1.90	23.20^{a} ±2.19	26.39^{a} ±2.36	20.69^{a} ±1.22
Cholesterol (mmol/l)	4.13^{b} ±0.08	3.90^{b} ±0.37	4.13^{b} ±0.08	3.91^{b} ±0.09	3.85^{b} ±0.08	2.92^{a} ±0.29	2.41^{a} ±0.10

Values with different small letter superscripts in a row differ between groups significantly (P<0.05).

Table.4 Carcass characterstic of broilers fed ration containing different level of poly herbal mixture

Attributes	T1	T2	T3	T4	T5	T6	T7
Dressed feather	89.96^{d}	90.25^{d}	90.30^{d}	85.83^{a}	87.82^{bc}	86.38^{ab}	89.65^{cd}
Weight yield (%)	±0.58	±0.81	±0.65	±0.21	±0.76	±0.76	±0.23
Dressed yield (%)	81.06^{c}	81.37^{c}	80.44^{bc}	77.71^{a}	78.28^{ab}	76.38^{a}	81.57^{c}
	±0.14	±0.64	±0.82	±0.44	±1.65	±0.20	±0.26
Eviscerated yield (%)	62.08^{a}	67.25^{b}	67.06^{b}	64.44^{ab}	62.49^{ab}	64.64^{ab}	65.20^{ab}
	±0.57	±2.39	±2.56	±0.21	±1.04	±0.35	±0.39
Giblet yield (%)	4.51^{ab}	4.33^{a}	5.12^{c}	4.80^{bc}	5.80^{d}	4.47^{ab}	4.62^{ab}
	±0.04	±0.02	±0.14	±0.15	±0.07	±0.16	±0.08
Drawn yield (%)	66.58^{a}	71.59^{b}	72.19^{b}	69.24^{ab}	68.29^{ab}	69.12^{ab}	69.82^{ab}
	±0.53	±2.38	±2.41	±0.36	±1.11	±0.20	±0.32
Liver yield (%)	2.05^{ab}	1.87^{a}	2.36^{bc}	2.52^{c}	3.1^{d}	2.10^{abc}	2.19^{abc}
	±0.18	±0.02	±0.10	±0.28	±0.01	±0.02	±0.05
Heart yield (%)	0.50^{a}	0.65^{cd}	0.71^{d}	0.55^{ab}	0.59^{bc}	0.65^{cd}	0.79^{e}
	±0.01	±0.03	±0.02	±0.02	±0.02	±0.01	±0.05
Gizzard yield (%)	1.96^{ab}	1.81^{ab}	2.05^{b}	1.74^{ab}	2.07^{b}	1.72^{ab}	1.64^{a}
	±0.22	±0.01	±0.07	±0.11	±0.10	±0.13	±0.01
Drumstick yield (%)	8.12^{a}	9.16^{bc}	9.89^{d}	9.41^{cd}	8.15^{a}	8.72^{b}	8.89^{bc}
	±0.30	±0.14	±0.06	±0.07	±0.13	±0.28	±0.03

Values with different small letter superscripts in a row differ between groups significantly (P<0.05).

The carcass parameters viz; dressed, eviscerated, giblet, drawn, liver, heart gizzard and drumstick yields were similar among the treatments (Table 4). Similar to our finding on drawn yield, Chaudhary (2012) did not found any change by supplementing a mixture of turmeric, mangrail and amla on the carcass yield of broiler chickens reared to six weeks of age. Norzarian *et al.,* (2011) also reported that supplementation of turmeric powder upto 10 g/ kg diet to the broiler chickens did not influenced the carcass, heart, pancreas, bursa of fabricious and spleen yield. On the contrary Durani *et al.,* (2006) reported higher dressing percentage, breast, thigh and giblet weight in broilers fed diet containng 5 g/kg turmeric powder. Contrary to present findings Naseer *et al.,* (1998) reported that no significant changes in liver, heart and spleen weight of Baldai chicks received different level of Nigella sativa seeds.

It could be concluded that supplementation of 2 % polyherbal mixture (turmeric, mangrail, ashwgandha and punarnava) improved the feed intake and gain to feed ratio. It reduced the serum cholesterol and stress of the broilers without using antibiotics.

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