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Effect of a phytobiotic, supplemented in different form, on performance, hepatic marker enzymes and carcass characteristics of broiler chickens

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Abstract
A study was conducted to evaluate the impact of a phytobiotic supplemented in different form in the diet on the performance, changes in hepatic marker enzymes and broiler's carcass characteristics. Two hundred fiftyVencobb-400Y strain broiler chicks were divided into five groups with 10 chicks in each five replicates. Each group was fed with different treatment i.e. a basal diet (NC), basal diet with antibiotic (PC), basal diet with herbal mixture powder (HP), basal diet with aqueous extract (AqE) and alcoholic extract of herbal mixture (AlE).The performance, liver function and carcass parameters of birds were ascertained. There was significantly (P<0.05) higher body weight gain (BWG) in AlE group compared to PC and NC group birds. Feed intake of AqE and AlE group birds were significantly (P<0.05) higher than NC, PC and HP group birds. Energy efficiency ratio (EER) and protein efficiency ratio (PER) of AlE groups was similar to PC, however significantly (P<0.05) higher than NC group broiler chickens. The serum ALT and AST level were significantly (P<0.05) lower in the birds that supplemented herbs in any form powder, aqueous or alcoholic. No significant effect of different treatments on broiler's dressed weight, giblet weight and drawn yield were observed. So, AlE supplementation had hepatoprotective impact and it improves performance of broiler chicken.

Keywords: Broiler, extract, performance and phytobiotic

Introduction
Feed additives are in dispensible element of poultry feed formulation and described as non-nutrient substances that accelerate growth, feed efficiency and are supposed to beneficial for health as well as nutrient metabolism of the animals and poultry (Church and Pond, 1988) [5]. In last few decades antibiotics were the most routinely used feed additives to improve growth and performance of broilers. However, due to the sever health concerns like alteration of natural gut microbiota and drug resistance, use of antibiotics in poultry industry have been banned in many countries (Karangiya *et al.*, 2016) [9]. Ban of antibiotics use in broilers feed ensuing to increased spread of bacterial diseases, poorer growth performance and worsened nutrient utilization in poultry flocks. So there are urgent need of alternative of feed antibiotics which can improve poultry performance without generating drug resistance and residual effect in poultry products. In this context various researchers dig out some possible alternatives of antibiotics like phytobiotics, probiotics, organic acids, prebiotics and synbiotics.
Phytobiotics can be defined as plant derived products like herbs, essential oils and oleorasins in feed supplementation improve broilers performance (Yang *et al.*, 2009) [19]. The bioactive compounds presents in plants and herbs showed greater potential as alternative of antibiotics due to their antimicrobial action, hepatoprotective properties and antioxidant activities (Toghyani *et al.*, 2011) [18]. Certain herbal formulations were tried successfully to improve growth performances, carcass yield (Singh *et al.*, 2016) [15] and gut health (Attia *et al.*, 2017) [2] in broilers. Therefore this study was aimed to evaluate the impact of an herbal preparation supplemented in different forms either powder, aqueous or alcoholic extract in broiler chickens the diets on their performance, hepatic marker enzymes and carcass characteristics.

Materials and Methods
The experiment of 42 days was carried out on 250 broiler chickens of Vencobb-400Y strain on livestock farm complex of Acharya Narendra Deva University of Agriculture and Technology,

Kumarganj, Ayodhya. The chicks were randomly divided into five groups and then each group was further distributed into five replicates contained 10 chicks. Each group was fed with different treatment diet i.e. either a basal diet (NC) or that supplemented with antibiotic in basal diet (PC), 2% herbal mixture powder with basal diet (HP), aqueous extract of 2% herbal mixture with basal diet (AqE) or alcoholic extract of 2% herbal mixture with basal diet (AlE). The birds were assigned to a clean and hygienic pen and raised on rice hull litter. Chicks were provided diets as per BIS (2007) [3] recommendation i.e. prestarter (1-7 d), starter (8-21 d) and finisher (22-42 d) (Table-1). Fresh and clean water was provided for 24 hrs and diets were available all the time throughout the experimental period.

Replicate wise weight of birds, feed offered, feed remaining and mortality were recorded for assessing the performance of birds for its body weight gain, EER and PER. Blood was collected at the end of experiment from one bird selected randomly from each replicate. Serum biochemical examination was done for hepatic enzymes assessment by using commercial diagnosis kit (Span Diagnosis Private Limited, Surat, India). Beside this, one bird from each replicate was sacrificed for carcass characteristics. All the data obtained during trial period was analyzed statistically under completely randomized design by using one way ANOVA (Snedecor and Cochran, 1989) [17]. The means of different treatments were compared with Duncan Multiple range test (Duncan, 1955) [6]. Statistical significance was determined at $P < 0.05$ level.

Results and Discussion

The changes in body weight gain (BWG), feed intake (FI), energy efficiency ratio (EER), protein efficiency ratio (PER), hepatic marker enzymes and carcass parameters of broilers in different dietary treatments are presented in Table-2. Body weight gain of all the additive supplemented birds were significantly ($P<0.05$) higher than the birds kept on only basal diet (NC). Aqueous (AqE) and alcoholic extract (AlE) of herbal mixture had significantly ($P<0.05$) positive effect in weight gain of birds compared to antibiotic (PC) or powder form (HP) of herbal mixture. The maximum weight gain (3034.89 g) was found in the birds that supplemented with alcoholic extract of herbal mixture. Feed intake (FI) in AlE and AqE group birds was significantly ($P<0.05$) higher than NC as well as PC group birds. Whereas HP group birds FI was comparable to NC and PC group birds.

The improvement in the BWG and FI of the broilers on herbal mixture supplementation in general and alcoholic extract in particular may be due to the presence of active ingredients which stimulates digestive enzymes and improves overall digestion and thus leads to increased body weight gain. This may also possible that dietary supplementation of herbal mixture improves lactic acid bacteria concentration and decreases pathogenic bacteria level such as mesophilic aerobic, coliform and *Escherichia coli* in birds GIR and thus nutrients absorption increased that leads to higher feed intake and better weight gain. It showed that there is no adverse effect of smell and/or taste of herbal mixture on the palatability of feed in the diets of broilers. In agreement to our findings Karangia *et al.* (2016) [2] also reported significantly ($P<0.05$) higher body weight gain as well as feed intake after supplementation of herbal mixture in broilers diet. The results are consistent with those of Mohamed *et al.* (2012) [11] and Arshad *et al.* (2012) [1], who also stated that use of herbal mixture in the diet of broilers had a significantly ($P<0.05$) positive impact on the feed intake and body weight gain as compared to the control.

The EER and PER of AlE group birds was similar to PC group and significantly ($P<0.05$) higher than NC, HP and AqE group birds. It was also observed that EER and PER of aqueous extract (AqE) supplemented group was similar to the birds that kept on only basal diet (NC) and significantly ($P<0.05$) lower than the birds that supplemented the herbal mixture in powder form (HP).The significant improvement in EER and PER of broilers fed with herbal mixture in their diet is due to the presence of bioactive compounds which prevents the damage of digestive organs and simultaneously improve their enzyme secretary power. Similar to our findings, El-katcha *et al.* (2016) [8] also reported higher protein efficiency ratio and efficiency of energy utilization in broilers after herbal supplementation in their diets. Singh (2015) [16] and Dwivedi (2015) [7] were also found the higher EER and PER in broilers supplemented with a herbal mixture formulation in their diets.

The hepatic enzyme markers viz. ALT and AST were similar in NC and PC group birds. It was evident that supplementation of herbal powder in any form either powder, aqueous or alcoholic reduces significantly ($P<0.05$) the serum ALT and AST level than the birds supplemented with antibiotic or without antibiotic growth promoter. The reduction in serum ALT and AST level indicated the hepatoprotective property of herbal mixture on broilers. The results were in agreement with the findings of Sakthi Priya *et al.* (2017) [13], who also did not finds any change in hematology whereas lower level of liver function enzymes i.e. ALT and AST after herbal mixture supplementation in broilers diet. Similarly Zhang *et al.* (2009) [20] also found positive impact of herbal supplementation on liver function of broilers.

The carcass characteristics was assessed in the form of dressed weight, giblet weight and drawn yield and found that supplementation of any additive either antibiotic or herbal mixture in any form viz. powder, aqueous, alcoholic did not affect significantly ($P>0.05$) the carcass characteristics (Table-2). Chaudhary *et al.* (2014) [4] also showed that no change in carcass characteristics of broilers by dietary supplementation of a mixture of turmeric, mangrail and amla. Similarly, no change in dressing percentage of broilers was reported by supplementation of an herbal growth promoter in broilers diet (Mahmood *et al.*, 2014) [10]. Omar *et al.* (2016) [12] also did not observed any significant differences in the carcass characters of broilers that supplemented with a mixture of pure honey with an extract of several medicinal plants. Contrary to the present findings, Sethar *et al.* (2016) [14] reported higher dressing percentage in broilers that supplemented with a commercial herbal preparation as compared to control group.

Conclusion

The supplementation of the alcoholic extract of 2% herbal mixture in the diet improved the performance and hepatic marker enzymes of broiler chickens. So, it has potential to use as an alternative of in-feed antibiotics in poultry production.

Table 1: Composition of basal diets (per 100kg)

Ingredient (kg)	Pre-starter	Starter	Finisher
Maize	50.42	55.52	59.82
Soybean meal	42.00	36.40	27.40
Rice polish	-	-	5.00
Vegetable fat	4.48	5.18	5.43
Dicalcium phosphate	1.15	0.97	0.80
Limestone powder	0.90	1.04	0.75
Common salt	0.40	0.38	0.36
DL-Methionine	0.25	0.18	0.16
Lysine	0.15	0.08	0.03
Choline chloride	0.10	0.10	0.10
Vitamin premix	0.05	0.05	0.05
Mineral premix	0.10	0.10	0.10
Nutrient composition			
Dry matter (%)	87.15	87.77	89.22
Crude protein (%)	23.14	22.09	20.30
Crude fiber (%)	3.05	3.25	3.45
Ether extract (%)	4.98	5.80	7.78
Metabolizable energy* (kcal/kg)	3003.10	3107.00	3203.40

*Calculated value

*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, 1.2 mg.

Table 2: Effect of different form of a phytobiotic on performance, AST, ALT and carcass characteristics (% of live weight) of broiler chickens

Attributes	Dietary treatments					SEM	P-value
	NC	PC	HP	AqE	AlE		
BWG (g)	2641.59^{d}	2804.59^{c}	2807.48^{c}	2894.71^{b}	3034.89^{a}	27.886	<0.001
FI (g)	5054.10^{b}	5065.40^{b}	5167.40^{b}	5465.80^{a}	5489.00^{a}	44.865	<0.001
EER	16.46^{c}	17.43^{a}	17.10^{b}	16.67^{c}	17.42^{a}	0.087	<0.001
PER	2.514^{c}	2.664^{a}	2.614^{b}	2.546^{c}	2.660^{a}	0.013	<0.001
ALT (U/l)	11.64^{a}	11.36^{a}	10.18^{ab}	7.09^{bc}	4.46^{c}	0.768	0.003
AST (U/l)	144.05^{a}	136.62^{ab}	130.64^{b}	115.65^{c}	128.45^{b}	2.242	<0.001
Dressed weight	88.09^{a}	87.62^{ab}	87.50^{ab}	86.59^{b}	86.89^{b}	0.177	0.033
Giblet weight	4.273^{a}	3.605^{b}	3.700^{b}	3.558^{b}	3.870^{ab}	0.089	0.052
Drawn yield	77.80^{ab}	79.19^{a}	76.87^{b}	76.46^{b}	78.48^{ab}	0.343	0.047

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

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