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Efficacy of herbal growth promoters in augmenting the performance of broilers.

KEYWORDS: Herbal growth promoter, digestibility co-efficient, performance parameters.

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ABSTRACT A total of 240 day old commercial broiler chicks were procured and divided randomly into 4 treatment groups (T0 to T3) of 60 chicks each. Group T0 (n=60) was kept as negative control. Group T1 (n=60) was treated with basal ration supplemented with AV/AGP/10 @250g/ton (M/S Ayurvet Ltd.). Group T2 (n=60) was treated with basal diet supplemented with Herbiotic @500g/ton. Group T3 (n=60) was treated with basal ration supplemented with Salinomycin @500g/ton. Parameters viz. feed trials and metabolic trials were evaluated. Results revealed improved body weight and better FCR in group T1. The mean digestibility coefficients for dry organic nutrients were improved in all supplemented groups. Nitrogen retention % was significantly better in group T1. Carcass characteristics were improved in the supplemented groups. Duodenal villous height:crypt depth ratio was higher in herbal supplement groups. Mortality rate percentage was decreased after product supplementation. Thus, it can be inferred that herbal growth promoters can significantly enhance broiler performance.

Introduction

Broiler rearing has become one of the most lucrative ventures given the profitability, short time period of rearing and increasing social acceptability. Use of growth promoters has now become routine to help attain the genetic potential for the faster growth rate imbibed in the present day broiler chickens. They help in efficient utilization of dietary nutrients to optimal level for growth, which otherwise is not achieved by inherent digestive capacity of the birds. Growth promoters are chemical and biological substances which are added to livestock food with the aim to improve the growth of chickens in fattening, improve the utilization of food and in this way realize better production and financial results **(Peric, 2009)**. Growth promoters are getting popularity as feed additives due to their beneficial effect on gut health and immunity, and growth performance **(Panda et al., 2009)**. Growth stimulants as feed additives are added to poultry diet to enhance growth rate and the economic meat production **(Bunyan et al., 1997)**. The animal feed manufacturers are exposed to increasing consumer pressure to reduce the use of antibiotic growth promoters as feed additive and find alternatives to antibiotic growth promoters in poultry diets **(Newman, 1997; Hertrampf, 2001; Humphrey et al., 2002)**. In Europe, research on plant extracts as alternatives to the use of antibiotics as growth promoters has significantly increased. Recently, a number of scientific studies has concentrated on the bactericidal and bacteriostatic effects of various herbs and plant extracts **(Dorman and Deans, 2000; Tucker, 2002)**. It has also been demonstrated that herbs and herbal products have a positive effect on broiler growth performance **(Guo et al., 2000)**. Plant active principles are chemical compounds present in the entire plant or in specific parts of the plant that confers them therapeutic activity or beneficial effects **(Martins et al., 2000)**. As more and more people are beginning to repose their faith in herbal medicine, it is pertinent to carry out further research towards that end and back up our assertions with strong scientific finding. There has been a paradigm shift in the approach towards herbal medicines and their acceptance and penetration into various treatment regimes has increased manifold. It is only obvious that this fervent switch to herbal medicine is only on account of is high safety margin and convincing performance. In light of the tearing need for stronger validation of these natural products, the present study has been carried out to evaluate the supplementation of natural growth promoter as a replacement of antibiotic growth promoter in improving growth performance, carcass traits and intestinal morphometry in broilers.

Materials and Methods

A total of 240 day old commercial broiler chicks were procured, wing banded and divided randomly into 4 treatment groups (T0 to T3) of 60 chicks each. Group T0 (n=60) was kept as negative control. Group T1 (n=60) was supplemented with AV/AGP/10 @ 250g/ton (M/S Ayurvet Ltd) along with basal ration. Group T2 (n=60) was supplemented with Hebiotic @500g/ ton along with basal ration. Group T3 (n=60) was supplemented with Salinomycin @500g/ton along with basal ration. Basal rations (BIS, 1992) were offered ad libitum to experimental chicks under different treatment groups during starter (1-28 days) and finisher (29-42 days) phases along with clean drinking water throughout the feeding trial; period of 42 days. Feeding trials viz. Body weight and Feed consumption were monitored during 42 days of study. Metabolic trial was also carried out. Several parameters viz. growth performance, nutrient utilization, carcass study, intestinal micrometry, incidence of diseases, mortality, economics of the experiment were evaluated during the period of study. All the data obtained were analyzed as per the standard statistical procedure (**Snedecor and Cochran, 1980**).

Results

Body Weight and Body Weight Gain

The mean body weight of broilers in group T0 (control group) increased from 42.25 g initially to 2340.72 g (Table 1) at the end of 6th week with a total gain in body weight of 2298.38 g (Table 2). In group T1 (AV/AGP/10 treated group) the mean body weight increased from 42.08 g initially to 2527.02 g at the end of 6th week (Table 1) with a total gain in body weight of 2484.81g (Table 2). In group T2 (Herbiotic treated group), the mean body weight increased from 41.83 g initially to 2391.56 g at the end of 6th week with a total gain in body weight of 2349.66 g. In group T3 (Salinomycin treated group) the mean body weight increased from 42.08 g initially to 2439.84 g at the end of 6th week with a total gain in body weight of 2397.71g (Table 1 and Table 2).

Table 1: Mean initial, weekly and final body weights (gm) of experimental broilers

Tr.	Initial	1st week	2nd week	3rd week	4th week	5th week	6th week
T_0	42.25± 0.29^{a}	165.24± 1.13^{b}	390.00±2 .74^{a}	776.53±2 .72^{a}	1244.60± 3.67^{a}	1780.44± 11.92^{a}	2340.72± 3.41^{a}
T_1	42.08±0. 08^{a}	176.67±2 .96^{b}	410.50±5 .26^{b}	805.00±7 .67^{a}	1310.51± 8.82^{b}	1900.09± 9.96^{c}	2527.02± 4.08^{c}

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T_2	41.83±0.22^{a}	172.58±3.17^{ab}	396.46±0.71^{ab}	788.25±1.9.15^{a}	1271.92±14.14^{ab}	1810.25±20.21^{ab}	2391.56±35.02^{ab}
T_3	42.08±0.17^{a}	169.33±2.32^{ab}	397.79±5.48^{ab}	771.31±9.52^{a}	1272.83±10.43^{ab}	1853.42±8.57^{bc}	2439.84±10.06^{b}

Means with different superscripts differ significantly (P≤0.05)

Table 2: Mean weekly and total gain in body weight (gm) of experimental broilers

Tr.	1st week	2nd week	3rd week	4th week	5th week	6th week	Total
T_0	122.99±1.18^{a}	224.76±3.79^{a}	386.53±5.07^{a}	468.07±5.87^{a}	535.83±8.46^{a}	560.29±1.4.36^{a}	2298.38±7.94^{a}
T_1	134.58±2.92^{b}	233.83±7.06^{a}	394.50±1.70^{a}	505.51±2.62^{b}	589.58±5.43^{b}	626.93±8.16^{a}	2484.81±8.52^{c}
T_2	130.75±3.38^{ab}	223.88±3.88^{a}	391.79±1.9.86^{a}	483.67±1.4.89^{ab}	538.33±9.28^{a}	581.23±3.8.28^{a}	2349.66±6.24^{ab}
T_3	127.25±2.38^{ab}	228.46±3.44^{a}	373.52±7.56^{a}	501.52±2.51^{b}	580.59±2.75^{ab}	586.42±1.69^{a}	2397.71±7.36^{b}

Means with different superscripts differ significantly (P≤0.05)

Feed Consumption and Feed Consumption Ratio

The total feed consumption of broilers was 4219.91 g in group T0, 4427.28g in group T1, 4228.14 g in T2, and 4319.24 g in T3. The maximum feed consumption was observed in group T1 (AV/AGP/10 treated group) followed by T3 (Salinomycin treated group) and T2 (Herbiotic treated group) (Table 3). However, the FCR was also significantly better in the supplemented groups as compared to the control (Table 4).

Table 3: Mean weekly and total feed consumption (gm) of experimental broilers

Tr.	1st week	2nd week	3rd week	4th week	5th week	6th week	Total
T_0	146.35±1.62^{a}	305.69±5.75^{a}	614.48±4.92^{a}	842.48±4.14^{a}	1044.91±10.50^{a}	1266.02±3.43^{a}	4219.91±10.16^{a}
T_1	158.75±0.88^{c}	318.04±5.58^{a}	607.47±4.13^{a}	879.60±4.76^{bc}	1096.60±7.51^{d}	1366.69±3.64^{c}	4427.28±19.86^{c}
T_2	154.25±1.75^{bc}	302.32±4.09^{a}	611.13±0.73^{a}	846.49±4.68^{a}	1016.43±5.64^{b}	1297.53±4.69^{b}	4228.14±17.15^{a}
T_3	150.08±1.78^{ab}	303.82±3.35^{a}	590.08±1.69^{a}	887.79±3.97^{c}	1091.39±6.16^{d}	1295.95±3.45^{b}	4319.24±28.90^{b}

Means with different superscripts differ significantly (P≤0.05)

Table 4: Mean weekly and total feed conversion ratio of experimental broilers

Tr.	1st week	2nd week	3rd week	4th week	5th week	6th week	Total
T_0	1.19±0.02^{a}	1.36±0.03^{a}	1.59±0.03^{a}	1.80±0.02^{a}	1.95±0.02^{a}	2.26±0.06^{a}	1.84±0.00^{a}
T_1	1.18±0.03^{a}	1.36±0.02^{a}	1.54±0.05^{a}	1.74±0.02^{a}	1.86±0.03^{a}	2.18±0.02^{a}	1.78±0.01^{c}
T_2	1.18±0.04^{a}	1.35±0.04^{a}	1.57±0.09^{a}	1.76±0.06^{a}	1.89±0.02^{a}	2.25±0.14^{a}	1.80±0.01^{bc}
T_3	1.18±0.02^{a}	1.33±0.01^{a}	1.58±0.04^{a}	1.77±0.01^{a}	1.88±0.02^{a}	2.21±0.00^{a}	1.80±0.01^{bc}

Means with different superscripts differ significantly (P≤0.05)

Mean Digestibility Coefficient

The mean digestibility coefficient of organic nutrients have been listed in Table 5. The mean digestibility coefficient of dry matter and and crude fibre was significantly (P<0.05) higher in group T1 (70.37 and 25.08 respectively) (AV/AGP /10 treated group), mean digestibility coefficient of crude protein was higher in group T3 (70.76) (Salinomycin treated group) , the mean digestibility coefficient of ether extract varied non significantly.

Table 5: Mean digestibility co-efficient of organic nutrients

Tr.	Dry matter	Crude protein	Ether extract	Crude fibre
T_0	65.52±0.37^{a}	67.51±0.28^{a}	81.00±0.51^{a}	24.26±0.26^{a}
T_1	70.37±0.24^{c}	69.48±0.37^{b}	80.98±0.37^{a}	25.08±0.12^{b}
T_2	68.77±0.29^{b}	69.59±0.26^{b}	80.94±0.20^{a}	23.89±0.15^{a}
T_3	69.59±0.35^{bc}	70.76±0.56^{c}	81.20±0.46^{a}	25.83±0.21^{c}

Means with different superscripts differ significantly (P≤0.05)

Retention % of Nitrogen , Calcium and Phosphorous

The nitrogen retention % was highest in AV/AGP/10 supplemented group T1 (62.77%) and the retention % of calcium and Phosphorus varied non significantly in all the groups (Table 6).

Table 6: Percentage of retention of nitrogen, calcium and phosphorus of experimental broilers

Tr.	Nitrogen	Calcium	Phosphorus
T_0	59.25±0.76^{a}	51.76±0.50^{a}	50.80±0.30^{a}
T_1	62.77±0.96^{b}	51.97±0.27^{a}	50.98±0.28^{a}
T_2	61.16±1.04^{ab}	52.07±0.37^{a}	51.10±0.36^{a}
T_3	62.34±0.70^{b}	52.23±0.19^{a}	51.02±0.34^{a}

Means with different superscripts differ significantly (P≤0.05)

Carcass Characteristics

The live weight carcass weight, dressing % and abdominal fat % were highest in group T1 (AV/ AGP/10 treated group) at 2.55 kg, 1.88 kg, 73.73% and 2.18% respectively. The intestinal pH was highest in group T2 (6.8) (Herbiotic treated group). The colour of meat was light pink in all the groups (Table 7).

Table 7: Carcass characteristics

Tr.	Live weight (Kg)	Carcass weight (Kg)	Dressing percentage	Abdominal fat (% of carcass weight)	Intestinal pH	Colour of meat
T_0	2.350±0.03^{a}	1.680±0.02^{a}	71.49±0.01^{a}	2.11±0.01^{a}	6.3±0.12^{a}	Light pink
T_1	2.550±0.02^{c}	1.880±0.04^{c}	73.73±1.05^{a}	2.18±0.10^{a}	6.5±0.00^{a}	Light pink
T_2	2.400±0.02^{ab}	1.720±0.03^{ab}	71.69±0.8^{a}	2.15±0.01^{a}	6.8±0.04^{a}	Light pink
T_3	2.450±0.03^{b}	1.780±0.05^{bc}	72.65±1.32^{a}	2.11±0.03^{a}	6.6±0.06^{a}	Light pink

Means with different superscripts differ significantly (P<0.05)

Intestinal Micrometry

Villous height:crypt depth ratio of duodenum and ileum was higher in herbal supplement groups in comparison to Salinomycin and non supplemented group (Table 8). The GALT (Gut associated limphoid tissue) was found to vary non significantly between the groups. Mortality rate decreased in the supplemented groups as compared to control group (Table 8).

Table 8: Intestinal Micrometry

Parameters	Dietary Treatments			
	T_0	T_1	T_2	T_3
Duodenum				
a) Villus height (µm)	753.50	790.21	787.21	781.61
b) Villus width (µm)	111.87	152.24	215.76	198.54
c) Crypt depth (µm)	94.60	97.03	96.32	96.66
d) Villus height : Crypt depth	7.97	8.14	8.17	8.09
Ileum				
a) Villus height (µm)	353.50	379.27	387.21	361.78
b) Villus width (µm)	108.89	110.49	116.14	106.60

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c) Crypt depth (μm)	76.60	80.53	79.53	79.37
d) Villus height : Crypt depth	4.61	4.71	4.87	4.56
GALT	1-2	1-2	1-2	1-2
Incidence of diseases	Mixed bacterial infection in all the treatment groups during 2nd and 3rd week			
No. of mortalities	4	2	2	1
Mortality rate (percent)	6.67	3.33	3.33	1.67

Economics of product supplementation

Results indicate that maximum profit was made from group T1 (Rs.58.18/bird) (AV/AGP/10 treated group) followed by T3 (Rs. 53.15/bird) (Salinomycin treated group), and T2 (Rs. 51.45/bird) (Herbiotic treated group) as compared to control group (Rs 46.62/ bird) (Table 9).

Table 9: Economics of product supplementation

Parameters	Dietary Treatments			
	T_0	T_1	T_2	T_3
Cost per day old chick (Rs.)	24	24	24	24
Av. Total Feed consumed (Kg)	4.220	4.427	4.228	4.319
Av. Cost of per Kg feed (Rs.)	34	34	34	34
Cost of total feed consumed (Rs.)	143.48	150.52	143.75	146.85
Miscellaneous cost per bird (Rs.)	20	20	20	20
Av. total cost per bird (Rs.)	187.48	194.52	187.75	190.85
Av. Live weight per bird (Kg)	2.341	2.527	2.392	2.440
Market price per Kg live weight (Rs.)	100	100	100	100
Av. Total price earning per bird (Rs.)	234.10	252.70	239.20	244.00
Av. Profit per bird (Rs.)	**46.62**	**58.18**	**51.45**	**53.15**
Av. Profit per Kg live weight (Rs.)	19.91	23.02	21.51	21.78

Discussion

The increased weight gain also bears resemblance to the earlier reports of Rahman *et al.* (2012) who recorded an increase in body weight after use of growth promoters. The increase may be attributed to the antimicrobial effect of the herbs viz. *Allium sativum*, *Zingiber officinale* (Karuppiah and Rajaram, 2012) present in AV/AGP/10 which result in inhibition of intestinal bacteria leading to the reduced bacterial competition with the host for available nutrients and diminution in the level of toxic bacterial metabolites as a result of lessened bacterial fermentation resulting in the improvement of protein and energy digestibility; thereby ameliorate the performance of bird weight. The increase in digestibility coefficient may be due to presence of *Allium sativum* in AV/AGP/10. Similar result resembling the present study was also reported where the digestibility of total tract DM, CP and EE digestibility were improved ($P < 0.05$) by the addition of the garlic (*Allium sativum*) powder compared to that in the control diet. (Issa and Omar, 2011). The short chain fatty acids which are by products of bacterial fermentation stimulate the proliferation of epithelial cells of the bowel (Ichikawa et al., 1999). The increase in the villous height:crypt depth ratio may be due attributed to bacterial fermentation which is enhanced by the herbal growth promoters.

Conclusion

The results indicate that the growth promoters improve overall performance in the broilers significantly aid in enhancing the productivity of broilers. Growth promoters improve the FCR, help to improve carcass characteristics, improve gut function and reduce mortality.

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