

COMPARATIVE EFFICACY OF NATURAL GROWTH PROMOTER (AV/AGP/10) WITH ANTIBIOTIC GROWTH PROMOTER ON OVERALL GROWTH PERFORMANCE AND INTESTINAL MORPHOMETRY IN BROILER BIRDS

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ABSTRACT

The inclusion of growth promoters in the feed is the most common and cost effective method of enhancing the performance of poultry. A 42 days study was conducted to assess comparative efficacy of herbal growth promoter product AV/AGP/10 (*supplied by M/s Ayurved Ltd. Baddi, India*) with that of Antibiotic growth promoter in improving growth & performance, digestibility of nutrients and intestinal morphometry in broilers birds. A total of 120 day old chicks were divided randomly into 4 groups of 30 chicks each. All the groups were fed standard basal ration throughout the experiment. Group T₀ was control without any supplement, group T₁ was supplemented with AV/AGP/10@250g/tonne of feed, group T₂ was supplemented with AV/AGP/10@500g/tonne of feed and group T₃ was supplemented with antibiotic growth promoter (Vetclin112) @ 62.5 g / tonne feed. At day 42, group T₁ and T₂ showed significantly better (P<0.05) results in terms of body weight and feed intake and thus the mean FCR was also significantly better in group T₂ (1.84), followed by group T₁ (1.91), group T₃ (1.99) and control group T₀ (2.03). The digestibility of DM, OM, CP, EE, CF and NFE was highest in T₂ group followed by T₁, T₃ and lowest in group T₀. Significantly higher (P<0.05) dressing percent was seen in group T₂ (63.75 %), T₁ (62.55 %), T₃ (61.33 %) and lowest in group T₀ (60.08 %). There was 10% mortality in the control group T₀, followed by 6.66% mortality in the T₃ group, 3.33% mortality in the T₁ group and no mortality in group T₂. The intestinal morphometry examination showed the height of intestinal villi of duodenum, ileum and jejunum was highest in Group T₂ birds. From the results of the study it can be conclude that AV/AGP/10 is beneficial at both the dose rates as growth promoter in poultry. Thus, antibiotic growth promoter can successfully be replaced with herbal growth promoter AV/AGP/10 in the poultry feed.

Keywords: Antibiotics, broilers, growth promoter, herbal, Intestinal morphometry

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1. INTRODUCTION

The poultry farming plays a major role in Indian economy. Farmers in India have moved from rearing country birds in the past to rearing hybrids which ensure faster growth of chicks, low mortality rates, excellent feed conversion and consequently sustainable profits to the poultry farmers. This has been supported by extensive efforts worldwide to improve the overall performance of the poultry in terms of growth and production so as to improve the economy of poultry production (1). Growth promoters are chemical and biological substances which are added to poultry feed with the aim to improve the growth, improve the feed utilization, stimulation of the immune system and increased vitality, regulation of the intestinal micro-flora, reduced morbidity and mortality due to various diseases (2) and in this way realize better production and financial results. Growth promoters are generally liver tonics which optimize hepatic functions of the birds (3). According to the National Office of Animal Health (4) growth promoters are used to "help growing animals digest their food more efficiently, get maximum benefit from it and allow them to develop into strong and healthy individuals". Antibiotics have been used since long as growth promoters for pig and poultry. Currently, there is controversy surrounding the use of antibiotic growth promoters for animals destined for meat production, as overuse of any antibiotic over a period of time may lead to adverse and unwanted results (5) such as undesired residue in animal products viz. meat, milk or eggs, residues in tissues, long withdrawal period and development of resistance in microorganisms, allergies, genotoxicity and harmful effects on human health by development of microbial resistance to specific products (6). In evaluating the possible alternatives to subtherapeutic use of antibiotics, one must consider not only the relative short- and long-term costs but also their ability to produce the same growth promoting effects as the antibiotics without any side effects. In herbal plants, a wide variety of

active phytochemicals, including the flavonoids, terpenoids, polyphenols, carotenoids, coumarins, saponins and plant sterols have been identified (7). Addition of these substances to the feeds and water improved feed intake, feed conversion ratio and carcass yield (8, 9, 10). Herbs have been used as food and for medicinal purposes for centuries. Keeping the above facts in view the present study was designed to compare the efficacy of new natural growth promoter AV/AGP/10 (*supplied by M/S Ayurved Limited, Baddi, H.P., India*) with antibiotic supplement on overall performance and intestinal morphometry of broiler birds.

2. MATERIALS AND METHODS

The study was conducted in the department of Animal Nutrition, College of Veterinary Science and Animal Husbandry, R.K. Nagar, Tripura, India after approval from Committee for the purpose of control and supervision of experimentation on animals (CPCSEA).

Experimental design:

Total of 120 healthy day old Vencob broiler chicks of nearly similar live body weight were obtained from authorized supplier and were equally divided into four groups of thirty birds each with three replicates of ten birds in each group. All the groups were fed standard basal diet throughout the experiment. Group- T₀: control group fed with standard basal diet without any supplement, group- T₁: test group supplemented with natural growth promoter AV/AGP/10 @ 250g/ton of feed from 0-42 days, group- T₂: test group supplemented with natural growth promoter AV/AGP/10 @ 500g/ton of feed from 0-42 days, group- T₃: test group supplemented with synthetic growth promoter Vetclin112 (Tetracycline powder) dose rate 62.5 g / ton (1 g Vetclin contains 112 mg. Tetracycline) feed from 0-42 days.

AV/AGP/10 is a phytoadditive that is a 'herbal growth promoter with essential oils', added to feed of poultry & swine and possesses a number of beneficial effects including: rapid

development of a healthy gut microflora, stabilization of digestion, increased growth performance, stimulation and rapid maturation of the immune system & many more. The product AV/AGP/10 comprises of oil of herbs viz. *Allium sativum*, *Zingiber officinale*, *Trigonella foenum graecum*, *Eruca sativa* & many others in a fixed concentration.

The chicks of all the five groups were housed separately under similar environmental conditions and maintained on *ad libitum* broiler starter and finisher ration and clean drinking water throughout the experiment. The chicks were vaccinated for Lasota and IBD vaccines on 7th and 14th day of age, respectively. The booster dose of IBD vaccine was given on 21st day.

Parameters estimated: In order to evaluate the efficacy of the products growth and performance parameters (body weight, feed intake, FCR and mortality rate) and carcass traits (carcass yield, dressing percentage) were assessed as per standard procedures.

For Metabolic/ Nutrient Retention study, a metabolic trial was carried out after 3rd week of the experimental trial, to study the effect of two different additives on nutrients utilization. Representative 10 birds of each group were housed individually in metabolic stall. The birds were fed the diet as described above for each (A to D) experimental groups for three days and excreta was collected from individual cages. The weight of feed intake and excreta were also recorded to estimate Nutrient balance studies, Digestibility coefficients of nutrients and Faecal Nitrogen content

For Intestinal Morphometry/Histology, 3 birds from each group (1 bird from each replicate), a total of 12 birds were slaughtered for collection of histological samples at 28 and 42 days and villous height of duodenum, jejunum, ileum was recorded.

Statistical Analyses

All the results were analyzed statistically by analysis of variance to determine the means and standard error (11).

3. RESULTS AND DISCUSSION

The records were observed weekly for six weeks duration with regards to body weight gain, feed intake and FCR. The intestinal samples were collected at 28th and 42nd day for morphological studies. At the end of experiment significant results were obtained in term of feed consumption, body weight gain and mean FCR in AV/AGP/10 treated groups.

Live body weight and Body Weight gain

The mean values of final body weight and body weight gain (g/bird/week) in different groups are shown in Table-1. At the end of sixth week, significantly higher live body weight (2104.55, 2243, 2212.55 and 2133 g respectively) was observed in all the groups. However, the body weight gain (g) was significantly high ($P < 0.01$) in T₁ (2198.92), followed by T₂ (2168.78), T₃ (2087.21) and lowest in control group T₀ (2058.66). The results of present study are in agreement with the findings where gain in the body weight of broilers chicken was observed when fed with extract of *Trigonella foenum graecum* (12, 13). These results are also in line with the findings of where higher weight gain was reported in broilers fed on rations supplemented with *Allium sativum* (14). The improvement in weight gain may be due to the action of allicin (an antibiotic substance found in garlic), which inhibits the growth of pathogenic bacteria and aflatoxin producing fungi (15).

Feed consumption

The average values of voluntary feed intake of all the groups during entire period were found to be significant from 1st to 6th week period. The total feed intake of treatment Groups T₀, T₁, T₂ and T₃ (4196.82, 4219.33, 4087.98, 4136.97 respectively) was found satisfactory and non-significantly different ($P>0.01$). However, the highest feed intake was seen in group T₁ fed with herbal growth promoter @ 250 g/ton of feed. Similar results were reported when *Trigonella foenum graecum* was added to broiler feed as growth promoter (17, 18). Similarly, increase in feed intake of broiler chicken supplemented with *Allium sativum* (15, 18) and aqueous extract of *Zingiber officinale* (19) was also reported. The mode of action of these feed additives is not completely clear. They have antimicrobial, antiviral, antioxidant and many other biological activities (20, 21). They act as a digestibility enhancers, stimulating the secretion of endogenous digestive enzymes (22).

Feed conversion ratio (FCR)

The mean values of feed conversion ratio (FCR) in different groups at different interval of study are shown in Table-1. Highest FCR (1.88) was found in group T₂, followed by T₁ (1.91) which means test group fed with the basal diet supplemented with test feed AV/AGP/10 @ 500g/ton and 250g/ton of feed, gained more weight for per Kg of feed consumed as compared to antibiotic fed group T₃ (1.99) and control group T₀ (2.03). These results agree with the earlier reports of increase in feed conversion efficiency of broiler chicken when fed with *Trigonella foenum graecum* and *Allium sativum* (15, 16) *Zingiber officinale* (19) and *Allium sativa* and *Zingiber officinale* (23) supplemented diet respectively.

Table 1. Mean (+ SE) values of Gain in weight at weekly intervals of study

Group	Feed Intake (g)	Final Body weight (g)	Body weight gain (g)	FCR
T ₀ (control)	4196.82	2104.55 ± 24.51 ^a	2058.71	2.03
T ₁ (AV/AGP/10 @250g)	4219.33	2243.0 ± 15.61 ^b	2198.92	1.91
T ₂ (AV/AGP/10 @500g)	4087.98	2212.55 ± 20.29 ^c	2168.83	1.88
T ₃ (Vetclin112)	4136.97	2133.00±45.05 ^d	2086.76	1.98

Values with different superscripts differ significantly (P<0.05) in a column

Similar results in terms of body weight gain, feed intake and feed conversion ratio were obtained, when AV/AGP/10 was fed for 42 days to the broiler birds in which significant improvement in body weight gain and FCR was recorded after AV/AGP/10 supplementation in feed (24).

Mortality: During the entire experiment, there was 10% mortality in the control group T₀, followed by 6.66% mortality in the T₃ group, 3.33% mortality in the T₁ group and no mortality in the T₂ group and no disease out break was recorded.

Nutrient Retention / Metabolic Trial

The mean values of digestibility coefficients of various nutrients of different groups are shown in Table-2. The statistical analysis of digestibility coefficient values of DM, OM, CP, CF, EE, and NFE revealed significant (P<0.05) difference in all the experimental groups. The highest values were observed in Group T₂ followed by group T₁, group T₃ and lowest in control group T₀ except DM digestibility which was lowest for T₃.

Table 2. Mean (+ SE) values of Digestibility Coefficient (%) of Various Nutrients

Nutrients	T ₀ (control)	T ₁ (AV/AGP/10 @250g)	T ₂ (AV/AGP/10 @500g)	T ₃ (Vetclin112)
DM	74.25	75.68	79.69 ^a	71.34 ^b
OM	73	74.09	76.88 ^a	73.11
CP	78 ^a	80 ^{ac}	81.07 ^{bcd}	79.9 ^{ad}
EE	85	85.92	87.93 ^a	85.6
CF	9.78 ^a	10.98 ^{bd}	12.09 ^c	10.6 ^d
NFE	73.87	74.02	76.88 ^a	74.6

Values with different superscripts differ significantly (P<0.05) in a column

Carcass yield / Dressing Percentage

The present study indicated best results in terms of dressing percentage in group T₂ (63.75 %) followed by group T₁ (62.55 %), group T₃ (61.33 %) and lowest in control group T₀ (60.08 %). Statistically, T₁ and T₂ groups treated with natural growth promoter AV/AGP/10 @ 250 g/ton of feed and 500 g/ton of feed respectively had significantly higher (P<0.01) dressing percentage than T₀ and T₃ group. However, difference among T₁ and T₂ group was non-significant. The increase in the carcass yield of the broiler chicken was also observed in case of *Trigonella foenum graecum* (13, 16), *Allium sativum* (14, 18), *Zingiber officinale* (25) and *Eruca sativa* (26) supplemented diet.

Intestinal morphometry

Histological samples were collected from birds at 28 and 42 days respectively from all the groups under study and routine staining was done after sectioning in 5µm thickness. The study showed that in 28 days the height of intestinal villi in group T₂ birds was highest in all the parts of small intestine indicating better absorption of nutrients in group T₂.

Table 3. Mean values of Intestinal morphology (μm) of duodenum of experimental Birds of different groups at day 21 and 42 of study period.

Grp	Day 21			Day 42		
	Duodenum	Jejunum	Ileum	Duodenum	Jejunum	Ileum
T₀ (control)	1962.04	1867.24	984.76	3432.88	2356.12	1008.66
T₁ (AV/AGP/10 @250g)	2134.75	1870.6	1089.25	3316.7	2478.43	1133.92
T₂ (AV/AGP/10 @500g)	2292.08	1988.33	1116.69	3492.32	2383.72	1204.28
T₃ (Vetclin112)	2058.43	1808.55	1043.04	3298.18	2314.84	1084.6

Values with different superscripts differ significantly ($P < 0.05$) in a column

But at 42nd day the villi length of duodenum and ileum showed highest growth in group T₂ and Jejunum showed highest growth in group T₁, this indicate that after 28 days the development of intestinal mucosa is increased in group T₁ as compared to control group T₀ and antibiotic treated group T₃.

Similar trend of the results in case of intestinal morphometry are also reported earlier (27, 28, 29). The short chain fatty acids which are by products of bacterial fermentation stimulate the proliferation of epithelial cells of the bowel (30).

The morphology of intestinal villi and crypts has been associated in chickens with intestinal function and growth. Adverse changes in the content of the digesta, such as high population of pathogenic bacteria, parasites or damaging substances, could lead to changes in the surface of intestinal mucosa, because of their close proximity. A lower villous height/crypt depth ratio has been associated with the presence of toxins, poor nutrient absorption, and increased secretion in the gastrointestinal tract, diarrhoea, reduced disease resistance and lower overall performance. A large crypt indicates a fast tissue turnover and a high demand for new tissue (31). Similar results

in the intestinal morphometry were observed earlier also, when AV/AGP/10 was supplemented in the feed of broilers for 42 days (24).

4. CONCLUSION

From the results of the present study it can be concluded that natural growth promoter (AV/AGP/10) is efficacious in promoting growth & improving performance. The feed efficiency, dressing percentage, intestinal micrometrical development & overall nutrient digestibility is well comparable to Vetclin112. The product can successfully replace antibiotic growth promoter in poultry feed. The efficacy of AV/AGP/10 as a bacteriostatic herbal growth promoter and gut function modulator may be attributed to the constituent herbs of the product namely *Allium sativum*, *Trigonella foenum graecum*, *Zingiber officinale*, *Eruca sativa* & many more.

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