Comparative efficacy of supplementation of phytoconcentrate herbal preparation and synthetic amino acid on broiler performance

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Abstract

In view to study the role of herbal sources of essential amino acids in improving growth & performance, an experiment was conducted on seventy five day Vencob broiler chicks. Chicks were randomly divided into three groups (n=25), one negative control (T_0) and two treatments (T_1 & T_2). Control group (T_0) was offered basal diet deficient in natural or synthetic source of amino acids (choline, methionine, lysine & biotin). Treatment group T_1 was fed with basal diet supplemented with polyherbal formulation comprising natural sources (herbs) that mimic the activity of amino acids (choline, methionine, lysine & biotin) @ 2Kg/tonne of feed while treatment group T_2 was fed with basal diet supplemented with combination of synthetic choline chloride (600gm/tonne), synthetic methionine (1kg/tonne), synthetic lysine (1kg/tonne) and biotin (150mg/tonne). Growth & performance parameters were recorded at weekly intervals and a metabolic trial for nutrient retention studies was conducted at the end of study. A significant increase in mean body weight gain, mean final body weight, feed efficiency & nutrient retention was observed in both the treated groups as compared to untreated control. The results of group T_1 supplemented with herbal sources of amino acids were in confirmation with T_2 supplemented with combination of synthetic amino acids suggesting that the polyherbal formula can successfully replace synthetic additives in feed.

Keywords: amino acid, broiler, growth, herbal, nutrient, performance

Introduction

Methionine, choline and Lysine are universally recognized as the most two limiting amino acids in broiler diets based on corn and soybean meal (Baker, 1997; Han and Baker, 1991). The supplementation of broiler feeds with these amino acids is very common in the poultry industry. However, Synthetic methionine and choline are metabolized into highly toxic compounds such as methylpropionate, *trimethylamine* thereby, adversely altering the performance of poultry birds (Bender, 1975). Synthetic methionine and choline are listed among the prohibited synthetic substances and its usage has been questioned in organic farming practices (Fanatico et al., 2007). Feed rations that are high in plant proteins, such as soyabean meal can be used instead of synthetic amino acid supplements, but may lead to environmental pollution. It is difficult to design diet with sufficient Methionine and choline but without oversupplying protein or adding synthetic amino acids in crystalline form. Alternatively, many herbs are rich source of these essential amino acids and also mimic the activity like that of methionine, choline or biotin. These may be supplemented along with ration to replace synthetic in feed.

The present experimental trial was conducted to evaluate efficacy of polyherbal coded formulation AV/CAP/18 (*supplied by M/S Ayurvet Limited, Baddi, India*) in comparison to synthetic additives in improving overall growth, productivity and performance in broilers.

Materials and Methods

An experimental trial was conducted in seventy five day old Vencob broiler chicks of nearly similar live body weight at Department of Animal Nutrition, College of Veterinary and Animal Sciences, Udgir, Dist. Latur, Maharashtra, India. The methodology of research trial and protocol was legally approved by the Committee for the purpose of control and supervision on experiments in animals (CPCSEA) No. 164/2005 (India) and Institutional Ethics Committee, C.V.A.S,

Table-1.1. Feed Formulations of Experimental Groups

Sr. No.	Feed Ingredient	Broiler Starter		Broiler Finisher	
		Control T0	Treatments T1 & T2	Control T0	Treatments T1 & T2
1	Maize	45.00	53.70	50.00	59.00
2	Jowar	06.00	05.00	06.00	-----
3	Sun flower Meal	11.00	-----	05.00	-----
4	Soybean Meal	-----	38.00	----	35.00
5	Groundnut Meal	33.00	-----	33.00	-----
6	Lime Stone	01.00	01	01.00	01.00
7	Dicalcium Phosphate	01.50	1.8	02.00	02.00
8	Oil	02.00	00	02.50	02.50
9	Salt	00.50	0.5	00.50	00.50
10	Total	100.00	100	100.00	100.00

Table-1.2. Chemical Composition of Rations of Experimental Groups

Sr. No.	Feed Ingredient	Broiler Starter		Broiler Finisher	
		Control T0	Treatments T1 & T2	Control T0	Treatments T1 & T2
1	Crude Protein (%)	23.41	22.38	21.24	21.06
2	Metabolizable Energy (Kcal/kg) *	2809	2873	2906	3004
3	C : P ratio*	125.37:1	128.37:1	136.84:1	142.64:1
4	Crude Fibre (%)	5.54	4.04	5.39	3.87
5	Ether Extract (%)	4.87	3.72	5.27	5.31
6	Calcium (%)	1.27	1.11	0.93	1.03
7	A. Phosphorus (%)*	0.34	0.44	0.42	0.46
8	Lysine (%)*	0.55	1.21	0.53	1.13
9	Methionine (%)*	0.23	0.44	0.21	0.41

* Calculated Values

Udgir, Maharashtra, India. Chicks were randomly divided into three groups (n=25), one negative control (T_0) and two treatments (T_1 and T_2).

Control group (T_0) was offered basal diet deficient in natural or synthetic source of amino acids (choline, methionine, lysine and biotin). Treatment group T_1 was fed with basal diet supplemented with herbal formulation containing combination of herbs (*Cicer arientinum, Phaseolus mungo, Mucuna pruriens, Trigonella foenumgraecum, Nigella sativa, Citrullus colocynthis and many more)* that mimic the activity of amino acids (choline, methionine, lysine and biotin) @ 2Kg/tonne of feed while treatment group T_2 was fed with basal diet supplemented with combination of synthetic choline chloride (600gm/tonne), synthetic methionine (1kg/tonne), synthetic lysine (1kg/tonne) and biotin (150mg/tonne).

The chicks of all the three groups were housed separately 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. Individual body weight and feed consumption of broilers from all three groups were measured at weekly intervals from 0-42 days. Mortality of each pen was recorded on a daily basis. A metabolic trial for nutrient retention studies was conducted on representative four birds per group during last week of experiment. Daily feed consumption as well as faecal output from each bird was measured. The daily faecal output was collected and preserved for proximate analysis studies. The feed and fecal samples were subjected for analysis of dry matter (DM), crude protein (CP), crude fibre (CF), ether extract (EE), total ash (TA) and nitrogen free extract (NFE). The nutrient digestibility was calculated after analysis of nutrient content in feed consumed and feces voided by the selected birds. Weende's system of proximate analysis was adopted for estimation of chemical composition of feed and feces in the nutrient analysis. Statistical analysis was carried out by the method given by Snedecor and Cochran, 1980.

Results and Discussion

Growth and Performance: The feed formula and chemical composition of broiler starter and broiler finisher ration for control group and treatment groups is depicted in Table no.1.1 and 1.2. The % calculated essential amino acid in control group diet is either lower or completely absent in positive control group dietary formula. Mean body weight gain was recorded to be significantly higher in treatment groups (T_1 and

Table-2. Mean (± SE) values of Gain in weight at weekly intervals of study

Parameter	Group	Intervals of study (weeks)					
		1st	2nd	3rd	4th	5th	6th
Gain in weight (gm)	T_0	$22.91^{a} \pm 0.18$	$83.13^{a} \pm 0.36$	$155.37^{a} \pm 0.44$	$113.51^{a} \pm 0.27$	$237.13^{d} \pm 0.49$	$198.12^{a} \pm 9.30$
	T_1	$79.55^{b} \pm 0.34$	$187.21^{b} \pm 0.47$	$454.70^{b} \pm 0.18$	$245.10^{b} \pm 3.92$	$340.85^{b} \pm 15.49$	$432.26^{b} \pm 17.57$
	T_2	$83.82^{b} \pm 0.13$	$192.46^{b} \pm 0.49$	$458.79^{b} \pm 0.36$	$240.39^{b} \pm 6.91$	$373.77^{a} \pm 9.13$	$406.62^{b} \pm 11.65$
	Stat	S	S	S	HS	HS	HS

Table-3. Mean (± SE) values of Live body weight at weekly intervals of study

Parameter	Group	Intervals of study (weeks)					
		1st	2nd	3rd	4th	5th	6th
Body weight (gm)	T_0	$72.11^{a} \pm 0.18$	$155.24^{a} \pm 0.23$	$310.60^{a} \pm 0.31$	$424.12^{a} \pm 0.28$	$661.24^{a} \pm 0.36$	$859.36^{e} \pm 9.31$
	T_1	$128.35^{b} \pm 0.34$	$315.56^{b} \pm 0.23$	$770.26^{c} \pm 0.24$	$1015.36^{b} \pm 3.56$	$1356.21^{b} \pm 16.51$	$1788.47^{b} \pm 10.70$
	T_2	$132.12^{b} \pm 0.13$	$324.57^{b} \pm 0.43$	$783.36^{a} \pm 0.44$	$1023.75^{b} \pm 6.48$	$1397.52^{b} \pm 4.81$	$1804.14^{b} \pm 10.70$
	Stat	S	S	S	HS	HS	HS

Table-4. Mean (+ SE) values of Digestibility Coefficient (%) of Various Nutrients of experimental Birds at weekly intervals of study

Group	Digestibility Coefficient (%) of Nutrients					
	DM	CP	CF	EE	Ash	NFE
T_0	$69.08^{a} \pm 0.31$	$68.78^{a} \pm 0.25$	$62.89^{a} \pm 0.13$	$61.51^{a} \pm 0.10$	$52.07^{a} \pm 0.22$	$65.78^{a} \pm 0.20$
T_1	$74.00^{b} \pm 0.36$	$81.48^{b} \pm 0.11$	$63.63^{ab} \pm 0.11$	$74.17^{b} \pm 0.14$	$54.98^{b} \pm 0.27$	$67.75^{b} \pm 0.24$
T_2	$77.86^{b} \pm 0.25$	$82.04^{b} \pm 0.55$	$64.34^{b} \pm 0.69$	$77.62^{b} \pm 0.44$	$60.62^{b} \pm 0.24$	$73.91^{b} \pm 0.04$
Stat	S	S	S	S	S	S

Means bearing at least one common superscripts within rows do not differ significantly.
HS- Highly significant (P < 0.05), NS- Non significant, S – Significant

T2) than control from 1st to 6th week of experiment, however, the values were non-significantly different among two treatments from 1st to IIIrd week (Table 2). At VIth week, the mean body weight gain of T_1 group was significantly higher than T_2 suggesting that the supplementation of herbal product lead to comparatively higher body weight gain than the group fed combination of synthetic amino acids in basal ration. The mean final body weight at the end of 6th week in treatment groups T_2 (1804.1410.70 gm) and T_1 (1788.47 10.70 gm) was significantly higher than the positive control group T_0 (859.36 9.31 gm) (Table 3).

The depression in body weight gain and mean final body weight in positive control group T_0 may be correlated with the basal diet deficient in essential amino acids methionine, choline, lysine and biotin. In poultry ration, along with the vitamins and minerals, proteins play a critical role, amongst these methionine and lysine are essentially required for overall growth and performance (Swick *et al*., 1990). Herbs namely *Cicer arientinum, Phaseolus mungo, Mucuna pruriens* are rich source of proteins and essential amino acids (Baker, 1997). The significant increase in mean final body weight and body weight gain in treatments may be attributed to the supplementation of essential amino acids in basal ration. Addition of methionine over and above the recommended requirement of broilers improves their performance in terms of body weight gain and food conversion efficiency (Ohta and Ishibashi, 1995).

The results in the present study are in corroboration with those reported by Kalbande *et al*., (2009) that addition of herbal source of methionine along with feed improved performance in terms of body weight gain and feed efficiency in broilers. Similar results were also given by Simone *et al*., (1995) and Ohta and Ishibashi, (1995) that supplementing herbal or synthetic sources of essential amino acids improved feed to gain ratio in broilers.

The feed conversion ratio for T_0 (1.88) was significantly higher than T_1 (1.544) and T_2 (1.536) that might be due to improved feed efficiency due to supplementation of either herbal sources or synthetic amino acids in feed. The results are well in confirmation with those reported by Ozturkan *et al*., (1993) that supplementation of choline, methionine and lysine to broilers improved performance in terms of feed efficiency and livability.

Nutrient Retention Studies: The mean values of digestibility coefficients of various nutrients of different groups are summarized in Table-4. The digestibility coefficient of DM and CP revealed non-

significant difference among T_1 and T_2; however, it was significantly higher in treatments than control group T_0. Similar results have been recorded for EE and NFE (table-4). The improvement in the digestibility coefficients in treatments groups supplemented either with herbal source of amino acids or synthetic amino acid supplemented group in comparision to the control group fed deficient diet suggests the positive role of essential amino acids in improving nutrient retention. The results are in confirmation with those reported by Babutunde et al., (1976).

Conclusion

Results of the present investigation demonstrate significant improvement in growth and performance parameters and feed utilization in treatment groups, it can be inferred that supplementing either synthetic or herbal sources of amino acids in broiler ration improves overall growth, performance, feed efficiency and nutrient retention and utilization in broilers and the herbal formula can successfully replace synthetic additives in feed.

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