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Study on Comparative Efficacy of Polyherbal Preparation and Synthetic Methionine, Choline, Lysine and Biotin on Performance of Rhode Island Red Layers

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ABSTRACT

An experiment was conducted for 20 weeks to evaluate the comparative efficacy of dietary supplementation of herbal (AV/CAP/18) and synthetic methionine, choline, lysine and biotin on the egg production and egg quality traits. 90 Rhode Island Red commercial layers of 15 weeks of age were randomly divided in 3 groups of 30 birds each. . All birds were offered standard basal diet so as to meet their all basic nutritional requirements. Group I (T0) served as control group while Group II (T1) supplemented with combination of synthetic choline (60%) 500g/ton+ methionine 1kg/ton+ lysine 1 kg/ton + biotin 150 mg/ton and III (T2) with AV/CAP/18 @ 1 kg/ton (supplied by M/S Ayurvet Ltd. Baddi. (HP). India). At the end of 35th week, significantly higher egg production, egg weight, egg mass, yolk weight and albumen weight were recorded in T1 followed by T2 and lowest in T0. Mean feed conversion ratio was also better in T1 (1.89) and AV/CAP/18 fed T2 (1.88) than control T0 (2.63). Lowest mortality percentage (%) was recorded in T2 (1.78%) than T1 (1.81%) and T0 (3.51%). On the basis of the results obtained it was concluded that herbal combined amino acid supplement AV/CAP/18 has efficacy comparable to its synthetic counterparts. Their successful incorporation in balanced layer ration may lead to improved egg production and quality traits.

Keywords : AV/CAP/18, amino acids, polyherbal, egg production, egg quality traits

INTRODUCTION

Protein and amino acids have an overwhelming importance in poultry feed (Dersjant and Peisker, 2011). The scientific feeding of poultry is not in fact based on the raw protein of the diet but on the amino acids content of the diet, their balance and intake. (NRC1994). Appropriate concentration of energy and amino acids in feed are needed in order to increase the productivity of laying hens (Chan *et al.,* 2007). Available layer hybrids have nutritional requirements that may be difficult to meet unless extra amino acids can be supplemented in the diet (Berg, 2001 and Odelros, 2000). Imbalance in amino acids composition in layer diet which is needed for egg protein synthesis will consequently result in lowered egg output alongwith poor plumage condition, feather pecking, cannibalism and increased overall mortality (Ambrosen and Peterson, 1997). Synthetic methionine is metabolized into highly toxic compounds such as methylpropionate, thereby, adversely altering the performance of poultry birds (Bender, 1975). Synthetic methionine is listed among the prohibited synthetic substances and its usage has been questioned in organic farming practices (Anonymous, 1999). Therefore, the present study was undertaken to determine the comparative efficacy of combination of synthetic methionine + choline + lysine and biotin with polyherbal feed supplement AV/CAP/18 (supplied by *M/S Ayurvet Limited, Baddi, (HP) India*) incorporation on egg production and egg quality traits in RIR layers. AV/CAP/18 is a polyherbal product comprises of herbs like *Trigonella foenum graecum, Allium sativum, Mucuna pruriens* & many others in a fixed concentration.

MATERIALS AND METHODS

A study was conducted at Department of Animal Nutrition, College of Veterinary Sciences, Anjora, Durg, (Chhattisgarh) India. Total 90 RIR layer birds of 15 weeks age were procured and maintained under identical conditions. Vaccination was done as per the recommended schedule. All the birds were fed standard basal diet formulated as per the recommendations of NRC, 1994. Further birds were randomly divided into 3 groups of 30 birds with 3 replicates of 10 birds in each group.

Group I (T_0): control without any supplementation

Group II (T_1): supplemented with combination of synthetic choline (60%) 500g/ton+ methionine 1kg/ton+ lysine 1 kg/ton + biotin 150 mg/ton

Group III (T_2): supplemented with AV/CAP/18 @ 1 kg/ton (supplied by *M/S Ayurvet Ltd. Baddi. (HP) India*)

Individual body weights were recorded on weekly basis in order to determine the body weight changes. The number of eggs laid, egg weights and feed consumption (g/hen) were recorded daily and accordingly, the egg production (%), egg mass (g/hen/day) and feed conversion (g feed/g egg weight) were calculated. To measure egg quality, 50 eggs in each group (total 150 eggs) were sampled during time interval of 20-35th weeks. First the whole egg was weighed (g), next it was broken and egg contents were separated carefully into yolk, albumen and shell and then internal traits were measured. Tripod micrometer was used to measure thick albumen height (El-Safty and Mahrose, 2009). Also albumen weight (g), yolk weight (g), yolk to albumen ratio alongwith the egg component % was determined individually. Haugh unit was measured using the formula: HU = 100 log (H – 1.7w $^{0.37}$+ 7.6), where HU=Haugh unit, H=Observed height of the albumen in mm W=Weight of egg (g). Yolk colour score was measured with Roche Yolk Colour Fan (Vuilleumier, 1969). The eggshell was dried and weighed subsequently to the nearest 0.01g (Ghazalah *et al.,* 2011). Egg-specific gravity (unit), Mortality (%) was also recorded.

Statistical analysis: Mean, standard deviation (SD), analysis of variance (ANOVA), least significant differences (LSD) and co-efficient of correlation values (r) were computed using the SPSS (version 11.0 for Windows).

RESULTS AND DISCUSSION

At the end of 35th week average body weight attained was highest in T_1 (1.74) followed by T_2 (1.73) and T_0 (1.49). T_1 performed better (98 g/hen/day) than T_2 (99 g/hen/day) and control group birds (118 g/hen/ day) in terms of feed intake (Table 2). The feed conversion (g feed/g egg weight) efficiency was also significantly better (P<0.05) in T_1 (1.89) and T_2 (1.88) as compared to T_0 (2.63). Similar finding were also noted by the Harms and Russell, (1996), Keshavarz and Jackson, (1992). There is less consumption of feed in treated groups as compared to control, as demonstrated earlier that mild deficiencies of protein, lysine and methionine in layers (Picard *et al.,* 1993) lead to small increase in feed intake. Similar results were obtained by Abdel (2006) in case of feed intake, FCR and body weight gain when *Trigonella foenum graecum* was added to broiler feed as growth promoter and Iyayi and Taiwo (2003) in case of *Mucuna pruriens*. The difference in feed intake were in agreement with findings of Wu *et al.,* (2005), who reported that with increasing dietary energy, hens can adjust feed intake so that same amount of dietary energy is used to produce 1 g of egg. 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. The mode of action of these feed additives is not completely clear. They have antimicrobial, antiviral, antioxidant and many other biological activities (Cross *et al.* 2002). They act as a digestibility enhancers, stimulating the secretion of endogenous digestive enzymes (William and Rosa, 2001).

Particular	Daily nutrient intake per hen						
Group	Energy: Lys (MJ/g)	Energy (MJ)	Protein (g)	TSAA (g)	Lys (g)	Available P (g)	Ca (g)
T_0	1.18	1.26	19.95[a]	0.804	1.072	0.445	4.243
T_1	1.17	1.28	19.55[b]	0.817	1.088	0.446	4.251
T_2	1.17	1.28	19.55[b]	0.817	1.088	0.446	4.251

Table 1. Effect of herbal methionine, lysine, choline and biotin on nutrient intake per hen daily in RIR birds (from 20 to 35 wk of age)

[a–b] Means within a column and under each main effect with no common superscripts differ significantly (P <0.05).

Egg production and components traits revealed that both the treatment groups T_1 and T_2 differed significantly (P<0.05) with control group (T_0) which was supplied basal diet without methionine, choline, lysine and biotin. However both the treatment groups were having identical values in terms of egg production and component traits. Egg production % in group T_1 (90.22%) and T_2 (90.20%) was significantly higher (P<0.05) than T_0 (75.05%). Also the egg weight observed in T_1 (56.75g) and T_2 (56.68g) was significantly higher (P<0.05) than 48.84 g (T_0). Group T_1 (52.25) and T_2 (52.18) also had significantly higher egg mass (g egg/hen per d) as compared to T_0 (44.89). (Table 2)

Yolk weight in T_1 (15.34 g) and T_2 (15.33 g) were significantly higher (P<0.05) than T_0 (15.04 g). Albumen weight was also significantly higher (P<0.05) in T_2 (38.19 g) and T_1 (38.13 g) than T_0 (36.51 g).

Table 2.Effect of herbal methionine, lysine, choline and biotin on performance in RIR birds (from 20 to 35 wk of age)

Particular	Feed intake (g/hen per day)	Egg production (%)	Egg weight (g)	Egg mass (g egg/ hen per day)	Feed conversion (g of feed/g of egg)	Egg-specific gravity (unit)	BW (kg)	Mortality (%)
Group								
T_0	118	75.05	48.84	44.89	2.63	1.0870	1.49	3.51
T_1	99[c]	90.22[b]	56.75[a]	52.25[a]	1.89[c]	1.0870[c]	1.74[a]	1.81
T_2	98[c]	90.20[b]	56.68[a]	52.18[a]	1.88[c]	1.0869[c]	1.73[a]	1.78

[a–c] Means within a column and under each main effect with no common superscripts differ significantly (P <0.05).

Shell weight of eggs in group T_2 which was fed with polyherbal preparation AV/CAP/18 was higher (5.40 g) than T_1 (5.36) and T_0 (4.71 g). Thus, better shell strength and ultimately egg quality was obtained with herbal product supplementation.

The Haugh unit (HU) being a measure of freshness of eggs, HU unit below 60 is considered as poor quality egg. Thus HU of eggs from hens fed with the herbal (69.99) and synthetic (70.07) nutrient (methionine, choline, lysine and biotin) was significantly lower than that of hens fed with the basal diets (74.87). This may be because of increased weight of eggs. Egg-specific gravity remained unaffected in almost all groups.

In the present investigation egg component weight and egg component percentage of the AV/CAP/18 supplemented group as well as the synthetic polyamino acid supplemented group was significantly higher (p<0.05) from control (Table 3).

Table 3. Effect of herbal methionine, lysine, choline and biotin on egg components in RIR birds (from 20 to 35 wk)

Particular	Egg component weight (g)			Egg component (%)			
	Yolk	Albumen	Shell	Yolk	Albumen	Shell	Yolk: albumen
Group							
T_0	15.04	36.51	4.71	25.76	64.85	9.03	0.397
T_1	15.34[a]	38.13[b]	5.36[c]	26.07	64.86	9.07	0.402
T_2	15.33[a]	38.19[b]	5.40[c]	26.07	64.85	9.08	0.402
P - value							
Treatment group	0.05	0.05	0.05	NS	NS	NS	NS

[a–c] Means within a column and under each main effect with no common superscripts differ significantly (P <0.05).

The increase in egg production and component traits in case of treated groups is supported by the findings that Low intake of amino acids lead to reduced metabolism (Pourreza and Smith, 1988), ultimately resulting in lowered protein synthesis for body growth and egg production performance (Harms and Russell, 1996; Keshavarz and Jackson, 1992). The increase in egg weight and egg mass is supported by the findings of Shafer *et al.,* (1998), Liu *et al.,* (2005) and Zeweil *et al.,* (2011) who reported that egg weight increased with increasing level of amino acid intake by laying hens. Egg mass was found to be having positive correlation with that of amino acid content in the layer diet Keshavarz, (1992). The increased egg mass was mainly contributed from the increased egg weight. The increase in albumen may be due to limited availability of amino acids having adverse effects on albumen solids (Shafer *et al.,* 1998) and egg size (Keshavarz and Jackson, 1992; Hsu *et al.,* 1998). Similar results were obtained by Hassan and Ragab (2009) in case of supplementation of *Trigonella foenum graecum* on productive performance and egg quality of layers and by Iyayi and Taiwo (2003) in case of *Mucuna pruriens.*

Lowest mortality percentage was noted in T_2 (1.78%), T_1 (1.81%) and T_0 (3.51%) (Table 2). Low level of mortality per-

centage is seen in treatment groups as adequate dietary provision of all amino acids is necessary for sustaining normal immunocompetence and protecting the host from a variety of diseases in all species (Peng Li *et al.,* 2007). Imbalance in amino acids composition in layer diet will consequently result in lowered egg output alongwith poor plumage condition, feather pecking, cannibalism and increased overall mortality (Ambrosen and Peterson, 1997).

CONCLUSION:

The data from the trial indicates that polyherbal preparation could successfully replace the synthetic methionine, choline, lysine and biotin amino acids for optimum production performance of laying Hens as performance of layer birds supplemented with AV/CAP/18 can well be compared with birds supplemented with synthetic amino acids.

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