Indian Journal of Animal Sciences **79** (11): 1169–1171, November 2009

Blood and serum activities in commercial broiler chickens fed with partial replacement of soybean and dicalcium phosphate feeds supported with microbial phytase

N V JADHAV[1], M D SURANAGI[2], S N ANJANEYA[3], PRAKASH CHANDRA[4] and S MALLIKARJUNAPPA[5]

Karnataka Veterinary Animal and Fisheries Sciences University, Bidar, Karnataka 585 401 India

Received: 22 November 2008; Accepted: 3 June 2009

ABSTRACT

The study was undertaken to evaluate the efficacy of phytase incorporation in feeds of commercial broilers partially replaced for soybean meal (SBM) and dicalcium phosphate (DCP) with alternative feedstuffs on Hb, serum alkaline phosphatase (ALP) and serum mineral profile in broilers at 3 and 5 weeks of age. The results revealed similar positive trend of effects at both the ages for all the 3 replacements of SBM with sunflower meal (SFM), safflower meal (SAFFM) and sesame cake accompanied by DCP substitution with limestone. There was highly significant increase in blood haemoglobin (Hb) level of phytase supplemented broilers when compared with non-supplemented birds. The serum ALP levels were highly significantly enhanced in all the phytase added groups in comparison with broilers without phytase. Further, phytase feeding had significant positive effect on serum mineral (Ca, P, Cu, Zn, Fe and Mg) levels in broiler chickens as compared to birds without phytase feeding. All the improved values of aforesaid parameters studied were at par with figures from control group.

Key words: ALP, Broiler chickens, Feedstuffs, Hb, Minerals, Phytase, Serum

Non-starch polysaccharides hydrolising enzymes like phytase, enhanced the availability of serum minerals in broiler chickens (Rama Rao *et al*. 2006). An improved response in respect of serum levels of ALP, Ca and organic P in broilers with feeding of phytase has been recorded (Kanagaraju *et al*. 2001, Jain 2007). The increased serum levels of Zn and Mn were observed in chicks fed soybean based rations added with microbial phytase (Biehi *et al*. 1995). In the light of reviewed findings the present study was planned and executed to evaluate effects of phytase supplementation in broiler feeding with 50% replacement of DCP with limestone followed by substitution of soybean meal (SBM) with sunflower meal (SFM), Safflower meal (SAFFM) and sesame cake at 20% total mixing level.

Present address: [1]Associate Professor and Head, Department of Avian Production and Management; [2]Associate Professor, Department of Animal Breeding, Genetics and Biostatistics, Veterinary College, Bidar 585 401.

[3]Veterinary Officer, Ambaragoppa, Shikarapura Shimoga 577 427.

[4]Professor and Head, Department of Animal Husbanry and Dairying, R. B. S. College, Bichpuri, Agra, Uttar Pradesh.

[5]Dean, Veterinary College, Vidhyanagar, Shimoga 577 203.

MATERIALS AND METHODS

Three separate research trials of 5 weeks duration were conducted by utilizing 200 commercial broiler chickens for each trial. The day-old chicks were procured and randomly divided into 5 groups of 40 each, which were further replicated to 4 sub-groups comprising 10 chicks per replication. The treatments allotted to 5 groups: T_o, control –basal diet; T_1, test diet–1, with replaced level soybean meal by alternate protein source at 20% mixing; T_2, test diet–2, test diet–1 + phytase supplementation; T_3,test diet–3, test diet–1 with 50% replacement of DCP by limestone; T_4, test diet–4, test diet–3 + phytase supplementation.

Phytase provided microbial activity of 2500 FTU/gram of the product which was fed 600 FTU/kg of feed. All the diets provided to the broilers were iso-proteinous and iso-caloric.

Broiler chickens were reared on deep litter with *ad lib.* feeding and watering. On day first, individual chicks were wing banded for obtaining individual body weights. All the birds were vaccinated with Marek's disease vaccine (day 1) and Lasota (day 7 and 24) against Ranikhet disease. Individual birds were weighed at weekly interval whereas weighed feed was fed to each replication daily and leftover feed was weighed at the end of week to get weekly intake.

Table 1. Effect of SBM replacement with SFM and DCP with LS on serum profiles of broiler chicken at the age of 3 weeks

Group	Hb (%)	ALP (IU/L)	Ca (mg/dl)	P (mg/dl)	Cu (ppm)	Zn (ppm)	Fe (ppm)	Mg (%)
T_0	7.73^{b}	479.80^{c}	11.19^{c}	5.90^{d}	1.77^{b}	2.82^{a}	2.99^{c}	3.08^{a}
T_1	6.55^{a}	452.40^{a}	9.24^{d}	5.03^{c}	1.57^{a}	2.44^{b}	2.54^{b}	1.89^{b}
T_{2*}	7.63^{b}	490.60^{b}	13.63^{b}	6.36^{b}	2.44^{d}	3.12^{c}	4.64^{a}	3.13^{a}
T_3	6.23^{c}	458.80^{a}	8.62^{a}	4.60^{a}	1.63^{a}	2.40^{b}	2.86^{c}	2.66^{c}
T_{4*}	6.85^{d}	474.40^{c}	13.63^{b}	6.35^{b}	1.90^{c}	2.93^{a}	4.54^{a}	3.05^{a}
SEM	0.12	4.28	0.58	0.17	0.07	0.06	0.08	0.11
P	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

*Phytase supplemented groups. The means connected with similar superscript in the column do not differ significantly (P<0.01) as per the DMRT.

Table 2. Effect of SBM replacement with SFM and DCP with LS on serum profiles of broiler chicken at the age of 5 weeks

Group	Hb (%)	ALP (IU/L)	Ca (mg/dl)	P (mg/dl)	Cu (ppm)	Zn (ppm)	Fe (ppm)	Mg (%)
T_0	9.19^{c}	454.80^{c}	14.53^{a}	6.46^{a}	1.83^{b}	2.67^{c}	4.20^{a}	3.72^{c}
T_1	8.12^{b}	460.60^{a}	11.89^{c}	5.42^{d}	1.64^{a}	2.50^{d}	3.69^{b}	2.47^{a}
T_2*	9.09^{d}	468.60^{b}	14.84^{a}	6.60^{a}	2.46^{c}	3.31^{a}	4.49^{a}	3.80^{c}
T_3	7.91^{a}	462.40^{a}	10.98^{b}	5.12^{c}	1.61^{a}	2.19^{b}	3.39^{b}	2.80^{b}
T_4*	8.90^{d}	481.60^{d}	14.95^{a}	6.12^{b}	2.35^{c}	3.39^{a}	4.37^{a}	3.75^{c}
SEM	0.09	4.88	0.26	0.17	0.08	0.10	0.12	0.14
P	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

*Phytase supplemented groups. The means connected with similar superscript in the column do not differ significantly (P<0.01) as per the DMRT.

During each trial on 21st and 35th day, blood from representative birds of each replication was collected from wing vein. The Hb content of blood was estimated immediately after collection as per Sahali's acid haematin method (Benjamin 1985). From the remaining blood, serum was harvested to estimate ALP and mineral profile.

A part of total serum harvested was sent to National Institute of Animal Nutrition and Physiology (NAINP), Bengaluru, for estimation of Zn, Cu, Fe, Mg. A part of serum was analyzed for estimating Ca, P and ALP with use of diagnostic kits (Ca, Faulker and Meites (1982); P, Tietz (1976) and Rick *et al.* (1990). The data were statistically analyzed by one-way analysis of variance as per Snedecor and Cochran (1989). As there were no differences in results of replications, the values were pooled together and means of various treatments were compared by Duncan's multiple range test as invented by Duncan (1955).

RESULTS AND DISCUSSION

The results indicated the similar positive trend of improvement in Hb concentration of blood and serum contents for ALP and minerals of broilers fed with feeds replaced for DCP with limestone and SBM substituted with SFM, SAFFM and sesame cake supported by phytase incorporation. The sample results of all the 3 trials at 3 and 5 weeks of age are depicted in Tables 1 and 2. It can be ascertained from these elaborations that Hb; ALP and Ca, P, Zn, Cu, Fe and Mg in serum at both the ages were significantly (P<0.01) higher in broilers fed replaced diets with phytase supplementation (T_2 and T_4) when compared with non-supplemented groups (T_1 and T_3). Further, these elevated values of all the parameters were at par with the estimates of control birds (T_0).

The results of enhanced levels of Cu, Zn, Fe and Mg were in line with that of Theil and Weigand (1992), Pallauf *et al*. (1992), Yi *et al*. (1996 a), Rama Rao and Ramasubba Reddy (2001) and Rama Rao *et al.* (2006), who observed increased serum levels of these minerals in broilers through feeding of phytase. The noting of improved levels of Ca and P in serum were in agreement with similar investigations of Sebastian *et al.* (1998), Kanagraju *et al.* (2001), Kamble *et al.* (2007) and Jain (2007), who reported improvement in absorption of Ca and P by addition of phytase to broiler rations. The improved level of Ca and P might be the result of more bio-availability of these minerals due to hydrolysis of phytates by phytase to release aforesaid bound minerals. The observations of higher levels of ALP in serum of broilers added with phytase in their feed tallied with similar findings of Kanagaraju *et al.* (2001) and Jain (2007), who reported raised serum levels of ALP in broilers through supplementation of phytase. The improvement in the level of aforesaid enzyme may be attributed to stimulation of secretion of ALP by complementary action of phytase towards ALP secretary mechanism.

On the basis of above results it can be concluded that phytase supplementation allowed 50% replacement of DCP

with limestone accompanied with partial substitution of SBM with SFM, SAFFM and sesame cake without adverse effects on Hb; ALP and minerals in serum of broiler chickens.

ACKNOWLEDGEMENT

The authors are thankful to university authorities of KVAFSU, Bidar and the Dean, Veterinary College, Bidar, for permitting to use the infrastructure to carry out the research trials.

REFERENCES

Benjamin M M. 1985. *An Outline of Veterinary Clinical Pathology*. 3rd edn. p: 233–54. Kalyani publication, New Delhi, India.

Biehi R R, Baker D H and Deluca H F. 1995. Hydroxylated cholecalciferolcompounds act additively with microbial phytase to improve phosphorus, zinc and manganese in chicks fed soybean based diets. *Journal of Nutrition* **125**: 2407–16.

Faulker W R and Meites S. 1982. *Selected Methods for the Small Clinical Chemis Laboratrory.* Washinton D. C. : p. 125.

Jain Archna. 2007. Effect of dietary supplementation of phytase on biochemical and haematological parameters in broilers. *Proceedings of XXIV. IPSACON,* Ludhiana.

Kamble R S, Muley Vijay and Toke S. 2007. Perspective of microbial phytase and phosphorus utilization in chicken. *Proceedings of XXIV, IPSACON,* Ludhiana.

Kanagraju P, Jalaludeen A and Anitha P. 2001. Effect of microbial phytase onretention of calcium and phosphorus in broilers. *Poultry Punch* **18 (2)**: 56–59.

Pallauf V J, Hohler D and Rimbach G. 1992. Effect of microbial phytase supplementation to a maize-soya diet on the apparent absorption of Mg, Fe,Cu, and Zn, and parameters of Zn status in piglets. *Journal of Animal Physiology and Nutrition* **68**: 1–8

Sebastian S, Touchburn S P, Chavez E R and Lague P C. 1996 b. Effect of supplemental microbial phytase at different calcium levels on growth performance and mineral utilization of broiler chickens. *Poultry Science* **75**: 1516–23.

Rama Rao S V, Raju, M V L N, Panda A K and Reddy M R. 2006. Sunflower utilization. *British Poultry Science* **47 (5)**: 592–98.

Rama Rao S V and Ramasubba Reddy V. 2001. Phytin phosphorus for eco-friendly products. *Poultry International, September* 46–52.

Rick W. 1990. *KLinsche Chemie and Microskopie.* 6th edn, P 294. Springer Verlag, Berlin.

Sebastian S, Touchburn, S P and Chavez E R. 1998. Implications of phytic acid and supplemental microbial phytase in poultry nutrition a review. *World's Poultry Science Journal* **54**: 27–47.

Snedecor G W and Cochran W G. 1989. *Statistical Methods.* Oxford and IBH Publishing company, New Delhi.

Thiel V and Weigand E. 1992. Influence of dietary zinc and microbial phytase supplementation on Zn retention and excretion in broiler chicks. *Proceedings of 19th World Poultry Congress Amsterdam*. The Netherlands. Sept. 20–22.

Tietz N W. 1976. *Fundamentals of Clinical Chemistry.* P. 903. W. B. Saunders Co., Philadelphia.

Yi Z, Komegay E T and Denbow D M. 1996. Supplemental microbial phytase improves the zinc utilization in broilers. *Poultry Science* **75**: 540–46.