



THE EFFECT OF ORGANIC AND INORGANIC ZINC SUPPLEMENTATION ON BLOOD HAEMOGLOBIN AND SERUM CORTISOL CONCENTRATION IN MALABARI GOAT KIDS

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ABSTRACT

The present study was intended to elucidate the effect of organic and inorganic zinc supplementation on blood haemoglobin and serum cortisol level in Malabari goat kids. The study was conducted in completely randomised design (CRD) using fifteen, 3-4 month aged goat kids which were divided into three groups of five animals each. Group G-I was fed on basal diet as per requirement of NRC (2007), G-II group fed on basal diet with extra supplementation of 40 ppm zinc from inorganic ZnSO₄ and G-III was fed on basal diet with extra supplementation of 40 ppm zinc from organic zinc methionine for a period of 90 days. Blood was collected at 0th, 45th and 90th day of experiment for the analysis of blood haemoglobin and serum cortisol level. Blood haemoglobin level was significantly (P<0.05) higher in organic zinc supplemented group compared to other groups. Serum cortisol level was not affected by both inorganic and organic zinc supplementation.

KEY WORDS: Cortisol, Haemoglobin, Inorganic, Organic, Zinc.

INTRODUCTION

A trace element plays a significant role in various metabolic functions in animals. They are available as either inorganic or organic sources. Inorganic sources are sulphates, oxides, chlorides and carbonates of the element and they can differ in their bioavailability. The other category is often referred to as “chelates”. Mineral chelates are organic trace minerals designed to enhance gut absorption and improve bioavailability. The bioavailability of minerals from diet depends on its content, chemical form, solubility and interactions with other components of ration. Zinc (Zn) is an essential element required by ruminants for the functional and structural integrity of many enzymes and functional proteins. Zinc plays an important role in growth, skin health, reproduction, skeletal development and in the utilization of protein, carbohydrates and fats in the body. Zinc is known to be essential for proper sexual maturity, reproductive capacity in males and all reproductive events, more specifically with onset of estrus in female. Recommended level of zinc in kids is 20 ppm as per NRC (2007). Various studies indicated that higher level of zinc can promote better immunity and growth in animals. Hence double the recommended level of zinc was used in the present study to elucidate its effect on growth and immunity in goat kids.

MATERIALS & METHODS

Fifteen healthy Malabari goat kids of about 3-4 months of age were selected from Goat farm, Instructional Livestock Farm Complex (ILFC), Pookode. The kids were divided into three groups randomly and they were randomly

allotted to one of the three dietary treatments. The G-I group kids were fed on basal diet without supplementation of zinc, G-II group fed with basal diet with extra supplementation 40 ppm of inorganic zinc as zinc sulphate (ZnSO₄) and G-III group fed with basal diet with extra supplementation of 40 ppm organic zinc as zinc methionine. Animal were fed as per National Research Council (NRC, 2007) requirement for goat kids. Green grass was used as roughage source. Experimental animals were maintained on their respective dietary regimen for a period of 90 days.

Blood was collected at 0th, 45th and 90th day of feeding trial and serum separated. All the serum samples were analyzed for serum cortisol constituents by Radioimmuno assay (RIA) using CORTISOL RIR KIT- IM1841 manufactured by Beckman coulter. Blood haemoglobin estimation was done by cyanmethaemoglobin method. Between groups comparisons of collected data were done using one way analysis of variance followed by Duncan Multiple Range test (DMRT) (Snedecor and Cochran, 1994). Statistical analysis of data was done using SPSS software version 21.0.

RESULTS

Results of the comparison of blood hemoglobin and serum cortisol between three different groups of Malabari goat kids are given below.

Blood haemoglobin concentration in kids

The data and graphical representation on blood haemoglobin concentration at 0th, 45th and 90th day of kids are presented in Table 1 and Fig. 1 respectively. The mean concentration of haemoglobin at the end of study in group

G-I, G-II and G-III were 10.83, 12.03 and 12.93, respectively. At 0th day haemoglobin concentration was comparable between the groups ($P>0.05$). While at 45th and 90th day the haemoglobin concentration was

significantly ($P<0.05$) higher in group G-III than group G-I. Zinc supplemented groups had ($P>0.05$) similar haemoglobin concentration.

TABLE 1: Comparison of blood haemoglobin concentration (g/dl) in three different groups

Group	Day 0	Day 45	Day 90
G-I	8.43	9.66 ^b	10.83 ^b
G-II	8.90	10.70 ^{ab}	12.03 ^{ab}
G-III	8.46	11.03 ^a	12.93 ^a
SEM	0.119	0.275	0.353
p - value	0.135	0.039*	0.018*

Mean values with different superscripts within a column differ significantly.

* Significant at 0.05 level

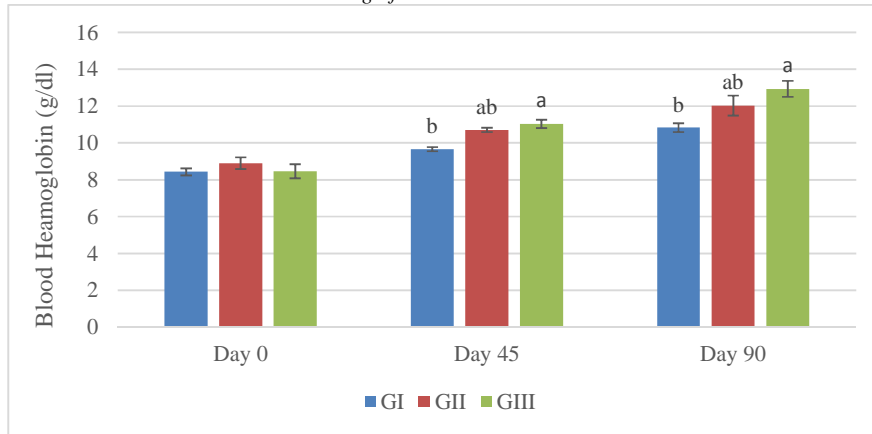


FIGURE 1: Blood hemoglobin concentration in three groups at different periods of measurement

Serum cortisol concentration in kids

The data and graphical representation regarding the serum cortisol levels in different groups and at different times of measurement is presented in Table 2 and Fig. 2 respectively. The mean values of serum cortisol level at the end of experiment was 14.68, 13.79 and 12.87 ng/mL, in group

G-I, G-II and G-III, respectively. The statistical analysis of data showed no significant ($P>0.05$) difference between groups at all the three times of measurement. The serum cortisol levels were numerically lowered in both the zinc supplemented groups but the difference was not statistically significant ($P>0.05$).

TABLE 2: Comparison of serum cortisol concentration in three different groups

Group	Day 0	Day 45	Day 90
G-I	15.02	14.33	14.68
G-II	15.12	13.86	13.79
G-III	15.53	13.44	12.87
SEM	1.97	1.61	1.13
p - value	0.658	0.245	0.656

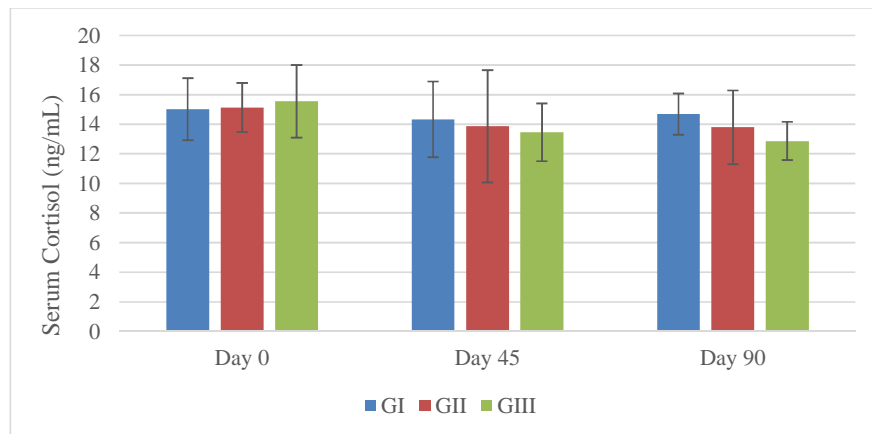


FIGURE 2: Serum cortisol concentration in three groups at different periods of measurements**DISCUSSION****Blood haemoglobin level in kids**

In current study, the observed mean haemoglobin concentration was significantly ($P < 0.05$) higher in organic zinc supplemented group than control group. Results indicated that feeding of organic zinc at 40 ppm improves the haemoglobin profile in goat kids.

Comparable findings were reported by Shinde *et al.* (2012) and Mondal *et al.* (2013), in adult rams and lambs, respectively. Contradictory to our results Mondal *et al.* (2009) observed increased haemoglobin concentration in inorganic zinc supplemented calves compared to organic zinc supplemented groups. However, Elamin *et al.* (2013) and Ramulu *et al.* (2015) informed no effect of zinc supplementation on blood haemoglobin concentration.

Zinc has significant role in haemoglobin formation and hence, more zinc availability in organic zinc supplemented group might have promoted better haemoglobin synthesis in group G-III goat kids.

Serum cortisol level in kids

Serum cortisol concentration value was numerically lowered in both zinc supplemented groups although the values were statistically ($P > 0.05$) nonsignificant. Similarly Droke *et al.* (1998) and Jafarpour *et al.* (2015) reported no effect of zinc methionine supplementation on serum cortisol levels in sheep. Contradictory to our findings, Almeida and Barajas (2002) reported that zinc methionine feeding decreased the serum cortisol level. Lowered cortisol levels are indicative of better immunity. The impact of supplementation of 40 ppm inorganic and organic zinc on the immunity of goat kids could not be fully ascertained by the present study.

CONCLUSION

Organic zinc supplementation significantly improved haemoglobin concentration in goat kids. The effect of zinc supplementation on the immunity of goat kids could be fully ascertained by future studies in this direction.

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