HAEMATO-BIOCHEMICAL PROFILE OF CROSSBRED CALVES SUPPLEMENTED WITH INORGANIC AND ORGANIC SOURCE OF ZINC

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ABSTRACT

Fifteen crossbred calves (Bos taurus x Bos indicus) of an initial body weight of 226 kg were used to determine effect of zinc level and source on blood haemato-biochemical profile. Treatments were: control (32.5 ppm Zn/kg DM) and control diet supplemented with 35 ppm of Zn/kg DM as either zinc sulphate (ZS) or zinc propionate (ZP). Calves were individually fed on a concentrate and wheat straw based diet for a period of 180 days. Blood sample was collected at monthly interval. Blood haemoglobin, packed cell volume, plasma glucose, serum total protein, globulin and urea were similar in three treatment groups. However, serum albumin concentration was significantly higher in Zn supplemented groups irrespective of Zn source. Concluded that basal diet containing 33 ppm Zn seems to be adequate in maintaining normal blood haemato-biochemical profile in crossbred calves.

Key words : Zinc, Zinc sulphate, Zinc propionate, Haemato-biochemical profile, Calves.

INTRODUCTION

Zinc is required by animals for a number of physiological and biochemical functions and it is essential for metabolism of carbohydrates and protein. Marginal deficiency of Zn in ruminants, especially under existing feeding conditions is not uncommon owing to deficiency of Zn in feed resources, serum, milk and hair of animals in many parts of India have been found to be deficient in Zn (Udar et al., 2003). Traditionally trace minerals are supplemented to animal diet as inorganic salts, however organic sources are also being advocated. There are scanty of literatures regarding supplementary effect of Zn propionate in the diet ruminants. Therefore, present investigation was carried out to see the effect of different Zn source on haemato-biochemical parameters in crossbred calves.

MATERIAL AND METHODS

Fifteen crossbred (Bos taurus x Bos indicus) male calves of approximately 12 months of age and an initial body weight of 226 kg were divided in to 3 groups of five animals in each on the basis of their body weight following completely randomized block design. Treatments were: control (no supplemental Zn); Zn sulphate (ZS) and Zn propionate (ZP). For the latter two groups, 35 mg Zn/kg diet through ZS and ZP was added. The animals were maintained for 180 days on experimental diet comprised of concentrate mixture (maize, 30; soyabean meal, 27; wheat bran, 40; mineral mixture, 2 and common salt, 1 parts) and wheat straw in the ratio of 50:50 to meet their nutrient requirement for 500 g body wt. gain/day (NRC, 1989). All the calves were provided two kg of green maize/oats/berseem fodder, twice a week to meet the vitamin A requirement, and tap water containing no detectable amount of Zn was available ad lib. Blood was collected from each calf through jugular vein in the morning (before watering and feeding) at zero day and subsequently at monthly interval. Determination of DM, crude protein (CP), ether extract, ash and acid insoluble ash in feeds were done as per the methods of AOAC (1995) and NDF and ADF were according to...
Goering and Van Soest (1970). All the blood parameters were estimated by using diagnostic kit (Glaxo), manufactured by Sigma Diagnostic Pvt. Limited, Baroda, India. Data were statistically analyzed using generalized linear model of SPSS (1996). For comparison of groups, Duncan’s multiple range tests were used.

**RESULTS AND DISCUSSION**

The CP content of concentrate mixture and wheat straw was 21.2% and 4.1%, respectively. The Zn content (ppm) in concentrate mixture and wheat straw was 52.8 and 10.6, respectively. Though, Zn content in wheat straw was low, but in total ration it was 32.54 ppm. Total ration contained more than required amount of Ca, P, Fe, Cu and Mn (NRC, 1989).

The average periodic means of haemoglobin (g/dl) in different groups were similar (Table 1). The packed cell volume (PCV) did not show any specific trend due to treatment. Though values were significantly different due to period, but it did not reveal any definite trend among different period (Table 1). Bedi (1976) did not observe any difference in haemoglobin and PCV status of calves after supplementing 40, 70 and 100 ppm Zn in basal diet (35ppm Zn). Similar finding was also reported by Khan (1978). Ott et al. (1965) suggested that Zn up to certain level was essential for better haemoglobin status. In present study Zn content of basal diet seems to be adequate to maintain normal haemoglobin concentration in blood. Ott et al. (1966) also observed that different levels of Zn in the diet did not influence PCV in calves.

The different blood biochemical parameters are presented in Table 2. The plasma glucose level (mg/dl) irrespective of period was significantly lower in ZP group as compared to ZS group, but it did not differ with control. Data revealed that, irrespective of treatment, plasma glucose level decreased with the advancement of experimental feeding. Engle et al. (1997) did not observe any influence of dietary Zn (17 vs 40 mg/kg feed) on blood glucose level. In contrast, present results showed lower glucose level in Zn propionate supplemented group, which may be due to high insulin concentration in this group (data not presented). This hypothesis is supported by the findings of earlier worker (Kirchgessner et al., 1978), who suggested that Zn is associated with insulin release from pancreas. The cumulative period mean concentration of serum total protein (TP) among groups varied non-significantly (P>0.05), but increasing trend (P>0.05) in serum TP due to Zn supplementation was observed with highest value recorded in ZP and lowest in control. TP concentration irrespective of treatment showed significant (P<0.001) variation due to period, but values did not follow any definite trend in relation to age. The significant drop in TP value during 60 d of feeding was unexpected. Similar were the findings

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Period (days)</th>
<th>Hb (g/dl)</th>
<th>PCV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>Control</td>
<td>10.67</td>
<td>10.77</td>
<td>11.06</td>
</tr>
<tr>
<td>ZS</td>
<td>10.77</td>
<td>9.03</td>
<td>11.25</td>
</tr>
<tr>
<td>ZP</td>
<td>10.08</td>
<td>11.27</td>
<td>11.12</td>
</tr>
<tr>
<td>Mean</td>
<td>10.51</td>
<td>10.6</td>
<td>11.14</td>
</tr>
<tr>
<td>SEM</td>
<td>0.30</td>
<td>0.49</td>
<td>0.42</td>
</tr>
</tbody>
</table>

abc means with different superscripts in a row differ significantly (p=0.05)
of Bedi (1976) and Daghash and Mousa (1999) who did not observe any change in plasma TP concentration due to Zn supplementation. However, Spear (1989) reported that serum TP concentration in lambs decreased (P<0.05) as Zn content of the diet was increased from 23.8 ppm to 48.8 ppm. The mean value of serum albumin (g/dl) as well as values during 120d and 150d post feeding varied significantly (P<0.05). The cumulative period mean values were significantly (P<0.05) higher in Zn supplemented groups, irrespective of Zn sources, than control group. Cumulative group mean of albumin also varied significantly (P<0.001) with feeding period and values followed an increasing trend with advancement of feeding. Daghash and Mousa (1999) reported numerically increased serum albumin concentration in buffalo calves due to Zn supplementation. The cumulative period mean values

### Table 2. Effect of Zn supplementation on blood biochemical properties in crossbred calves.

<table>
<thead>
<tr>
<th></th>
<th>Treatment</th>
<th>Treatment</th>
<th>Treatment</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Period (days)</td>
<td>Mean</td>
<td>SEM</td>
<td></td>
</tr>
<tr>
<td>Glucose (mg/dl)</td>
<td>0 30 60 90 120 180</td>
<td>61.49ab 51.20bc 55.54b 48.56cd 46.01d 46.67cd</td>
<td>1.49</td>
<td>1.54</td>
</tr>
<tr>
<td>Total protein (g/dl)</td>
<td>0 30 60 90 120 180</td>
<td>5.51bc 6.03ab 4.93c 6.48a 6.34a 6.08ab</td>
<td>0.14</td>
<td>0.29</td>
</tr>
<tr>
<td>Albumin (g/dl)</td>
<td>0 30 60 90 120 180</td>
<td>2.87bc 2.83bc 2.56c 3.08b 4.02a 3.16b</td>
<td>0.14</td>
<td>0.16</td>
</tr>
<tr>
<td>Globulin (g/dl)</td>
<td>0 30 60 90 120 180</td>
<td>2.64b 3.20a 3.40a 2.36b 2.32b 3.24a</td>
<td>0.20</td>
<td>0.26</td>
</tr>
<tr>
<td>Urea (mg/dl)</td>
<td>0 30 60 90 120 180</td>
<td>17.69bc 15.97c 15.56c 22.20a 18.97b 23.13a</td>
<td>0.70</td>
<td>0.85</td>
</tr>
</tbody>
</table>

*abcd* means with different superscripts in a row differ significantly (p=0.05)

*xy* means with different superscripts in a column differ significantly (p=0.05)
of serum globulin (g/dl) in different groups did not show any significant (P>0.05) difference. The cumulative group means varied significantly (P<0.001) with higher values recorded during 30, 60 and 180d of feeding as compared to other periods. Contrary to present findings, Daghash and Mousa (1999) observed increased serum globulin concentration due to Zn supplementation in buffalo calves. The mean serum levels of urea (mg/dl) irrespective of period, was not altered, however the cumulative period means showed significant (P<0.001) variation. The present research findings were supported by Hueta et al. (2002) who did not observe any change in plasma urea-N concentration upon Zn supplementation. In contrary to our findings, Bedi (1976) and Spears et al. (1991) reported significantly increased and decreased, respectively, in plasma urea concentration due to Zn supplementation.

CONCLUSION
The findings of present study indicated that diet containing about 33 ppm Zn is adequate for maintaining normal blood heamato-biochemical profile. Additional benefit was not obtained when dietary Zn concentration was increased above 33 ppm by supplementing organic or inorganic source of Zn.

REFERENCES