

# EFFECT OF INORGANIC AND ORGANIC ZINC SUPPLEMENTATION ON SEXUAL BEHAVIOR IN CROSSBRED CATTLE (*BOS INDICUS X BOS TAURUS*) BULLS

N KUMAR, RP VERMA, LP SINGH AND RS DASS<sup>1</sup>

Indian Veterinary Research Institute,  
Izatnagar-243122 (UP)

## ABSTRACT

An experiment was conducted on 12 crossbred bulls (about 2 years of age, 316.2 ±0.77kg body weight) divided into 3 groups of four animals in each to study the effect of inorganic and organic zinc supplementation on their sexual behavior. All the animals were fed on wheat straw and concentrate mixture to meet their nutrients requirement. In addition animals in-group II and III were supplemented with 35-ppm zinc as zinc sulphate (inorganic zinc) and zinc propionate (organic zinc), respectively, whereas group I served as non-supplemented control group. This feeding experiment lasted for 9 months. In last 3 months of feeding, animals in all the three groups were closely observed for their *libido* and sexual behavior at the time of semen collection and scoring was made as per the method of Anzar *et al.* (1993). Results revealed that reaction time (seconds) and sexual behavior (percent) values were significantly ( $P<0.01$ ) higher in 35ppm zinc propionate supplemented group as compared to control and zinc sulphate supplemented group, indicating that zinc propionate was better in enhancing the sexual behavior of crossbred bulls as compared to zinc sulphate.

**Keywords:** Crossbred bulls, zinc sulphate, zinc propionate, sexual behavior

## INTRODUCTION

Zinc is an essential trace element for the action of over 300 metalloenzymes and play important role in polymeric organization of macromolecules like DNA and RNA, protein synthesis and cell division (Chvapil, 1973). Zinc plays an important role in growth and development of primary and secondary sex organs as evidenced by atrophy of these organs when given Zn deficient diet in different species (Pitts *et al.*, 1966; Underwood and Somers, 1969; Neathery *et al.*, 1973). Sexual behavior is one of the important measures to assess reproductive performance. Sexual behavior is differentiated into *libido* and mating ability and is very critical for breeding bulls as well as for a successful artificial insemination programme (Amann and Almquist, 1976). Reports are available to show that supplementation of Zn to animal diet results in significant improvement of semen quality, biochemical attributes and serum testosterone level in different species (Underwood and Somers, 1969; Tikkiwal *et al.*, 1987; Saleh *et al.*, 1992; Tharwat, 1998; Kumar *et al.*, 2006).

No reports are available in literature comparing the effect of inorganic and organic zinc supplementation on sexual behavior of male animals of any species. Therefore, the present work was undertaken to study the effect of zinc supplementation from inorganic (zinc sulfate) and organic (zinc propionate) sources on the sexual behavior of crossbred cattle bulls.

## MATERIALS AND METHODS

This study was conducted on twelve healthy crossbred cattle bulls (2 years of age; 316.2±0.77 kg body weight), maintained in the Animal Nutrition Division of Indian Veterinary Research Institute, Izatnagar. The bulls were randomly divided into three groups comprising four animals in each group. All the animals were fed on wheat straw and concentrate mixture to meet their dry matter and crude protein requirement as per NRC (1989). In addition, the animals were given 35 ppm zinc as zinc sulfate and zinc propionate in group II and II, respectively, whereas, group I served as non-supplemented control group. This feeding practice lasted for 9 months, during which all the animals were trained to donate semen in artificial vagina over a dummy. In last 3 months of

experimental feeding, all the three groups of bulls were closely observed for their *libido* and sexual behavior at the time of semen collection. The scoring pattern was followed as per the method of Anzar *et al.* (1993) in buffalo bulls. The scoring pattern of sexual behavior i.e., *libido* and mating ability are described below. *Libido* was scored on the basis of sexual aggressiveness, reaction time and tactile stimulations.

**Sexual aggressiveness (SA):-** The behavior of bulls towards teaser bull during approach was assessed visually and the bulls were classified as:

Aggressive	Extremely eager to mount and approach teaser with full vigor	Score 4.0
Active	Approached teaser with less vigor and aggressiveness.	Score 3.0
Dull	Proceeded with a dull expression and took a longer time to mount	Score 2.0
Shy	Exhibited mild sexual interest and was reluctant to mount.	Score 1.0

**Reaction Time(RT) :** The time taken by a bull from exposure to the teaser until mounting. It was recorded in seconds.

**Tactile stimulation (TS)-** Bull exhibited certain behavioral characteristics after approaching the teaser, called as tactile stimulations and consists of sniffing, flehman's reaction, licking, bleating, pawing, nudging, chin resting, licking of penis and urinating etc. For each tactile stimulation 0.2 was added to the total score obtained for reaction time and sexual aggressiveness. Reaction time and sexual aggressiveness of any successful attempt was used for *libido* scoring and *libido* (%) of each attempt was computed as follows:

**Libido (%):**  $\{[(R.T. \text{ score} + SA \text{ score}) + 0.2 (TS)]/10\} \times 100$

**Mating ability:** Mating ability was scored on a 10-point scale distributed among different behavioral events displayed by bulls during ejaculation as given below.

Sexual events	Score
<b>1 Penile erection(PE)</b>	
Complete	2
Partial	1
Absent	0
<b>1 Mounting (MO)</b>	1
<b>1 Penile movement (PM)</b>	1
<b>1 Grasping the teaser (GT)</b>	1
<b>1 Ejaculatory Thrust (ET)</b>	
Strong	2
Weak	1
Absent	0
<b>1 Throwing whole body forward (TW)</b>	0.5
<b>1 Sudden backward movement of head (SM)</b>	0.5
<b>1 Ejaculation(E)</b>	2
<b>1 Total score</b>	10

After mating, if a bull did not ejaculate, then 1 point was deducted from total score for futile attempt. The mating ability score was determined in successful attempt only, as follows:

**Mating ability Score:**  $\{[(PE+MO+PM+GT+ET+ TW+SM + E)-Futile \text{ attempts}]/10\} \times 100$

**Sexual behavior score:** The sexual behavior score was calculated from the net scores of *libido* and mating ability as follow:

$$(\text{Libido score } (\%) + \text{Mating ability score } (\%))/2$$

### Statistical analysis

Data collected on sexual behavior of crossbred bulls during period of study were analyzed as per Snedecor and Cochran (1989) using one-way analysis of variance and significant means were compared using Duncan's multiple range test (Steel and Torrie, 1980).

## RESULTS AND DISCUSSION

The mean values of reaction time and sexual behavior score for crossbred bulls of different groups are presented in Table 1. The mean reaction time (seconds) was recorded as 32.95, 32.66 and 12.20 in three groups, respectively. No significant difference was observed in reaction time between control and 35ppm ZnSO<sub>4</sub> supplemented groups. However, the mean reaction time was significantly higher (P<0.01) in 35ppm Zn propionate supplemented group as compared to other two groups. The mean sexual behavior score was recorded as 71.75 (control group), 70.875 (35ppm ZnSO<sub>4</sub>), and 90.29 (35ppm Zn propionate) supplemented groups. There was no significant difference between control and 35ppm ZnSO<sub>4</sub> supplemented group for sexual behavior score. However, it was significantly higher (P<0.01) in 35ppm Zn propionate supplemented group. The mean reaction time and sexual behavior score were observed to be significantly (P<0.01) higher in Zn propionate supplemented group, while no significant difference was observed between control and inorganic Zn supplemented groups. Regarding effect of supplemental Zn on the sexual behavior score, no literature

**Table 1: Effect of zinc supplementation on sexual behavior of control and Zn supplemented crossbred cattle bulls**

Attribute	Group		
	I	II	III
Reaction time (Seconds)	32.95 <sup>a</sup> ±0.59	32.66 <sup>a</sup> ±0.56	12.20 <sup>b</sup> ± 0.47
Sexual behavior (%)	71.75 <sup>a</sup> ±0.40	70.87 <sup>a</sup> ±0.58	90.29 <sup>b</sup> ±0.44

Means with different superscripts in a row differ significantly (P<0.01)

is available to compare the results of present study. There is some possibility of role of Zn in modifying sexual behavior, which is indirectly evident by observation of Neathery *et al.* (1973), who found complete loss of *libido* when male calves were exposed to severe Zn deficiency. However, in the present study ZnSO<sub>4</sub> had not given any significant improvement over the control group, which may be due to poor bioavailability of Zn from zinc sulphate as compared to zinc propionate. Organic form of zinc is having higher bioavailability than inorganic form, which result in higher absorption, distribution and uptake by cells (Spears *et al.*, 1991). Significantly ( $P < 0.01$ ) higher and lower values of sexual behavior (%) and reaction time (seconds) obtained in Zn propionate supplemented group revealed that supplementation of organic form of Zn was a better source of zinc as compared to zinc propionate.

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