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(Research article)

Trace Mineral Status of Nili-Ravi Buffaloes in Tehsil Pattoki of District Kasur, Pakistan

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Abstract

The present study was undertaken with the objective to be acquainted with the copper, iron and zinc in serum of heifers, milch and dry Nili-Ravi buffaloes. The study was carried out during year 2010 in Tehsil Pattoki of District Kasur. A total of 100 sites were selected representing the whole Tehsil and from each site blood samples were collected from heifers, milch and dry Nili-Ravi buffaloes. A total of 300 blood samples were collected from 100 sites comprising of 100 samples from calves, 100 from heifers and 100 from milch buffaloes. Serum copper, iron and zinc were determined on Atomic Absorption Spectrophotometer. The mean serum copper, iron and zinc concentrations vary significantly (P>0.05) among calves, heifers and milch buffaloes. Copper concentrations were significantly higher (P<0.05) in milch buffaloes compared with calves and heifers. The serum iron concentrations were significantly higher (P<0.05) in calves and was significantly lower (P<0.05) in milch buffaloes. The zinc concentrations were significantly higher (P<0.05) in calves in comparison with heifers and milch buffaloes. In conclusion, the present study showed that serum mineral profile of buffaloes reflects the physiological status of the animal.

Keywords: *Calve, Heifer, Milch buffalo, Copper, Iron, Zinc.*

1. Introduction

Buffalo is an important dairy animal in Pakistan producing approximately 28694 liters of milk out of total 46440 liters of milk produced in the country [1]. These buffaloes are of dairy type and belong to two breeds: Nili-Ravi and Kundi. The Nili-Ravi breed of buffalo is classed as a river type belonging to the Murrah group. It is the main breed in Pakistan with the largest concentration in the central part of the country (Punjab Province). The breed is among the highest milk-producing breeds of buffalo.

Mineral imbalances frequently are thought to be associated with infertility in cattle. There are many interr elationships between the absorption and utilization of many of the essential minerals. Both macro and micro minerals play a vital role in augmenting production and reproduction in farm animals, and their deficiency causes impairment in body functions [2]. Copper and zinc are essential trace elements and they are involved in many physiological processes in animals [3]. Blood mineral contents in buffaloes and cows have been reported to differ from area to area [4]. Similarly, the mineral contents of plants have been reported to vary with variation in chemical composition of soil which is largely affected by the climatic conditions, especially temperature, rain fall and drainage of water [5]. A large number of factors such as species, breed, sex, age malnutrition, illness, reproductive status, and physiological variations, can affect the serum chemistry values [6,7].

Information on micro mineral status of buffaloes in central Punjab is meager and inconclusive. The sub-clinical deficiencies without manifestation of specific deficiency symptoms occur in this area adversely affecting the growth, health, fertility and productivity of animals. An effort has been made to draw a picture of micro mineral deficiencies in buffalo population in Tehsil Pattoki of District Kasur, so as to suggest practical

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methods of micronutrient supplementation under the present farming system.

2. Materials and methods

Pakistan is predominantly an agricultural country with a semi-arid continental subtropical climate. It is located between latitude 23° and 36°N and longitude 60° and 75°E. The present study was conducted on Nili-Ravi buffaloes in Tehsil Pattoki of District Kasur. The Tehsil Pattoki of District Kasur is located at31°1'0N 73°50'60E. The study was carried out during year 2010. A total of 100 sites were selected representing the whole Tehsil. At each site blood samples were collected from calves, heifers and milch Nili-Ravi buffaloes. So, a total of 300 blood samples were collected from 100 sites comprising of 100 samples from heifers, 100 from milch and 100 from dry buffaloes. These animals were raised and maintained under the existing field management conditions. Blood samples were collected from door to door visit of the farmers.

Twenty ml of blood from each buffalo was collected in a clean glass test tube through venipuncture of jugular vein using a sterile 16 gauge needle. Test tubes containing blood were placed in a slanting position for one hour to let the serum separate. Samples were carried out at Buffalo Research Institute, Pattoki, District Kasur for analysis. The serum was next aspirated carefully with a pipette, placed in glass vials, labeled and stored at -20˚ C till analyzed.

Serum was thawed at room temperature and analyzed for copper, iron and zinc concentrations. Wet digestion of samples was done by following the method of Richard (1968) [8]. Serum copper, iron and zinc were determined on Atomic Absorption Spectrophotometer (Model AA-5). Standard solutions for copper, iron and zinc were prepared using the available standard salts. Each standard solution was run one by one for all minerals and their absorbance was recorded. Thereafter, the absorbance of all samples one by one was recorded. Standard curves for each mineral were obtained by plotting the absorbance of standards against their concentrations. Then concentrations of respective minerals in the samples were calculated from their respective regression equations.

The mean (±SD) values for serum copper, iron and zinc were calculated. The data was analyzed by using statistical package SPSS 13. To determine the significance among different groups, one way ANOVA was applied at 5% level of significance.

3. Results

The mean (±SD) values for copper, iron and zinc in calves, heifers and milch buffaloes are presented in table1. Values sharing different superscripts in a row differed significantly ($P<0.05$). The mean serum copper, iron and zinc concentrations vary significantly ($P>0.05$) among calves, heifers and milch buffaloes. A micro mineral like copper was increased significantly high ($P<0.05$) in milch buffaloes compared with calves and heifers. The serum iron concentrations were significantly higher ($P<0.05$) in calves and were significantly lower ($P<0.05$) in milch buffaloes. The zinc concentrations were significantly higher ($P<0.05$) in calves in comparison with heifers and milch buffaloes.

4. Discussion

The purpose of present study was to determine the variations in copper, iron and zinc concentrations in the serum of calves, heifers and milch buffaloes of Nili-Ravi breed. The trace minerals were determined because inadequate mineral intake may affect hormonal secretion, enzyme activity, muscle function, bone mineral content, and other body mineral functions.

Minerals perform various biological functions in the body, including maintenance of structural tissue (Calcium, Phosphorus); act as enzyme catalysts (Copper, Zinc, Iron); assist in oxygen transport (Iron in haemoglobin); regulation of membrane transport and electrolyte balance (Sodium, Potassium, Chloride); prevention of oxidative damage (Selenium, Copper) and are integral components of the hormone and immune systems (Iron, Copper, Zinc).

The serum copper concentrations progressively increased from calves to heifers and in the milch buffaloes and this rise might be related to hormone dependent metabolic activities. As age advances, the copper concentrations dependent enzymes, cytochrome oxidase, monoamine oxidase, tyrosinase etc. increased and this perhaps was revealed in the raised serum copper concentrations. Regarding copper concentrations, the present findings are in agreement with the earlier reports [9].

The serum iron concentrations decreased gradually from calves, heifers, and in milch buffaloes. Chandolia and Verma (1987) [10] also reported similar findings in Indian buffalo. The low level of zinc in milch buffaloes may be attributed to parasitic infection as plasma zinc concentrations fall during parasitic infection in ruminants

Table 1 Mean (±SD) values of micro minerals indicating mineral status of Nili-Ravi buffaloes in Tehsil Pattoki, District Kasur, during 2010.

Mineral	Criticallevel (McDowell 1997)	Calves (n=100)	Heifer (n=100)	Milch buffaloes (n=100)
Copper (ppm)	0.65	$0.32^{c} \pm 0.18$	$0.38^{a} \pm 0.29$	$0.55^{b} \pm 0.33$
Iron (ppm)	1.10	$3.11^{c} \pm 6.8$	$2.76^{a} \pm 7.3$	$2.23^{b} \pm 8.7$
Zinc (ppm)	0.80	$3.21^{c} \pm 7.4$	$2.43^{a} \pm 7.6$	$2.86^{b} \pm 6.5$

[11]. The iron is associated with metabolic and hematological characters [12]. In the present study, iron levels in all three categories of buffaloes were within the normal critical range. This authenticated the abundance of elemental iron in the feeds and fodder grown in the area.

In conclusion, the present study showed that serum mineral profile of buffaloes reflects the physiological status of the animal.

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