Assessment of serum values of copper in cross-breed cows in Sarab

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Abstract: The most common reason to assess the trace mineral status of ruminants is because performance is below expectation. Accordingly, the assessment is done to determine the presence or prevalence of nutrient deficiencies (or toxicities) within a population. Assessment also is done to evaluate efficacy of dietary supplementation or to compare available supplements. The aim of this study was to assessment of serum values of copper in cross-breed cows in east Azerbaijan province of Iran. In this study, 316 blood serums were obtained from cows growing in the pasture conditions were used as a material in 4 season of a year. The sera were extracted from the blood taken, and kept in the deep freeze in -20°C, until they are analyzed. The copper analyses in the serum were made with spectrophotometric method by Randox kit. The values found were evaluated by “t test”. According to the table 1 and 2, mean value of copper and ceruloplasmin was 0.21±0.85 ppm and 0.91±3.74 mg/dl in understudying animals respectively. So, based on ANOVA comparative test, there was significant difference in serum values of copper and ceruloplasmin in term of seasons. According to the tables 3 and 4, the serum value of copper in pregnant and non-pregnant cows was 0.21±0.84 and 0.21±0.87, respectively. Also, the serum value of ceruloplasmin in pregnant and non-pregnant cows was 0.87±3.68 and 0.94±3.81, respectively. So, based on ANOVA comparative test, there was no significant difference in serum values of copper and ceruloplasmin in term of pregnancy. It has been thought that this study will fulfill an important gap, because of not to be present the normal value of serum copper belonging to the sanjabian races. It is known that the excess and insufficiency of trace elements cause some disorders and decrease in production. So in order to search the effects of these substances, the normal values should be known.

Key words: serum, copper, cow, east Azerbaijan province, Iran.

1. Introduction

The living things, obtain the mineral substances of their body from air, water and soil on behalf of plants, depending on the conditions of the climate. Thats why the health of the organism is related to the soil on which it lives and the geological structure of the soil (Curthbertson, 1970). Since the trace elements are in lots of biomolecules such as hormone and enzyme and have an important role on growing, they should be found in the food of human being and animals (Underwood, 1971; Tietz, 1986; George and becking, 1976). The zinc having a role in various functions of organism is a trace element which is very important in the diagnosis of the diseases (Slater et al., 1971; Underwood, 1962; Torunoglu, 1981; Baysal, 1977). It was also recorded that it has some effect on the activity of insulin, GH, TSH, LH, FSH, ACTH (Baysal, 1977), in addition to its effect on the some enzyme such as; leucine amino peptidase (Wart and Lin, 1981), alkali phosphatase (Jacob, 1973), carbonic anhidrase (Jacob, 1973; Urman, 1966; Antaphl, 1990), lactate dehydrogenase, ribonuclease (Jacob, 1973). The copper value in the blood serum differs, depending on the age of the animal, pregnancy and the absence of the copper in the diet (Ashton, 1970). The symptom of zinc and copper are associated with the enzyme defects.

Polyfenol oxidase which has a role in the synthesis of melanine includes copper. The Acromatrichia is seen in the absence of melanin (Hall and McHowell, 1973; Smith et al., 1973). Smith et al., indicated that the effects of zinc and copper on growing is due to on the mineralization of the bone and zinc has an active role on the metabolism of vitamin A and protein and zinc are needed in the blood for the mobilization of vitamin-A in the liver (Smith et al., 1973). Vural reported that, zinc has a role on the vitamin-C, metabolism and if there is high zinc in the diet, it increases the concentration of plasma vitamin-C (Vural, 1981).

It is also reported that zinc and copper also limit the deposition of iron as ferritin by affecting the absorption of iron (Tietz, 1986; Wart and Lin, 1981). It is suggested that no ingestion of trace elements or in sufficiency of them, may be led to affects on animals and serious problems which may result with death (George and becking, 1976; Underwood, 1962). The insufficiency of trace elements, especially zinc and copper, stimulates the catabolism of protein, limits the biosynthesis of protein by making differences on the nucleic acid metabolism and as a
As a result of these effects, the regeneration and growing of the tissue is affected (George and Becking, 1976; Slater et al., 1971; Riordan, 1976; Kirchessner, 1971; Stephan, 1973; Karabiyikoglu and Bor, 1988; Cin et al., 1978).

Cin et al. revealed that the feather is rough and mixed, and growing is less than the control group, in calves fed with feed including insufficient zinc (Cin et al., 1978). A group of researchers (Dalkılıç, 1982; Wart and Lin, 1981) reported some diseases that are seen with the parakototic skin and the differentiation of the colour of the skin and the dropping of skin around eyes, was related to the samples of the plant including insufficient zinc and copper that was given to the sheep. The aim of this study was to assessment of serum values of copper in cows in east Azerbaijan province of Iran.

2. Materials and methods

This study was conducted to measurement of copper in serum of cows during a year. In this study about 316 blood samples from apparently healthy cows were obtained and blood samples taken near the ice and sent to the laboratory and after serum preparation were freezing inside the micro tube. In this inspection, age, body condition score and Pregnancy status of animals was investigated. Simultaneous inspection of animals, attempting to obtain blood samples of 10 ml of jugular vein was done by venoject. In lab, blood samples centrifuged at 2000 RPM for 15 minute. Measurement of copper in serum was followed by spectrophotometric method. In this study to analyzing and comparison of data were used of ANOVA test and to evaluate the relationship between the variables together, correlation test was used (Yıldız and Bircan, 1991).

3. Results

According to the table 1 and 2, mean value of copper and ceruloplasmin was 0.21±0.85 ppm and 0.91±3.74 mg/dl in understudying animals respectively. So, based on ANOVA comparative test, there was significant difference in serum values of copper and ceruloplasmin in term of seasons.

Table 1: Frequency distribution of serum levels of copper in term of seasons

<table>
<thead>
<tr>
<th>Season</th>
<th>No.</th>
<th>Mean (ppm)</th>
<th>Mean square between groups</th>
<th>Mean square within groups</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring</td>
<td>91</td>
<td>0.21±0.79</td>
<td>0.323</td>
<td>0.043</td>
<td>7.51</td>
<td>0.000</td>
</tr>
<tr>
<td>Summer</td>
<td>60</td>
<td>0.27±0.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autumn</td>
<td>99</td>
<td>0.17±0.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>66</td>
<td>0.16±0.95</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>316</td>
<td>0.21±0.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Frequency distribution of serum levels of ceruloplasmin in term of seasons

<table>
<thead>
<tr>
<th>Season</th>
<th>No.</th>
<th>Mean (mg/dl)</th>
<th>Mean square between groups</th>
<th>Mean square within groups</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring</td>
<td>91</td>
<td>0.907±3.47</td>
<td>6.54</td>
<td>0.77</td>
<td>8.44</td>
<td>0.000</td>
</tr>
<tr>
<td>Summer</td>
<td>60</td>
<td>1.13±3.78</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autumn</td>
<td>99</td>
<td>0.78±3.69</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>66</td>
<td>0.70±4.18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>316</td>
<td>0.91±3.74</td>
<td></td>
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</tr>
</tbody>
</table>

According to the tables 3 and 4, the serum value of copper in pregnant and non-pregnant cows was 0.21±0.84 and 0.21±0.87, respectively. Also, the serum value of ceruloplasmin in pregnant and non-pregnant cows was 0.87±3.68 and 0.94±3.81, respectively. So, based on ANOVA comparative test, there was no significant difference in serum values of copper and ceruloplasmin in term of pregnancy.

Table 3: comparison of serum values of copper in term of pregnancy

<table>
<thead>
<tr>
<th>Group</th>
<th>No.</th>
<th>Mean (ppm)</th>
<th>F</th>
<th>t</th>
<th>df</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-pregnant</td>
<td>159</td>
<td>0.21±0.87</td>
<td>0.28</td>
<td>1.41</td>
<td>314</td>
<td>0.158</td>
</tr>
<tr>
<td>Pregnant</td>
<td>157</td>
<td>0.21±0.84</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4: comparison of serum values of ceruloplasmin in term of pregnancy

<table>
<thead>
<tr>
<th>Group</th>
<th>No.</th>
<th>Mean (mg/dl)</th>
<th>F</th>
<th>t</th>
<th>df</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-pregnant</td>
<td>159</td>
<td>0.94±3.81</td>
<td>0.69</td>
<td>1.22</td>
<td>314</td>
<td>0.223</td>
</tr>
<tr>
<td>Pregnant</td>
<td>157</td>
<td>0.87±3.68</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Discussion and conclusion

Copper proteins have diverse roles in biological electron transport and oxygen transportation, processes that exploit the easy interconversion of Cu (I) and Cu (II). The biological role for copper commenced with the appearance of oxygen in earth's atmosphere. The protein hemocyanin is the oxygen carrier in most mollusks and some arthropods such as the horseshoe crab (Limulus polyphemus). Because hemocyanin is blue, these organisms have blue blood, not the red blood found in organisms that rely on hemoglobin for this purpose. Structurally related to hemocyanin are the laccases and tyrosinases. Instead of reversibly binding oxygen, these proteins hydroxylate substrates, illustrated by their role in the formation of lacquers. Copper is also a component of other proteins associated with the processing of oxygen. In cytochrome c oxidase, which is required for aerobic respiration, copper and iron cooperate in the reduction of oxygen. Copper is also found in many superoxide dismutases, proteins that catalyze the decomposition of superoxides, by converting it (by disproportionation) to oxygen and hydrogen peroxide. Several copper proteins, such as the "blue copper proteins", do not interact directly with substrates, hence they are not enzymes. These proteins relay electrons by the process called electron transfer.

Ozan, in his study, examining the zinc and copper levels between the healthy group of sheep and the group dropping its spring wool found that, the blood serum zinc level average of the healthy group was 27 ± 0.63 and the copper level was 33.72 ± 0.77 μg/100 ml and in the spring wool dropping group, it was respectively 14.45 ± 0.25 and 63.5 ± 1.17 μg/100 ml. This may be due to the conditions of the environment and the climate and especially the trace element consistency of the soil and to the various races of the sheep (Ozan, 1985).

It is reported that the level of plasma copper in sheep shows differences according to the level of the copper and antagonists (Pb, CaCO3, Zn, Mo, S) in the norishment, environment and seasons, drought and rain, and pregnancy (Chergariu, 1978). Lorentz and Gibb reported that the plasma copper concentration should be more than 50 μg/dl normally, and decrease in production. So in order to search the effects of these substances, the normal values should be known. With this study determining the normal values of the copper element which have great importance on the growing of the animals in and around Kars that have a wide potential of stockbreeding, and finding that there aren’t any great differences in sanjabian races, led to thought that this study will be useful in the diagnosis of lots of diseases and can light the way to the further coming studies.

References