EFFECT OF SUPPLEMENTATION OF VITAMIN E AND SELENIUM ON SERUM ENZYME PROFILES IN HALLIKAR CATTLE DURING DIFFERENT SEASONS

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ABSTRACT

A study was carried out to assess the influence of summer stress and effect of supplementation of vitamin E and selenium during different season on serum enzyme activities, *i.e*., aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) in Hallikar cattle. In the control group, activities of AST, ALT and ALP were significantly ($P<0.05$) higher during the summer season compared to winter season and rainy season. Further, the activity of all the enzymes were significantly ($P<0.05$) reduced in supplemented group compared to control group during summer, winter and rainy season.

KEY WORDS : Summer stress, antioxidants, ALT, AST and ALP

INTRODUCTION

High environmental temperature during summer months challenges the homeostatic system of the animal and stimulates the production of free radicals which cause damage to the healthy cells (Singh *et al*., 2014). Exposure to high ambient temperature evokes a series of changes in biological functions which include reduced feed intake, feed efficiency and utilization, disturbances in metabolism of water, protein, energy, and mineral balances, hormonal secretions, enzymatic reactions and blood metabolites (Marai and Haeeb, 2010).

The normal serum levels of aspartate transaminase (AST) and alanine transaminase (ALT) are indicative of animal health (Gupta *et al*., 2013) and the ability to survive and adapt to the thermal stress are associated with changes in biochemical responses and gene expression at the cellular level (Sharma *et al*., 2013). Though the information on the effect of summer stress on enzymatic profile and its amelioration by antioxidant supplementation in cross breed cattle is available, there is paucity of such information in the indigenous breed like Hallikar cattle. Therefore, the present study was undertaken to ascertain the effect of summer stress and supplementation of antioxidants on certain serum enzymatic profile in Hallikar cattle.

MATERIALS AND METHODS

Present study was conducted at Madbal village of Magadi Taluk, Ramanagar District, during three seasons of the year (January to August 2014) with two months representing each season. Study period included winter months (January and February), summer months (April and May) and rainy months (July and August). A group of twelve apparently healthy female Hallikar cattle aged between 4 and 6 years were randomly selected for the study. All the animals were maintained in semi-intensive management system with similar feeding practices in the farmer's premises. Selected animals were divided into two groups, *viz*., control group and supplemented group, with six animals in each group. Animals of both the groups were exposed to natural environmental stressors for three different periods of the study. The animals of control group received only maintenance diet, whereas the supplemented group received vitamin E (D-Alpha Tocopherol Acetate: 1000 IU/day/

animal) and selenium (Sodium Selenite: 0.3 ppm / kg dry matter intake) in addition to maintenance diet during the study period.

Blood samples were collected from all the selected animals on the last day of every month in the respective period during all the three seasons. About five ml of blood sample was collected in clot activator coated vial from each animal and was transported to the laboratory in refrigerated temperature within an hour after the collection. Clotted blood samples were centrifuged at 700 × g for 15 minutes to obtain the serum. The serum obtained from each sample was immediately analyzed for the aspartate aminotransferase (AST) and alanine aminotransferase (ALT) and alkaline phosphatase (ALP) activity. Serum enzyme activity was determined at 37 °C with the help of Microlab 300 semi- automated biochemical analyzer supplied by Merck Pvt. Ltd, Mumbai, using commercially available reagent kits manufactured by Transasia Bio-medicals Ltd., Baddi, Dist. Solan, (HP). The obtained data were analyzed using computerized statistical software programme, GraphPad Prism version 5.01 (2007) by applying two-way ANOVA with Bonferroni post test.

RESULTS AND DISCUSSION

Significant increase in AST and ALT activity in serum during summer season compared to winter season and rainy season observed in the control group in the present study (Table 1) could be due to oxidative stress induced hepatocellular damage and leakage of intracellular enzymes leading to their increased levels in blood stream. Significant reduction in activity of both the transaminases as well as ALP during all the three seasons (Table 1) was observed due to Vitamin E and selenium supplementation.

Table 1. Mean ± SE values of serum aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) activity (IU/L) during different seasons in Hallikar cattle (n = 6).

Season	Aspartate aminotransferase Activity		Alanine aminotransferase Activity		Alkaline phosphatase Activity	
	Control Group	Supplemented Group	Control Group	Supplemented Group	Control Group	Supplemented Group
Winter	68.27 ± 1.35^{aA}	59.69 ± 1.92^{aB}	44.55 ± 1.84^{aA}	35.03 ± 1.14^{aB}	112.64 ± 1.32^{aA}	79.06 ± 1.24^{aB}
Summer	85.23 ± 1.54^{bA}	69.32 ± 1.00^{bB}	63.04 ± 2.16^{bA}	46.78 ± 2.55^{bB}	139.75 ± 1.47^{cA}	90.49 ± 1.38^{bB}
Rainy	80.08 ± 1.02^{cA}	64.76 ± 1.31^{cB}	40.54 ± 1.17^{aA}	30.54 ± 1.01^{aB}	133.57 ± 0.91^{bA}	86.22 ± 1.78^{bB}

The values with different superscripts within a column (a, b and c) and within a row (A and B) for a specified enzyme differ significantly ($P<0.05$).

Serum ALT could be used as one of the most universal markers for hepatic injury across species and its low concentration in peripheral circulation indicates normal cell turnover or release from nonvascular sources. But, their levels in the serum indicate hepatic injury (Amacher, 1998). The higher levels of serum ALT during summer season observed in the control group could be the result of increased oxidative stress in the summer which was in conformity with the reports of increased ALT activity during summer in White Fulani cows, which was attributed to the deranged energy

metabolism during summer (Al-Saeed *et al*., 2009). The significant reduction of ALT activity in the supplemented groups indicated that the provision of antioxidants could be beneficial in protecting the organisms against any stress.

The ALP activity was significantly (P<0.05) reduced in the supplemented group compared to control group during all the seasons of the study. ALP is found in many tissues including bone, liver, intestine, kidney, placenta and germ cells (Sarkar, 2012) and during altered bone metabolism (Chandra *et al*., 2013). Higher serum levels of ALP observed in the present study in the control group could be due to oxidative stress injury to the organs. The supplementation of vitamin E and selenium during stress could protect the cells from the oxidative injury. It was concluded that the significant reduction in the AST, ALT and ALP activities in vitamin E and selenium supplemented group compared to control animals in Hallikar cattle could be due to protection of the vital organs including liver by their antioxidant property.

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