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Factors Affecting Plasma Contents of Thiamine and Ascorbic Acid in Camels (*Camelus dromedarius*)

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Abstract: The study was designed to investigate the effect of age, breed, sex and breeding season on thiamine and ascorbic acid status (AA) in camels (Camelus dromedarius). A total of 375 camels were sampled over a one-year field survey in Butana area, Central Sudan. No effect of sex on thiamine and ascorbic acid levels was observed. The breeding male and female camels showed higher status of plasma thiamine and lower ascorbic acid as compared to non-breeding camels. Thiamine plasma contents showed variation with respect to age. The thiamine plasma levels for neonate, yearling and adult were 59.9±4.4, 70.5±8.9 and 88.9±6.7 μg L^{-1}, respectively. The corresponding figures for AA were 6.2±1.0, 4.9±0.9 and 4.5±0.8 mg L^{-1}, respectively. The Arabi showed higher ascorbic acid (5.9±1.0) than Anafi (4.2±0.9 mg L^{-1}). However, no significant breed variation for thiamine status was indicated.

Key words: Ascorbic acid, camel, thiamine

INTRODUCTION

Vitamin nutritional requirements in camels grazing on natural vegetation received little attention. Both thiamine and Ascorbic Acid (AA) are not dietary requirement for ruminants because they are synthesized endogenously by the rumen micro flora[1] and the liver [2], respectively. However, under various physiological stressor such as breeding season[3] and pathological[4], reduced AA status in camels was reported.

The supply of thiamine and the other vitamins can be compromised by alterations to the diet and the racing activity[5], or high sulphate water levels[6]. An optimum blood status of water-soluble vitamins in crucial for an animal living solely on the desert vegetation. The cited literature indicated very poor and scarce information of vitamin status in camels and camelids. Therefore, the current investigation was performed to through lights on factors affecting the plasma levels of ascorbic acid and thiamine in Sudanese camels, in an attempt to establish baseline levels.

MATERIALS AND METHODS

A field survey was conducted in Butana area using 375 Arabi and Anafi camel beloging to Lahawiyin tribe. Apparently healthy camels were randomly selected.

Sample collections and analysis: Blood samples were collected from the jugular vein in heparinized tubes. The plasma was separated from the blood cells by centrifugation for 15 minutes (3000 g at 4°C). 2 mL of plasma were added to 3 mL of tricholoroacetic acid (TCA) with vigorous stirring and were kept for 1 hr in the dark room temperature. After buffering with 0.8 mL sodium acetate, 0.2 mL clara-diastase solution was added and the tube was shaken in a water bath for 3 hrs at 4°C. After cooling and centrifuging, the clear supernatant was analysed according to Botticher and Botticher[7]. A solution containing 2.55% (v/v) (metaphosphoric acid; plasma: acid; 2:1) was added to the plasma and the mixture was frozen until thawed just prior the analysis. The storage period was less than1 week. Plasma AA content was determined by HPLC[8].

A capillary zone electrophoresis method with high-sensitivity cell (Z-cell) has been developed for the determination of thiamine in plasma[9]. For the quantitative assay of thiamine in plasma it is necessary to precipitate the protein component. Good results were achieved by treating the sample with acetonitrile (1:3, v/v). The samples in the biological media were analysed using a calibration curve for thiamine concentrations between 0.1 and 200-microg mL^{-1}[9].

RESULTS AND DISCUSSIONS

The current investigation indicated higher thiamine and lower AA during breeding than non-breeding season, irrespective of sex (Table 1). Significantly higher thiamine plasma levels were obtained in adult than in yearling and the neonate showed the lowest level. However, ascorbic acid was higher in neonates than yearling than adult camels (Table 2.). Ascorbic acid showed significant breed variation, but thiamine showed no change (Table 3).

Table I: Effect of breeding season on thiamine (μg L^{-1}) and ascorbic acid (mg L^{-1}) plasma levels in camels (*Camelus dromedarius*)

	Breeding season		Non-breeding season	
Category	Thiamine	Ascorbic acid	Thiamine	Ascorbic acid
Male	83.7±4.4^{x}	2.30±0.82^{a}	66.8±5.1^{y}	4.73±0.7^{b}
Female	79.8±6.0^{x}	2.41±0.7^{a}	63.0±3.9^{y}	4.01±0.9^{b}

^{a,b}Means on the same raw having different superscripts are significantly different at p<0.05 ^{x,y}Means on the same raw having different superscripts are significantly different at p<0.05 Values are expressed as means±SD

Table 2: Effect of age on thiamine and ascorbic acid plasma levels in camels (*Camelus dromedarius*)

Age group	Thiamine (μg L^{-1})	Ascorbic acid (mg L^{-1})
Arabi	69.9±4.4a	5.9±1.0a
Anafi	71.5±5.9a	4.2±0.8b

^{a,b,c}Means on the same raw having different superscripts are significantly different at p<0.05 Values are expressed as means±SD

Table 3: Effect of breed on thiamine and ascorbic acid plasma levels in camels (*Camelus dromedarius*)

Age group	Thiamine (μg L^{-1})	Ascorbic acid (mg L^{-1})
Neonate	59.9±4.4^{a}	6.2±1.0^{a}
Yearling	70.5±8.9^{b}	4.9±0.9^{b}
Adult	88.9±6.7^{c}	4.5±0.8^{c}

^{a,b,c}Means on the same raw having different superscripts are significantly different at p<0.05 Values are expressed as means±SD

Though, camelids can meet their thiamine and vitamin C status by microbial and hepatic synthesis, respectively, an increase in vitamin requirements owing to physiological and pathological stressors have been indicated[3,4]. Thiamine deficiency has been reported in goat, buffaloes[10] and camel[11] and it causes cerebrocortical necrosis. The higher ascorbic acid plasma levels reported in the neonates may be due to high number of calves sampled (less than four months of age), having ample supply of milk containing higher ascorbic acid[12]. However, the lower thiamine in adult may relate to functional rumen and feeding of concentrate at the expense of forage.

The present study indicated higher thiamine status in camels than the level reported in racing camels in the United Arab Emirates[11]. This may be attributed to training and racing and or increased grain content in the diet at the expenses of forages, affecting microflora by production of thiaminase type II, which hydrolyses thiamine. The poor racing performance was related to the low thiamine status in camels (Mohamed, personal communication).

Arabi camels have a heavy posture and pinkish appearance and used for packing purposes. However, Anafi have lighter color and longer neck and used for racing. Camels are seasonally polyestrous, with a peak of sexual activity in Sudan from November to February corresponding to the winter season. During the breeding season, higher thiamine and lower ascorbic acid plasma levels were observed. The reduction may be attributed to high cortisol levels during high breeding activity, increasing the demand for ascorbic acid. Similar data for lowered AA in breeding camels, irrespective of sex and seasonality of pasture caused no effect on ascorbic acid blood status of camels[3].

It could be concluded that detailed investigation of these vitamins in relation to race and productivity needs to be further investigated.

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