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ASSESSMENT OF SELENIUM CONTENT IN PASTURE AND EWES IN PUNJAB, PAKISTAN

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Abstract

The current research was carried out at Rakh Khaire Wala, Punjab, Pakistan. The most developed station for sheep farming. The aim of the study was to determine and collect data on selenium contents of soil, forages along with blood plasma and milk so as to gain information on the deficiency and/or excess of selenium levels for ruminants grazing therein. The livestock farm was visited eight times during the study year so as to determine the effect of sampling periods on the selenium contents of various samples. The mean Se concentrations of soil, forage, plasma, and milk sampled in the study were: 0.041 and 0.035 mg/kg for soil and forages and 0.036, 0.0054 mg/L for plasma and milk, respectively. These values are considered to be indicative of inadequate but point to the dietary supplementation. Based on the results of this study, it is recommended that in this animal pasture, it is necessary to monitor the Se in animals so as to maintain adequate nutrition for achieving vigorous ewes.

Introduction

Selenium is an essential microelement for all type of animals. Selenium like all other trace elements plays an important role in ruminants. Early interest in Se was related particularly to its toxic effects, but later investigations showed that insufficient Se supply can result in several disorders, such as reproductive failure, muscle degeneration and functional and physical damage to cell membrane (Shamberger, 1983; Milad and Kovac, 1998). The Se requirement for sheep is 0.10 – 0.20 mg/kg. The information regarding the absorption and pathway of Se from gastrointestinal tract is limited. It is known that it is absorbed mostly from the upper small intestine however, no absorption of Se take place from the stomach, rumen or abomasum (Barbezat *et al.*, 1984).

The absorbed Se travels in the plasma on a protein to its target tissue (James *et al.*, 1989). It is deposited more readily when it is in an organic form. Selenium is readily transferable through the placenta and the mammary barrier so the animal's status will affect offspring and milk concentrations. The primary routes of excretion are through the urine and the faeces (McDowell, 1992). It has been found that the microorganisms in the rumen may convert Se into insoluble compounds, causing the ruminant to absorb less than its monogastric counterpart (Rechcigl & CRC, 1978). It has also been suggested that more Se is absorbed when administered with a high-protein diet, although the reasons have not been confirmed (Underwood, 1981).

In livestock, in various regions of the world many malnutrition diseases are related to Se-imbalance in soil and forage. Many studies have revealed non-consistent relationship to Se concentration of forage and other diets. It has been reported that concentration of Se in animal's tissues increases with increase in Se in diet. Blood plasma and liver are excellent indicators of dietary Se in ruminants (McDowell *et al*., 1984; McDowell, 1985, 2003).

The aim of the present study is 2-fold. The first was to determine the plasma and milk levels of Se of ewes grazing in the meadows along with soil and forage Se levels and to determine whether there is any deficiency of this element. The other aim was to determine the differences in its concentration among the various periods of sampling of pasture and animal samples along with evaluation of pasture and animal Se concentrations so as to establish laboratory reference value for pasture samples and ewes in the semi arid ranch in Punjab, Pakistan and to have the knowledge for supplementation requirements to the grazing animals in this ranch.

Materials and Methods

The investigations were conducted at the Animal Research Unit, south-western part of Punjab, Pakistan. In general, soils are sandy and low in natural fertility. Twenty (20) ear-tagged ewes (3-5 years-old) in their second lactation were evaluated for Se status. The investigation was divided into eight collection periods for soil, forage, blood, plasma and milk. During the study, ewes were confined to natural pastures having predominately various grasses, legume and crop wastes. Description of pasture, animal management and procedure for sample collection and preparation for Se determination florimetrically and statically analysis has been described elsewhere by Khan *et al*., (2005).

Results and Discussion

Determination of the Se status of grazing farm animals is an appropriate clinical practice. Evaluation of the Se results requires knowledge of differences to species, age, sample type and experience with the analytical technique (Stowe & Hordt, 1992).

Mean Se concentrations of different samples by sampling periods are presented in Table 1. Differences in Se concentration in different samples were found among different periods of collection. Se concentration in soil varied from 0.035–0.059 mg/kg during the sampling periods with the highest concentration found at sampling period 7 (P_7), and lowest at the period 4 (P_4), respectively. Cary *et al*., (1967) reported that soil Se concentrations of 0.5 mg/kg were found in areas where Se deficiency occurs. Based on this critical value, all soil samples were considered deficient in Se. McDowell *et al*., (1982) reported similar low level of soil Se in Florida with values ranging from 0.020–0.038 mg/kg, but Khan (2003) found higher soil Se concentration compared to those found in the present study, ranging from 0.055–0.077 mg/kg in Pakistan.

Forage Se was found to be highest at sampling periods (P_2) and the lowest value at sampling period (P_8), ranging from 0.020–0.049 mg/kg, respectively. All forage samples analyzed were found to be deficient in Se in relation to the requirement of 0.1 mg/kg for ruminants as recommended by Anon., (1984). Similar deficient forage Se concentrations for Pakistan and other countries have already been reported (McDowell e*t al.,* 1982; Khan *et al.,* 2005).

Table 1. Mean selenium concentration in soil, forage, plasma and milk at different sampling periods.

Variable	Sampling periods								
	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	Mean
Soil (mg/kg)	0.038	0.045	0.048	0.035	0.038	0.057	0.059	0.047	0.041
Forage (mg/kg)	0.038	0.049	0.047	0.045	0.032	0.025	0.022	0.020	0.035
Plasma (mg/L)	0.025	0.032	0.038	0.049	0.042	0.035	0.038	0.028	0.036
Milk (mg/L)	0.0048	0.0057	0.0052	0.0058	0.0049	0.0060	0.0065	0.0041	0.0054

All values are mean of five replicates.
P_1– P_8 indicates sampling periods.

Mean plasma Se values varied among sampling periods. Period 5 (P_5) showed higher mean plasma Se concentration than those recorded at other periods. These values ranged from 0.025–0.049 mg/kg in sampling periods from P_1 to P_5, respectively. In most of the plasma samples, Se concentrations were below the critical concentration of 0.03 mg/L as suggested by McDowell *et al.*, (1984). Perry *et al.*, (1976) suggested that tissue concentration of Se increased with increase in intake of Se by the ruminants.

In lactating sheep, Se concentrations in milk was higher at the sampling period (P_7) compared to other periods at the other periods but the lowest level was found at the sampling period 8 (P_8), but the pattern of increase or decrease in milk samples taken at different periods were not consistent. Milk Se concentrations found in this study were below the critical level of 0.02 mg/L established by Miles *et al.*, (2001). Similar values of milk Se have already been reported by McDowell *et al*., (1990) and Khan *et al*., (2005). Perry *et al*., (1976) described that milk Se concentrations were not a good indicator of picture of Se intake by the livestock. Ammerman *et al*., (1980) observed milk Se concentration in animals declined from 0.015 mg/L two weeks after calving to 0.010 mg/L at eight week. Milk Se contents ranging from 0.029–0.064 mg/L have been reported in dairy animals by Maus *et al*., (1980). Campbell *et al*., (1990) indicated that even though milk Se was higher in ewes, the actual amount of Se in milk appeared to be too little to be of any nutritional importance in deficient young ones.

Based on this study it is concluded that continued monitoring of Se in plasma/ serum of grazing ruminants is important at this ranch, and it is necessary to maintain adequate nutrition and performance in grazing ewes.

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