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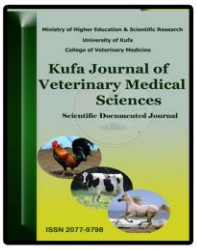

Effect of some minerals in soil and forage on same minerals in cattle plasma at three sites in the province of Thi-Qar

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Abstract

The objective of this investigation is to evaluate the level of the some minerals (sodium, potassium and calcium) in the soil, forage and Cattle plasma, the specimens taken from three districts (Nasriya, Shatra and Sookalshukh) in Thi-qar province. Results showed an increase in the concentration of sodium element in soils Nasiriya, potassium, calcium element in soils Sookalshukh region compared to other regions, while plants Sookalshukh region showed the highest concentration of sodium and calcium either the Nasiriya area showed the highest concentration of potassium compared to other regions.

The results show that significant ($p \leq 0.05$) increase in the cattle plasma sodium concentration in Nasriya region compared with the Shatra and Sookalshukh , significant ($p \leq 0.05$) increase in Cattle plasma potassium concentration in Nasriya district compared with Shatra and Sookalshukh but there is significance ($p \leq 0.05$) change found in Cattle plasma calcium in shatra compared with the two studied areas. There was a highly significant between grass and animal sodium and potassium element, soil and grass and animals of the calcium element.

Key words: sodium, potassium, calcium , Cattle plasma, soil, grass

Introduction:-

Mineral status of soil-plant- animal is interrelated (Sharma *et al*. 2002). Hence deficiency or excess of one may affect the status of other and vice versa. There appears to be a definitive role of mineral deficient soils to cause deficient levels in ration (Mc Dowell and Conrad, 1990). Based on the abundance in the body, the minerals are divided into macro minerals and micro minerals, the latter sometimes referred to as trace elements. The original basis for this categorization was the analytical methods used, providing possibilities to quantify the amount of macro minerals, while the micro minerals could only be found, not quantified. The terms macro and micro minerals have been defined differently by different authors, but the term macro minerals always includes calcium, phosphorus, magnesium, sodium, potassium, chloride and sulphur Earlier, the feeding of ruminants with normal diets composed of grass and supplemented with grain was assumed to provide sufficient mineral compounds, as long as the animal had access to sodium chloride. However, it must be noted that the production rate of animals in those

days was much lower, especially that of animals in the Western world, where production capacity has increased enormously (Cecilia Kronqvist, 2011).

Elemental concentration of different forages is mostly affected by soil characteristics including pH, fertilization practices, drainage system, plant species forage stage of maturity and, various types of interactions among different mineral elements, (Velasquez-Pereira et al., 1997). When animals depend exclusively on forage plants to fulfill their fodder requirements it is necessary to identify various attributes that may change forage composition and to measure strategy program to improve livestock productivity and performance (Velasquez-Pereira et al., 1997). Variable environmental limitations in the subtropical and semiarid region including drought stress during dry season, elevated temperature and intensity of light radiations result in low level of soil elemental composition. These conditions impose many restrictions on the achievement of primarily goal for the maintenance of suitable forage plant production and their quality which has been considered to support required levels of ruminant's production. The composition of the elemental concentration varies with the change of season and sites and period of sample collection, which in turn may affect elemental profile of animal consuming these forages. This situation may limit the animal production due to imbalances of minerals in the forage diet (McDowell, and Conrad, 1977), (Songonzoni et al., 1996).

The prominent and devastating consequences of mineral deficiency are the delayed puberty of heifers and late and low productivity of cows which is often correlated with long calving duration (McDowell, 1985).

Soil plays a significant role in cattle production and health because cattle obtain their nutrient needs from the feed and fodder, which in turn obtain nutrients from the soil. The role of soil and nutritional quality of plants with respect to the health and production of livestock is very important and varies from place to place (Abdelrahman *et al*., 1998). Plants are the basic and potential source of food for animals; ultimately the nutritional values of plants are of central importance in determining the plants and human health (Aleš Pavlík *et al*., 2013).

Material and Methods:

The present study was conducted in three district in Thi-qar province (Shatra, Nasriya and Suqalshukh). The Soil, forage and serum samples were collected Randomly from the study areas. Ten serum samples collected from each district, Samples were haphazardly chosen in the parts of the animal grazing land where animals were presently grazing. The processed samples were use for estimation of serum minerals (Ca, K, and Na) of cattle by using Spectro- photometer (T 80) manufactured by UK, and Human Kit to estimation of minerals of cattle serum.

Soil samples were taken from areas at 0 – 30 cm depths, the soil texture was loamy with pH ranging from 7.5 to 8.4.

The determination of calcium done by titration with (EDTA) (0.01 N), sodium and potassium are determined by Flam photometer, (Page *et al*., 1982).

STATISTICAL ANALYSIS

For statistical evaluation, data were expressed as mean ±Sd (n=10) and One-way ANOVA were performed.

Results:

Table (1) show the concentration of sodium, potassium and calcium in cattle plasma at different locations of Thi-qar province (n=10)

Parameters Location	sodium	potassium	calcium
Nasriya	11.10c ±2.30	13.23a ±1.59	0.47a ±0.21
shatra	35.39b ±9.02	11.57b ±1.86	0.30b ±0.06
sookalshukh	81.76a ±17.08	11.32b ±1.17	0.49a ±0.16
LSD	24.29	1.66	0.17

- The different letters refer to significant differences between groups at level of ($p \leq 0.05$).

Table (1) represents the Level of sodium, potassium and calcium in cow serum in different regions (Nasryia, Sookalshukh and Shatra) in Thi-qar province

The results in table (1) appears that significant ($p \leq 0.05$) increase of sodium Level in cattle serum of Sookalshukh region compared with Nasryia and Shatra, But the Level of sodium in the Shatra region shown significant ($p \leq 0.05$) increase compared with Nasryia region and show significant ($p \leq 0.05$) decrease compared with the Sookalshukh at the same time but the low sodium Level in cattle serum appear of Nasryia as significant ($p \leq 0.05$) decrease compared with the other regions.

The table (1) also shows significant ($p \leq 0.05$) increase in potassium Level in Nasryia region compared with other regions, But there are no significant ($p \leq 0.05$) differences appear between Sookalshukh and Shatra in Level of potassium cattle serum.

The calcium Level appears in table (1) as significant ($p \leq 0.05$) decrease in Shatra region compared with Nasryia and Sookalshukh regions at the same time there are no significant ($p \leq 0.05$) differences found between the Sookalshukh and Nasryia regions in the calcium level in cattle serum.

Table (2) some minerals concentration percentage in the ccattle plasma, plants & soils of Thi-qar province (Nasria, Shatra and Sookalshukh)

Elements Location	K% Soil	K% Plant	K% Animals
Nasryia	4.10	4.11	13.23
Shatra	4.20	2.55	11.57

Sookalshukh -0.043sp 0.758 pa -0.684	**4.94**	**3.42**	**11.32**

Elements Location	**Ca% Soil**	**Ca% Plant**	**Ca% Animals**
Nasryia	**6.40**	**1.36**	**0.47**
Shatra	**6.05**	**3.11**	**0.30**
Sookalshukh 0.262 sp -0.415 pa 0.770 sa	**7.37**	**3.11**	**0.49**
Elements Location	Na% Soil	Na% Plant	Na% Animals
Nasryia	**9.28**	**3.69**	**11.10**
Shatra	**9.11**	**3.21**	**35.39**
Sookalshukh -0.933 sp 0.855pa -0.984sa	**8.32**	**5.5**	**81.76**

- s= soil, p=plant, a=animal

Table (2) show the concentration percentage of sodium which appear in high percentage in the Sookalshukh and the low percentage found in the shatra, The potassium concentration percentage available in Nasryia as high percentage and the low percentage occur in Shatra region.

The concentration percentage of Calcium found as high in the Shatra and the lowest percentage occur in the Nasry

Table (2) represented the concentration percentage of minerals in the soil of the three regions of Thi-qar province which appear there are high concentration percentage of sodium in the Nasryia but the low percentage found in the Sookalshukh, Potassium concentration percentage occur as high in the Sookalshukh in contrast the lowest percentage available in the Nasryia, Finally The Calcium concentration percentage appear in high percentage in the Sookalshukh and the lowest occur in the Shatra region.

Discussion :

In the (1)and (2) tables we show that the concentration of the sodium in the cow plasma is high in the Sookalshukh and then Shatra and then Nasryia city, and this is similar in the case of plant minerals percentage in which the high level of sodium of plant found in the Sookalshukh and then Nasryia and then Shatra, but the high level of sodium of soil occur in the Nasryia and then Shatra and then Sookalshukh, This is case explained by Hoekstra, 1973 which mentioned that The

availability of minerals depends on the concentration and chemical form of these elements in the soil. The availability of minerals in the soil depends upon the effective concentration in soil solution (Hoekstra, 1973), which is influenced by pH, moisture, organic matter, leaching, presence of other elements and microbial activity of soil (Burk, 1978; Williams, 1977).

The level of the calcium and potassium have relationship among them in which the most high level of potassium associated with the low level of sodium and visa versa and this is agree with mary and susan, 2012 which saw that In dairy cattle feeding, alfalfa is often avoided in the diet of dry cows, not because it is too high in calcium but because high potassium levels in heavily fertilized alfalfa interfere with magnesium absorption, and low magnesium then induces hypocalcemia. If dairy sheep are being fed alfalfa hay or haylage from cow dairy farms, avoid feeding forages with a potassium concentration substantially above 1%. Based on recommendations for dairy cattle, the potassium to magnesium ratio in the ration in late pregnancy should not exceed 4:1(mary and susan, 2012).

The low level of calcium in cow can due to their low content in locally available feedstuffs and drain of calcium through lactation(Bhat etal.,2011).The mineral inter-relation among soil, plants and animals revealed that there was non-significant negative correlation for calcium between soil and forage and soil and serum, which might be due to excessive usage of nitrogen fertilizers that might have led to reduction in uptake of calcium by plants (Underwood and Suttle, 1999). Calcium also revealed non-significant positive correlation between forage and serum(Bhat *et al*.,2011).

Calcium in serum is exaggerated only by sever shortage and is intimately synchronized hormonally. Consequently, Ca in feeds would be an additional dependable criterion to asses Ca composition in cattle, higher serum Mg was advanced ($p < 0.05$) in dry cows (Reinhardt *et al*., 1988).

References

- Abdelrahman, M.M. – Kincaid, R.L – Elzubeir, E.A. 1998. Mineral deficiencies in grazing cattle in Kardofan and Darfur regions in the eastern Sudan. In Tropical Animal Health Production, vol. 30, 1998, p. 123–135.
- Aleš Pavlík, Petr Škarpa, Petr Sláma, and Zdeněk Havlíček. (2013). Iron concentration in soil, pasture and blood plasma of beef cattle reared in suckling cows system. Journal of Microbiology, Biotechnology and Food Sciences. 2 (Special issue 1) 1526-1530.
- Bhat, M. S.; Shaheen, M.; Zaman R.; and Muhee A.(2011). Mineral Inter-relationship among Soil, forage and Dairy cattle in Kashmir, India. Vet. World, Vol.4(12):550-553.
- Burk, R.F. (1978): Selenium in nutrition. World Record on Nutrition Diet, 30:88-106.
- Cecilia Kronqvist.(2011). Minerals to Dairy Cows with Focus on Calcium and Magnesium Balance. Doctoral Thesis, Swedish University of Agricultural Sciences Uppsala. Print: SLU Service/Repro, Uppsala. Pp9.
- Hoekastra, S.L. (1973): Biochemical role of Selenium, In: Trace Element Metabolism in Animals-2. Pp. 61-77. Baltmore: University Park Press.
- Mary C. Smith DVM and Susan M. Stehman VMD. (2012)FLOCK HEALTH

MANAGEMENT FOR DAIRY SHEEP. New York State College of Veterinary Medicine Ithaca, New York .

- McDowell LR, and Conrad JH (1990). Mineral imbalances of grazing livestock in tropical countries. Int. J. Anim. Sci., 5: 21-32.
- McDowell, L.R. and J.H. Conrad, 1977. Trace mineral nutrition in Latin America. World Anim. Rev., 24: 24-33.
- McDowell, L.R., 1985. Nutrition of Grazing Ruminants in Warm Climates, 1st ed. Academic Press, New York, pp: 443.
- Page, A.L. ;Miller, R.H.; and Keeney, D.R.(1982). Methods of Soil Analysis. Part 2.Chemical and Microbiological properties. 2nd. Ed. Am. Soc. Agron. Inc. Soil sci. Soc. Am., Inc. madison, Wisconsin. USA.
- Reinhardt, W., Paul, T.L., Allen, E.M., Alex, S., Yang, Y.N., Appel, M.C. and Braverman, L.E. (1988) Effect of l-thyroxine administration on the incidence of iodine induced and spontaneous lymphocytic thryoiditis in the BB/ WOR rat. Endocrin, 122, 1179-1181.
- Sharma MC, Joshi C, and sarkar TK (2002). Status of macro minerals in soil, fodder and serum of kumaun hills. Indian J. Anim. Sci., 73(3): 308-311.
- Songonzoni, M.G., L.R. McDowell, N.S. Wilkinson and J. Harrison, 1996. Identification of nutritional status, emphasizing minerals in Northwestern Zaire. Comm. Soil. Sci. Plant. Ana., 27: 2699-2712.
- Underwood, E.J. and Suttle, N.F. (1999): The Mineral Nutrition of Livestock, 3rd Edn. CABI Publishing, New York.
- Velasquez-Pereira, J.B., L.R. McDowell, J.H. Conrad, N.S. Wilkinson and F.G. Martin, 1997. Mineral status of soils, forages and cattle in Nicaragua I Micro-minerals. Rev. Fac. Agron., 14: 73-89.
- Williams, C.H. (1977): Trace metals and superphosphates: Toxicity problems. Journal of Australian Institute of Agriculture Science, 43: 99-109.