

Study of some minerals deficiency in grazing sheep in Thi-Qar province.

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Abstract

This study was carried out on 250 locally sheep collected from four sides of Thi-Qar Governorate. The clinical, hematological, trace elements changes in naturally occurring minerals deficiency in sheep were described. Anemia & Pale mucous membranes, Alopecia & steely wool, Diarrhea, parakeratosis, pica and abortion constituted the main signs and symptoms. The respiratory and heart rates were significantly higher ($p < 0.05$) in mineral deficient sheep than in normal control sheep in one side of province. Values of total erythrocyte count, hemoglobin concentration and packed cell volume were significantly lower ($p < 0.05$) in mineral deficient sheep than in normal control sheep. Significant differences were not found in total leukocyte count and differential leukocyte count values in sick and normal control sheep. Copper, Zinc and Iron values in the serum were significantly lower ($p < 0.05$) in mineral deficient than in normal control sheep. The erythrocytes morphology appeared a abnormal shapes and size, this refer to Macrocytic hypochromic anemia and Normocytic hypochromic anemia, It was concluded that a significant changes were noticed between diseased and control sheep in clinical hematological values and trace elements and abnormal erythrocytes morphology, deficiency of a single element seldom occurs under field condition in Thi-Qar Governorate.

Key words: Zinc deficiency copper deficiency, iron deficiency, sheep, hemoglobin, serum, erythrocytes morphology,

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. That's why the health of the organism is related to the soil on which it lives and the geological structure of the soil(1). 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(2,3). Zinc is a component of almost 300 enzymes (4). It is vital to the activity of a variety of hormones such as glucagons, insulin, growth hormone and sex hormones (5). It also plays a key role in the immunological responses (6). Zinc also plays a role in maintaining hoof tissues through stimulation of growth of epidermal cells, production of keratin, improved wound healing and improved

cellular integrity (7). Clinical signs of zinc deficiency include alopecia and thickening or keratinization of epithelial cells. Additional signs included growth retardation, swelling of the coronet, hock and knee joints, rough coat and congestion of the eye mucous membrane (8,9). Copper is required for the activity of enzymes associated with ferrous metabolism, elastin and collagen formation, melanin production and integrity of central nervous system (1). Copper is a cofactor of several metalloenzymes and other metalloproteins (such as ceruloplasmin, superoxide dismutase, cytochrome oxidase, lysyl oxidase, and metallothionein) (10). Primary copper deficiency developed when the copper content of the ration is less than animal requirements. Secondary deficiency produced when copper of the ration is

marginal but absorption and utilization of ingested copper is impaired by other minerals (11). These antagonistic minerals include molybdenum, sulfur and iron (9) The symptoms of copper deficiency in sheep include wool abnormalities as the fine wool becomes limp and glossy and losses its crimps. Moreover, the black wool showed depigmentation. Additional signs include anaemia, scouring, swayback and bone deformities (12,8). Copper deficiency affects various physiological characteristics that may be important in immunological

defense against pathogenic challenge (13). Copper deficiency induces hypochromic macrocytic anemia(2). Haemoglobin level and erythrocytic count are depressed in advanced cases of primary copper deficiency (8). This study was planned to reach a correct diagnosis of some minerals deficiency in grazing sheep in Thi-Qar province depending on the clinical and laboratory examinations, which included the levels of some blood parameters and mineral values in serum .

Materials and Methods

The study conducted in Thi-Qar province ,the area of the study is divided into: northern, southern, eastern, and western region 28 herds of sheep consisting of 5940 sheep were examined in Thi-Qar Province (Thi-Qar -Iraq). Among these sheep, a total of 250 ewes (1 year & over) were found to be affected with mineral deficiency and constituted the basis of the present study. mineral deficiency ewes were 45 west, 55 south, 52 north and 51 east. Additionally, 47 normal ewes were used as control. Both the clinical cases and the control sheep were of a local breed . All of the used sheep were negative for external parasites. Blood

samples were taken with and without anticoagulant from the jugular vein for hematological and trace element analysis. Values of erythrocyte Count (RBCC), hemoglobin(Hb), packed cell volume(PCV) & Total Leukocyte Count (WBCC) & erythrocyte morphology according to Coles (14). The zinc, copper and iron values were determined using atomic absorption spectrophotometer (Biotech engineering management, Co., Ltd. UK). The significance of variations in the various values of sheep with minerals deficiency and those of normal control sheep were analyzed statistically using SPSS version 11.5 (15).

Results and Discussion

The signs and symptoms of the 203 sheep are summarized (Table 1 and 2). These signs and symptoms arranged in order of decreasing frequency included Anemia &

Pale mucous membranes(M.M.) 54.8%, Alopecia & steely wool 32.4%(Fig .1) , Diarrhea 7.2%, parakeratosis 7.2% (Fig2), pica 6%, abortion 1.2% in (Table 1).

Table1: Signs & symptoms in ewes affected with minerals deficiency

Sings & symptoms	No. of cases	Cases (%)
Anemia & pale M.M.	137	54.8
Alopecia & steely wool	81	32.4
Diarrhea	18	7.2
parakeratosis	18	7.2
pica	15	6
abortion	3	1.2



Fig .1:A ewe affected with mineral deficiency, (alopecia in different parts of the skin)



Fig2: A ewe affected with mineral deficiency (parakeratosis)

Body temperature(Temp.) was similar in normal control and minerals deficiency ewes (Table 2). The respiratory rate (R.R.) was significantly higher ($p<0.05$) in sick sheep than in normal control sheep in east. Within the groups of diseased ewes, the respiratory rate was not significantly variations ($p<0.05$) (Table 2). The pulse rate(P.R.) was significantly higher ($p<0.05$) in sick ewes than in control ewes in east and west but not significantly variations between other group. Results of hematological examination of samples from control and diseased ewes are presented in Table 3. Values of R.B.C.C., hemoglobin concentration and packed cell volume were significantly lower ($p<0.01$) in minerals deficiency ewes than in normal control ewes, no significant differences were encountered in the W.B.C.C. of normal control and diseased ewes are shown in Table 3. Result of erythrocytes morphology appeared a abnormal shapes marked (Poikilocytosis)(Fig.:3) and variation in size (anisocytosis)(Fig.:4) and hemoglobin appeared pale ,this refer to Macrocytic hypochromic anemia and Normocytic

hypochromic anemia. Serum values of minerals in control and diseased ewes are presented in Table 4. Copper, Zinc, and Iron values were significantly lower ($p<0.05$) in diseased sheep than in control sheep. Wool abnormalities were usually related to deficiency of copper and zinc (2). The alopecia and the loss of crimp (steely wool) might be attributed to defective keratinization (16,17). The polypeptide chain of keratin fibers are cross-linked by disulphide bonds which are formed by oxidation of the $-SH$ group of the cysteinyl residue present in the polypeptide chain. This process is copper-dependent and affects the chemical and physical properties of wool and hair (17,18). Results of blood picture (Table 2) indicated a significant decrease of the values of haemoglobin (Hb) and erythrocytic count (RBCC). This decrease might be due to disturbance in the regular metabolism of iron as copper deficiency decreases the absorption of iron, releasing of iron from body stores and utilization in haemoglobin synthesis (1,2), and this result reported also by Al Saad *et al.*,(19); Al Kalidi (20); Al-Shawi(21)

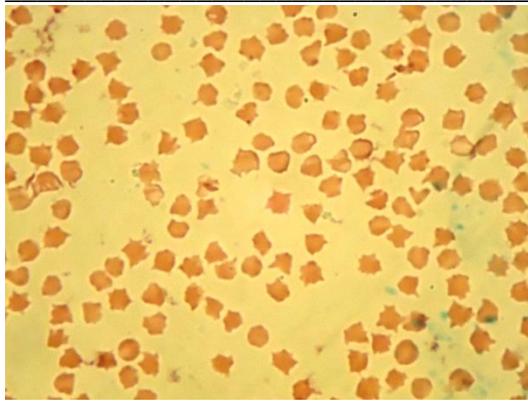


Fig3: Poikilocytosis

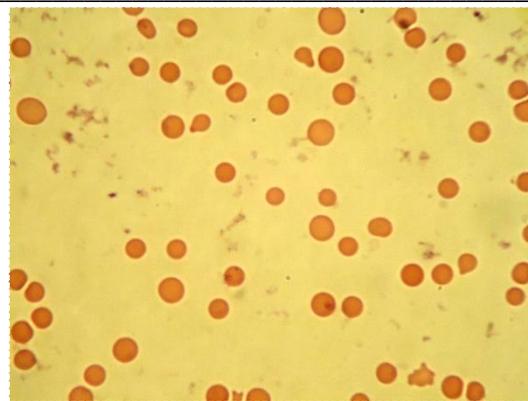


Fig 4: Anisocytosis

Result of Diarrhea is cause by villous atrophy and ,major clinical finding in secondary copper deficiency associated with molybdenosis (8,12).More over depression of cytochrome oxidase activity may result in the defective synthesis of phospholipids, and so delay the maturation of red blood cells and give abnormal shape (22).and this lead to pale M.M. and increase R.R. & P.R. to regulation anemic anoxia . This result was coincided with those of Jama(23) and .Al-Yawer (24).so in this study. The respiratory and heart rates were significantly higher ($p < 0.05$) in mineral deficient sheep than in normal control sheep in east but not significantly in other sides because major cases were chronic cases a atmospheric conditions and decrease atmospheric temperature and bad management which lead to respiratory and heart rates This result was coincided with(8).The mean values of total leucocytic count showed a non-significant

change. This result was coincided with those of Mobarak (25), Abd El-Raof and Ghanem(26).In this study, attempts to breed ewes depleted of copper were unsuccessful; the results were either failure to conceive, or foetal death and abortion and this cause by Depression of cytochrome oxidase activity (27) This result was coincided with those of Al Kalidi (20).Serum values of some minerals (Table 4) revealed a highly significant decrease in copper , zinc and iron levels was recorded. Similar results were obtained by Abd El-Raof and Ghanem (26) who recorded a significant decrease in the levels of copper, zinc, manganese and iron in sheep with alopecia in Sheep Due to Deficiency of Some Trace Elements. Moreover, Ali (28) reported a significant decrease of the values of serum copper, iron, zinc, cobalt and manganese in sheep showing alopecia.

Table 2: clinical parameters of normal control ewes &affected with minerals deficiency

parameters	control		affected							
			west		south		east		north	
	mean	±SE	mean	±SE	mean	±SE	mean	±SE	mean	±SE
R.R. (Min)	30 ^a	2.48	33.68	1.52	32.73	1.35	36.66 ^b	1.18	34.4	1.06
P.R. (Min)	70.53 ^a	3.13	77.38 ^b	2.43	75.61	2.07	77.26 ^b	1.59	73.41	1.63
Temp.(C°)	39.22	0.12	39.42	0.28	39.17	0.15	39.44	0.11	39.36	0.18

*^{a, b} denotes significant different from control at $P \leq 0.05$

Table3: Hematological values of normal control ewes &affected with minerals deficiency

parameters	control		affected							
			west		south		east		north	
	mean	±SE								
W.B.C.C.10 ³	6.77	0.39	6.44	0.37	6.21	0.27	5.94	0.23	6.09	0.39
R.B.C.C.10 ⁶	7.06 ^a	0.06	5.40 ^b	0.13	5.16 ^b	0.14	5.33 ^b	0.12	5.04 ^b	0.11
P.C.V.%	27.55 _a	0.27	21.00 _b	0.45	21.16 _b	0.55	21.35 _b	0.48	19.14 _b	0.43
Hb g/dl	9.15 ^a	0.86	7.12 ^b	0.15	7.08 ^b	0.18	7.20 ^b	0.15	6.50 ^b	0.15

*^{a, b}, denotes significant different from control at $P \leq 0.05$

Table 4: Serum values of some minerals of normal control ewes &affected with minerals deficiency

parameters	control		affected							
			west		south		east		north	
	Mean	±SE	Mean	±SE	Mean	±SE	Mean	±SE	Mean	±SE
Cu ppm	0.973 ^a	0.03	0.365 ^b	0.018	0.343 ^b	0.198	0.358 ^b	0.01	0.35 ^b	.0631
Zn ppm	1.073 ^a	0.032	0.652 ^b	0.021	0.686 ^b	0.020	0.65 ^b	.026	0.72 ^b	0.010
Fe ppm	2.454 ^a	0.041	2.065 ^b	0.23	2.10 ^b	0.039	1.93 ^b	.0362	1.93 ^b	0.0178

*^{a, b}, denotes significant different from control at $P \leq 0.05$

Conclusion

Minerals deficiencies were affected sheep and exhibited different clinical signs, significant changes were noticed between diseased and control sheep in hematological values and trace elements and abnormal

erythrocytes morphology. Clinically deficiency of a single element seldom occurs under grazing condition. The respiratory and heart rates and temp. Not effected diagnostic tools in grazing sheep specially in chronic cases.

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دراسة نقص بعض المعادن في الأغنام الرعوية في محافظة ذي قار

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الخلاصة

اجريت هذه الدراسة على مئتان و خمسون رأس من الغنم جمعت من اربعة اتجاهات من محافظة ذي قار. فظهرت تغيرات سريرييه ودموية و مستوى المعادن النادره في الاغنام التي كانت تعاني من نقص المعادن. كانت العلامات و الصفات الظاهرة هي فقر الدم و شحوب الاغشية المخاطية ، تساقط الصوف و ابيضاض الصوف ، اسهال ، تقرن الجلد ، انحراف الشهية بالاضافه الى الاجهاض . كان معدل التنفس و نبض في الاغنام التي تعاني نقصا اعلى من اغنام السيطرة السليمة ظاهريا معنويا ($p < 0.05$) في منطقة واحدة من المحافظة . اظهرت الدراسة ان معدل كريات الدم الحمراء ، الهيموغلوبين و حجم كريات الدم المضغوطة اوطأ معنويا ($p < 0.05$) في الاغنام التي تعاني نقصا من اغنام السيطرة السليمة ظاهريا ، بينما لم يحدث فرق معنوي في كريات الدم البيضاء بين الاغنام التي تعاني نقصا و اغنام السيطرة السليمة ظاهريا. كان مستوى النحاس ، الزنك و الحديد في مصل الدم اوطأ معنويا ($p < 0.05$) في الاغنام التي تعاني نقصا من اغنام السيطرة السليمة ظاهريا. وكان الشكل الظاهري لكريات الدم الحمراء في الاغنام التي تعاني نقصا قد اظهرت تغيرا مورفولوجيا في الحجم والشكل مما يدل على حدوث فقر الدم قليل الكروماتين كبير الحجم و فقر الدم قليل الكروماتين معتدل الحجم . خلصت النتائج الى ان هناك تغير ملحوظ سريريا ودمويا و مستوى المعادن النادره ، وان نقص عنصر واحد نادرا ما يحدث تحت الظروف الحقلية في محافظة ذي قار .