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أنيميا الدم في الماعز بعد التسمم الصناعي بالفلورين

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أختير مصنع منقباد للسوبر فوسفات بمحافظة أسيوط لاجراء البحث لدراسة تأثير التسمم بغاز الفلورين على التركيب الهستولوجي للدم بالماعز التي ترعى بالمناطق المحيطة بالمصنع .

وقد تمت هذه الدراسة بفحص ٢٠٠ رأس متقاربة الاعمار من ذكور وأناث الماعز البلدى موزعة بين المناطق المحيطة بالمصنع ومنها ٣١ رأس من منطقة أبنوب وهي بعيدة تماما عن تأثير التلوث بمخلفات المصنع كضوابط التجربة .

وكانت نتائج البحث : انخفاض في العدد الكلي للخلايا الحمراء وكمية الهيموجلوبين مع زيادة معدل الترسيب (٢٤ ساعه) وزيادة نسبة خلايا الليمفوسيت والنتروفيل في دم الحيوانات التي ظهرت عليها أمراض التسمم مع انخفاض ملحوظ في مستوى الحديد والنحاس في سيرم الحيوانات المخبرة .

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APLASTIC ANAEMIA IN CAPRINE FLUOROSIS

(With 3 Tables & 13 Figs.)

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SUMMARY

The present work aimed to study the picture of anemia fllowing caprine fluorosis. The relation of such anemia to iron and copper levels was also discussed.

INTRODUCTION

Unfortunately, still data concerning the effect of industerial fluorosis on blood and serum constituents of ruminants, including goats, are scarcely avialable especially under Egyptian circumstances.

BURNS and ALLCROFT (1964) mentioned that among types of fluoride toxication, systemic fluorosis which occurs when fluorine intake is high enough to result in depression of appetite, stunted growth, loss of condition and reduced milk yield in non-lame animals was included.

HOOGSTRATTEN et al. (1965) stated that eosinophilia may be an early manifestation of fluoride toxicity. HILLMAN et al. (1978) observed the development of anemia in cattle affected with fluorosis. The authors proved that the number of red blood cells per unit volume of blood, haemoglobin, haematocrit, and mean corpuscular volume were low in fluorotic herds.

Iron is essential to normal functioning of Hb, cytochrome system, myoglobin and many other oxidation reduction enzymes. Inadequate iron in animals leads to iron deficiency anaemia (BREAZILE 1971).

Copper plays a vital role in normal erythrocyte formation, iron utilization and conversion of dietary iron to haemoglobin (OSER, 1979). Copper dificiency have deleterious effects on animal health. Its dificiency in livestock leads to defects in the process of pigmentation, keratinization of wool, bone formation, reproduction, cardiac function and defects of growth in addition to haemopoeisis (SONNENWIRTH and JARRET 1980).

The aim of the present work is to study the erythrocytic and white cell picture following caprine industerial fluorosis.

MATERIAL and METHODS

A total number of 200 Balady goats showed clinical signs of chronic industerial fluorosis. These clinical signs are summarized as loss of appetite, dryness of skin, decreased weight gain, emaciation, and anemia. Dental lessions varied from light staining of incisors to complete attrition (Fig. 2). Animals were chosen at different localities from Manqabad Superyphosphate Factory, Assiut Province (Fig. 1). Samples were collected as follows:

Sample (A): Whole anticoagulated blood for haematological picture.
Sample (B): Blood for serum separation.

Methods:

whole anticoagulated blood samples were used for erythrocytic picture, which included:

- Total erythrocytic count.
- Hb content (gm %).
- Differential leucocytic count.
- Packed cell volume.
- Erythrocyte Sedimentation Rate (ESR) per 24 hours.
- Mean corpuscular volume (M.CV), mean corpuscular haemoglobin (M.C.H) as well as mean corpuscular haemoglobin concentration (MCHC) was caculated mathematically. Standards methods of COLES 1967, were applied.

Serum samples were used for:

- Serum Iron (ug %) was estimated colorimetrically after TRINDER (1956).
- Serum copper (ug %) was estimated by the method described by ZAK (1958). Test kits supplied by Boehringer Mannheim Gmbh Diagnostica (West Germany), were choiced.

Data obtained from the previous study were statistically analysed. Mean of results, standard deviations, and standard error were calculated according to KALTON, (1967).

RESULTS

Results were summarized in tables 1, 2 and 3 and figures 3 : 13.

DISCUSSION

Anemia which was previously detected clinically in goats at examined localities was accertained by haematological examination. Significant decrease ($P/\_\_ 0.05$) in TECs (10^6 /mm), Hb content (g/100 ml) and PCV (%) appeared in examined sample depending uon the distance of grazing from the factory (Fig. 3:5). Consequently ESR was accelerated (Fig. 6). Animals at Gaz. El-Akrad (adjacent to the factory) showed the lowest values for RBCs (10.79 $\pm$ 1.20), Hb content (6.91 $\pm$ 0.94) and highest rate of sedimentation (8.49 $\pm$ 1.31) per 24 hours, while animals grazing at Manqabad recorded the lowest PCV (24.19 $\pm$ 2.17). The other values were insignificantly affected.

Checking the correlation between the erythrocytic picture, tooth and bone involvement confirmed the exposure of such animals to fluorosis.

Anemia was among the clinical signs in cattle herds affected with fluorosis (RAND and SCHMIDT 1952). The authors stated that anemia may result from reduced synthesis of Vit B . HOOGSTRATTEN et al. (1965) attributed anemia in cattle fluorosis to lower blood folic acid. In this respect SUTTIE et al. (1972) and HILLMAN et al. (1978) reported that the number of red blood cells per unit volume of blood, Hb, haematocrit, and mean corpuscular volume were low in fluorotic herds. It is of interst here to mention that the obtained results for Hb content disagree with those of SUTTIE and FALTIN (1973). These authors recorded normal values (10 g/100 ml of blood) for Hb content in cattle even under deleterious effects of fluorine ingestion. Such variations could be attributed to method, degree and time of exposure of animals to fluorine intoxication.

A highly significant decrease ($P/\_\_ 0.01$) in serum iron concentration (ug %) among all groups of tested goats rather than the animals of control ones was evident (Fig. 7). Serum iron values for toxicated animals ranged from 38.43 $\pm$ 26.14 to 99.41 $\pm$ 25.50 ug %, while

for controls it was 137.69 ± 20.34 ug %. Lower values for serum iron in fluorotic goats may be attributed to the damaged effect of fluorine on iron metabolism in bone marrow. Depending up on recorded results one can say safely that fluorosis inhibits heme synthesis in bone marrow reticulocytes and causes an anemia that is morphologically similar to animia of iron deficiency.

In the present work, with exception of animals at El-Gazira, serum copper values were lower than that of controls. The recorded values a ranged from 80.00 ± 17.78 to 171.28 ± 48.10 ug % (Fig. 8).

A fieled study of IBRAHIM (1980) in goats grazing nearby the Superphosphate Factory revealed a lower serum copper (138 ug %) than for animals at control area (160 ug %). The author interpretted that the lower serum copper was due to precipitation of copper in the gut by sulpher compounds and more excretion of copper with urine. It is intersted to mention that our data confirmed the openion of IBRAHIM (1980). On the other hand the results were contradicted with those of GRIFFITH (1977) who recorded normal serum copper level in dairy cattle whose diet contained excess fluorine.

Results of total leucocytic count (TLCs X 10^3/mm) in the present study were variable irrespective of examined localities. Thus TCL ranged from 6.99 ± 3.06 and 11.76 ± 3.65/mm (Fig. 9). Date on differential leucocytic count in examined animals revealed that animals with high serum fluoride level behaved lymphocytosis, monocytosis, and eosinophilia (Fig. 10 : 13). This goes hand by hand with the findings of HOOGSTRATTEN (1965) in bovine fluorosis. Esinophilia was inter pretted by the author, to be an early indication of fluoride toxicity.

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Table (1)
MCV (cubic microns) in tested goat blood

Areas	Average mean	Males	Females		
			Total	Pregnant	Non pregnant
El-Akrad	24.44±6.39	23.47±6.27	24.73±6.52	24.99±7.02	24.64±6.56
Ez-Mohamed	18.48±4.18	18.21±1.21	18.93±4.47	20.81±5.21	17.92±3.86
El-Tawabiya	15.94±2.48	14.14±5.33	16.20±2.54	16.33±0.42	16.16±2.89
Manqabad	19.79±2.29	15.15±3.52	20.10±2.07	20.11±2.56	20.09±1.52
Elwan	20.12±2.94	---	20.12±2.94	17.55±1.72	20.77±5.20
El-Willidiya	17.60±3.49	17.51±4.81	17.63±3.12	18.04±2.88	17.40±3.38
Abnoub	18.39±4.15	18.12±3.79	18.48±4.41	18.46±5.57	18.51±2.65

Table (2)
MCH (M. micrograms) in examined goats

Areas	Average mean	Males	Females		
			Total	Pregnant	Non pregnant
El-Akrad	6.55±1.22	6.37±1.12	6.65±1.28	7.20±1.99	6.47±0.96
Ez. Mohamed	6.18±1.17	5.65±0.55	6.27±1.23	6.72±1.23	5.98±1.2
El-Tawabiya	4.47±0.65	4.43±1.12	4.47±0.68	4.51±1.10	4.46±0.53
Manqabad	5.96±0.83	5.21±0.73	6.01±0.83	5.91±0.44	6.09±1.06
Elwan	6.45±1.98	--	6.45±1.98	6.77±1.76	6.33±1.23
El-Willidiya	5.16±0.81	5.59±0.73	4.92±1.07	4.68±0.23	5.39±0.37
Abnoub	5.55±1.56	5.47±0.88	5.58±1.78	6.35±2.55	4.96±0.60

Table (3)
MCHC (%) in the blood of goats

Areas	Average mean	Mean	Females		
			Total	Pregnant	Non pregnant
El-Akrad	28.54±6.14	30.98±1.88	28.00±6.45	28.18±12.16	27.93±3.65
Ez.Mohamed	30.98±3.53	31.60±1.67	30.83±3.88	30.31±5.68	31.16±2.65
El-Tawabiya	27.74±2.94	27.61±2.63	27.76±3.10	29.03±2.19	27.13±3.41
Manqabad	30.20±2.99	32.40±3.12	29.85±2.78	30.68±2.79	29.25±2.82
Elwan	30.50±3.21		30.50±3.21	27.70±2.56	31.44±2.95
El-Willidiya	28.39±4.77	27.81±3.26	28.59±5.29	27.46±5.46	29.39±5.44
Abnoub	27.90±5.63	29.00±2.32	27.65±6.35	27.40±10.71	27.40±3.85

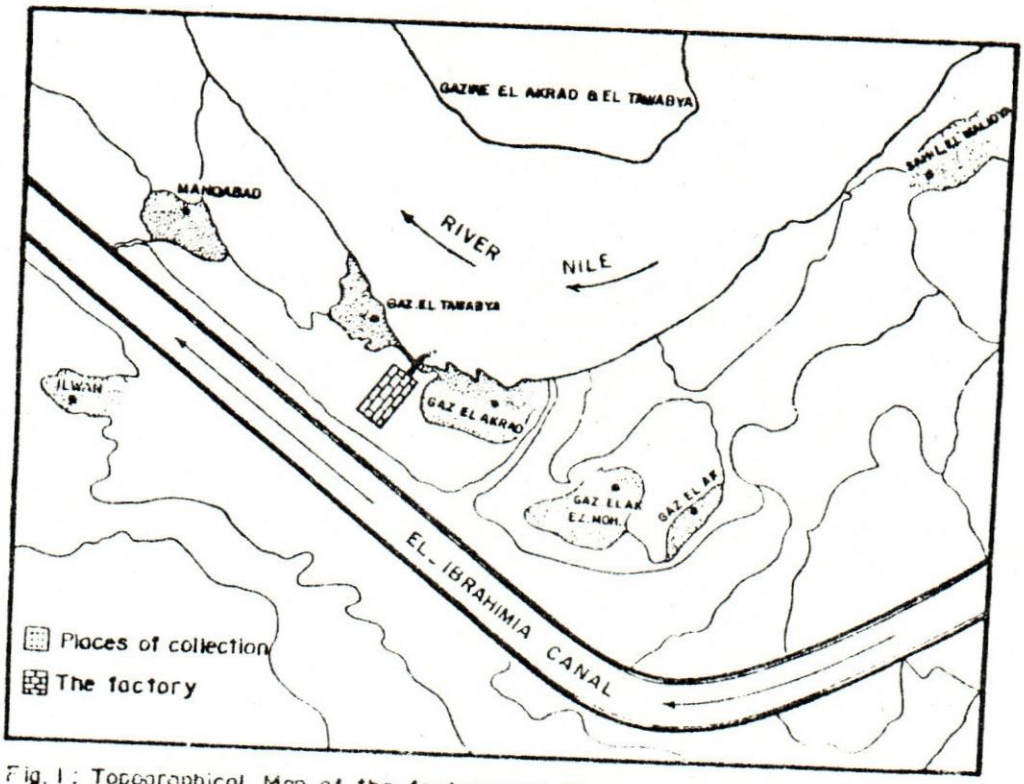

Fig. 1 : Topographical Map of the factory and the places of collection .

Fig. (2): Dental Lesion

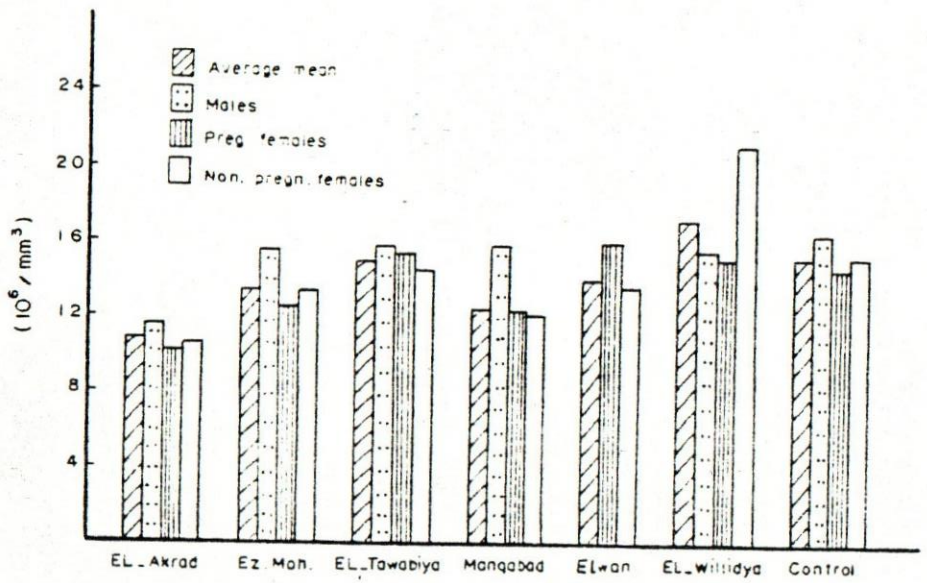

Fig.(3) Total RBCs count (10^6 / mm^3) in goats

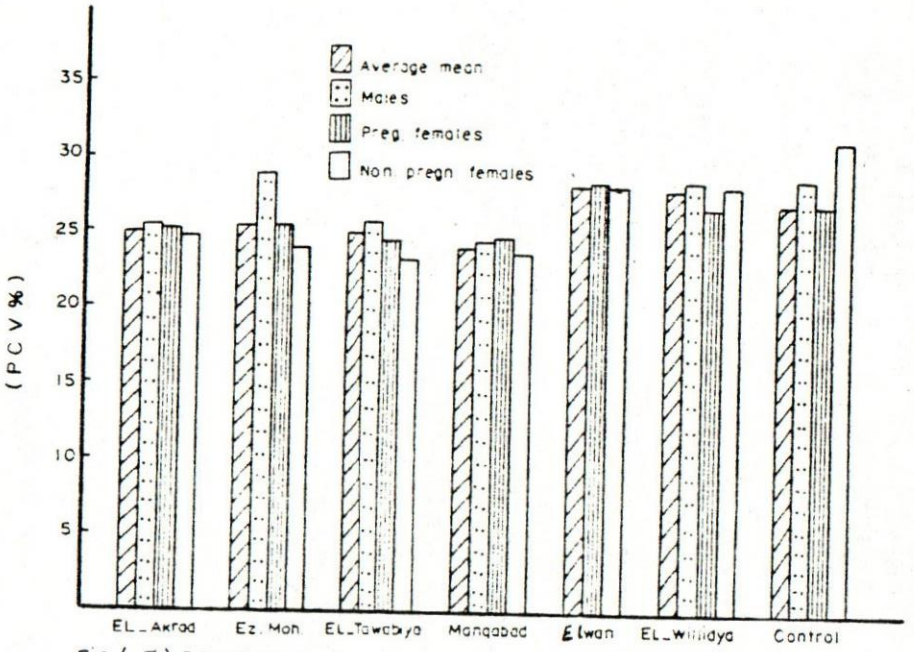

Fig.(5) PCV % of tested goats blood

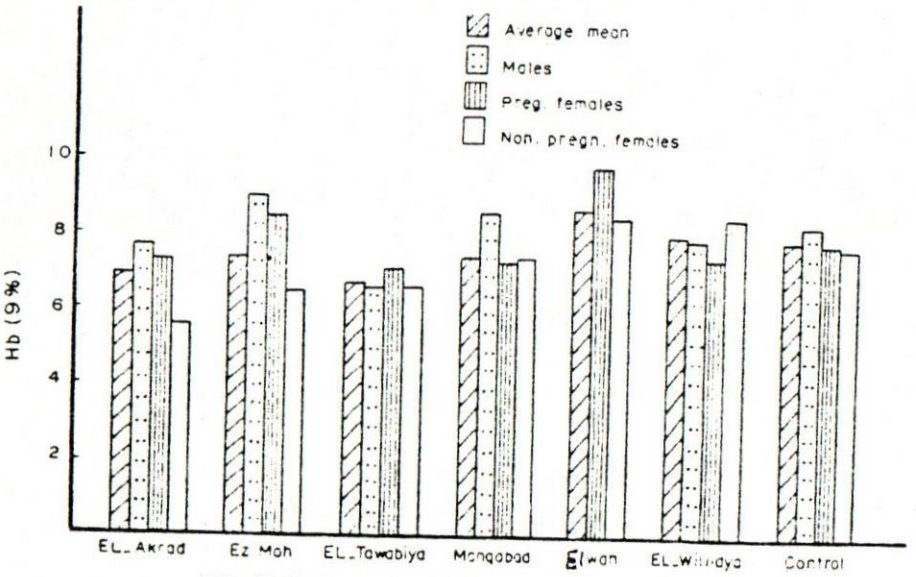

Fig (4) Hb content (g%) of tested goat blood

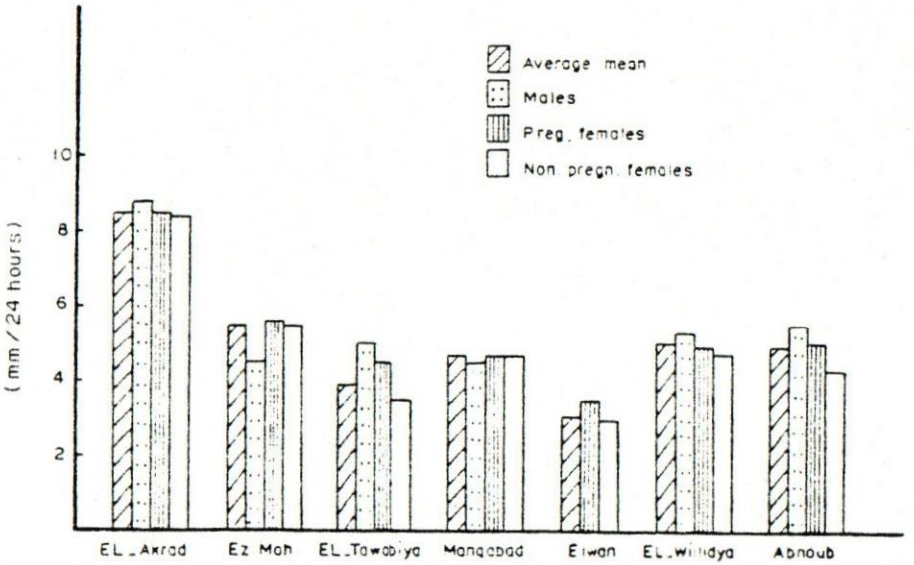

Fig (6) ESR (mm per 24 hours) in goats

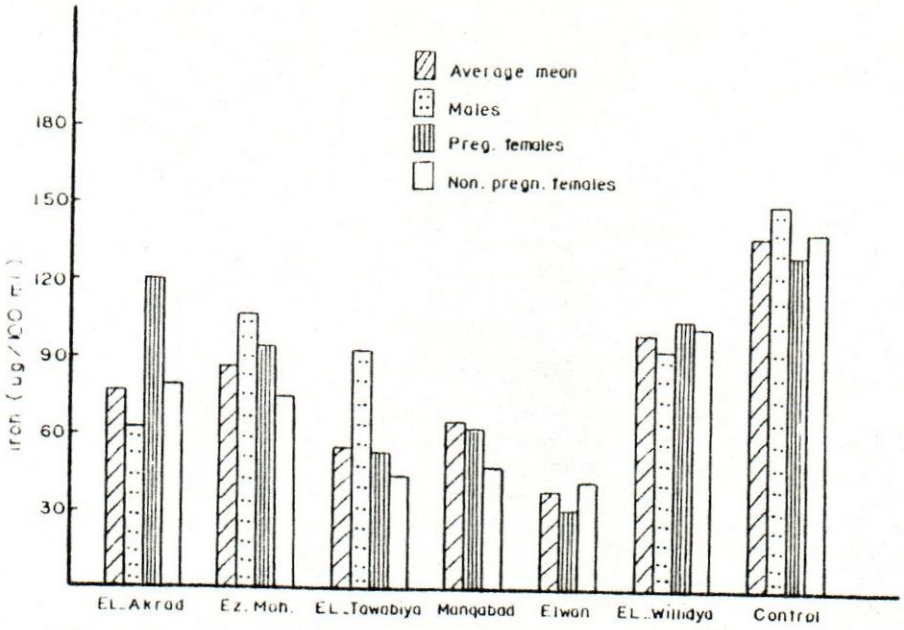

Fig (7) Serum iron concentration (ug/100ml) in goats at various localities

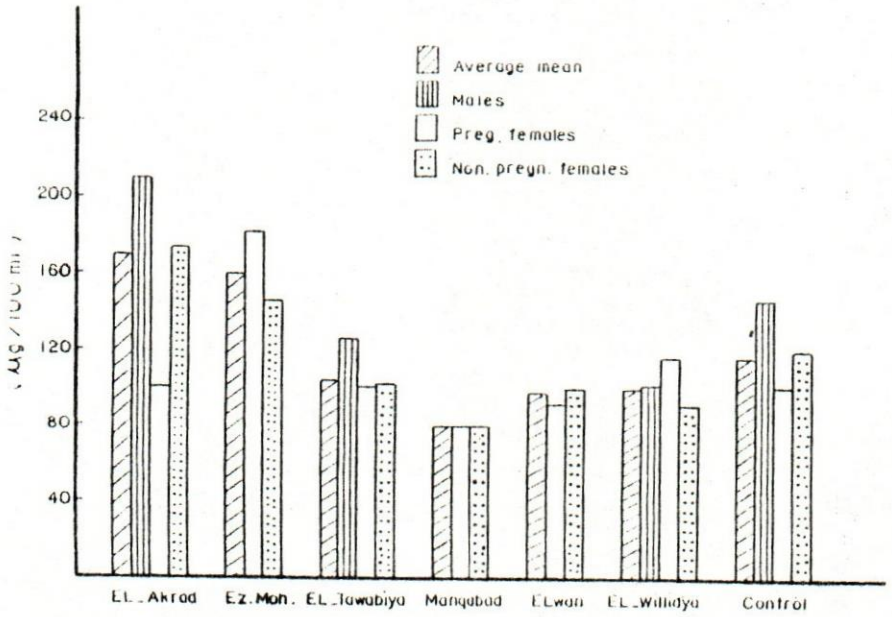

Fig. (8) Serum copper (ug/100ml) in goats at various localities

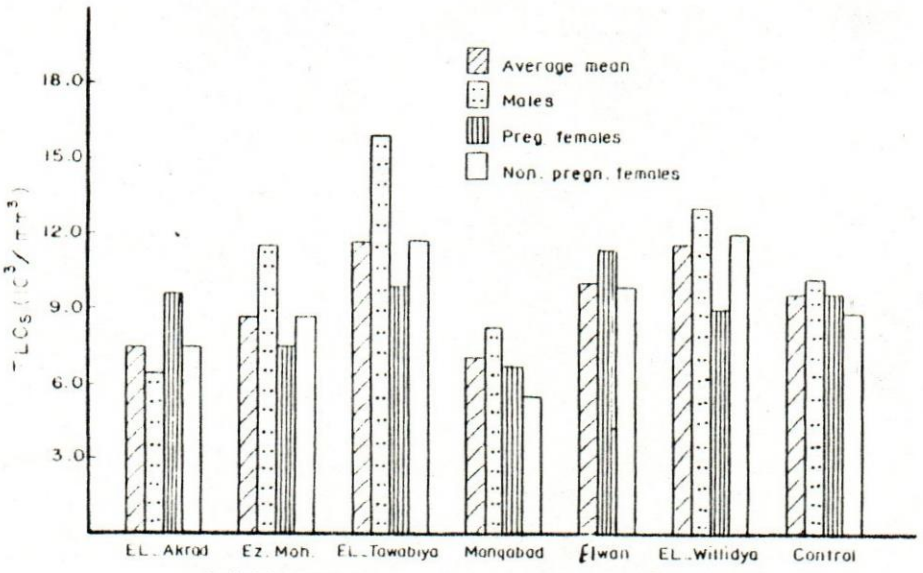

Fig. (9) Total leucocyte count (10^3 / mm^3) in goats

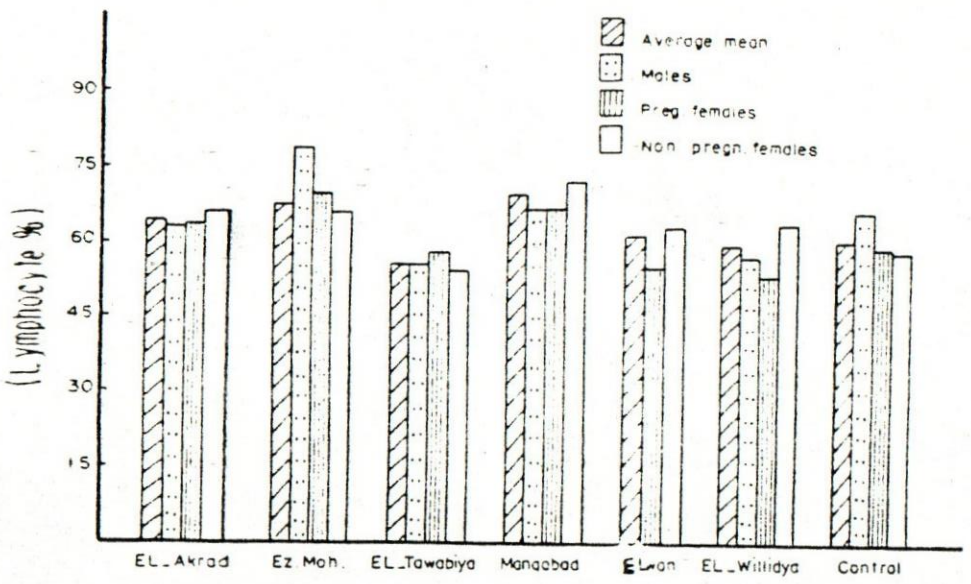

Fig. (10) Blood lymphocyte percentages in examined goats

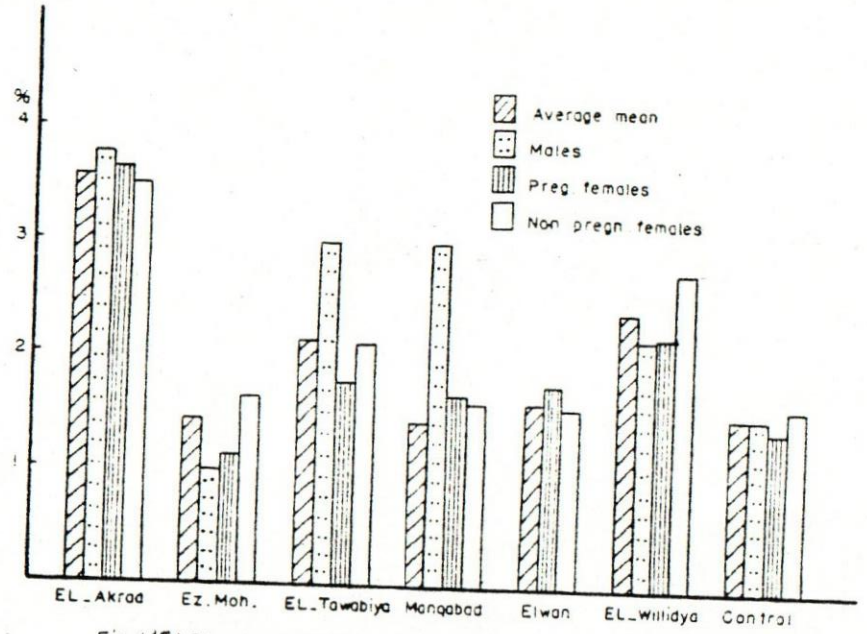

Fig. (12) Blood monocyte percentages in goats at various localities

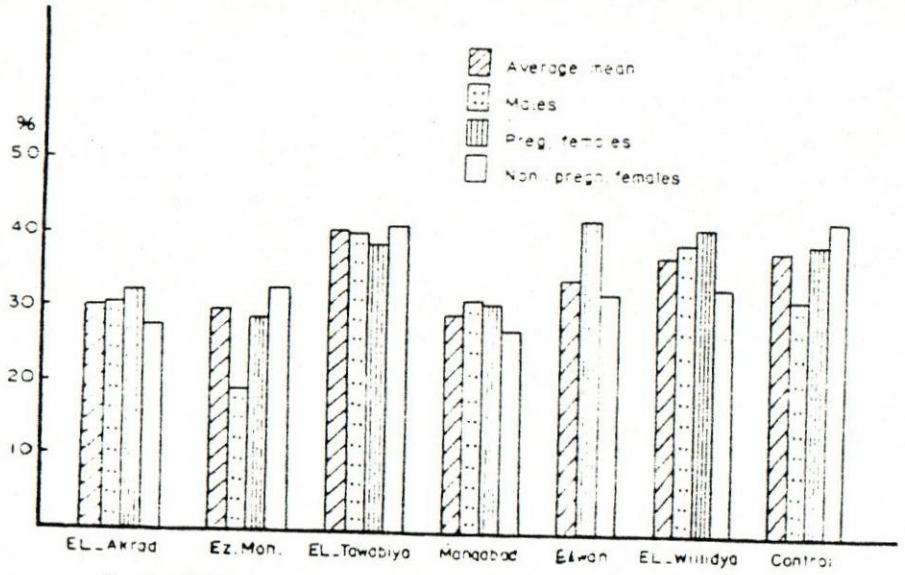

Fig (11) Blood neutrophil percentages of tested goats

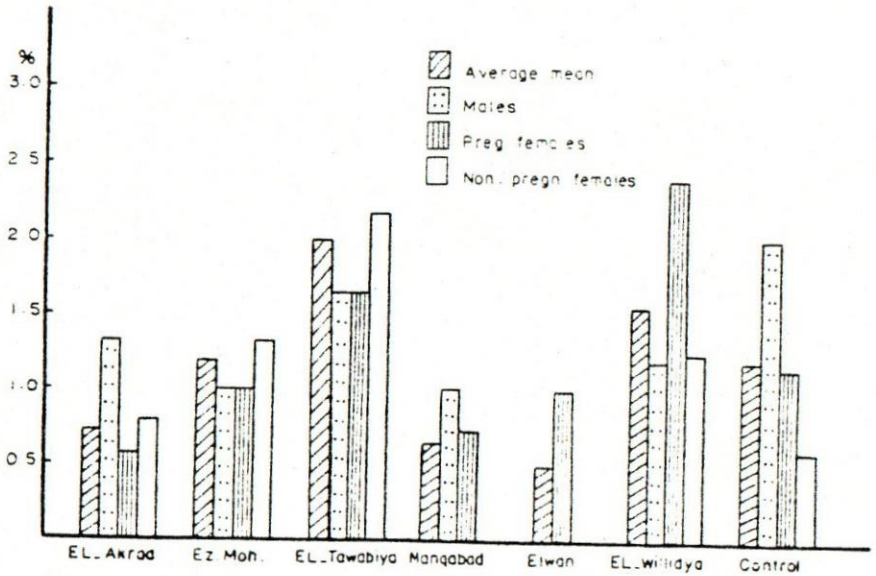

Fig (13) Blood eosinophil percentages in goats