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CLINICAL, HAEMATOLOGICAL AND SOME TRACE ELEMENTS STATUS IN HEALTHY AND EMACIATED CAMELS IN ASSIUT AND NEW VALLEY GOVERNORATES.

(With 3 Tables and 4 Figures)

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الحالة الإكلينيكية وصورة الدم وبعض العناصر النادرة في الجمال السليمة
والجمال الهزيلة
في محافظتي أسيوط والوادي الجديد

عرفات صادق سيد

شملت الدراسة عدد ٧١ من الابل من كلا الجنسين تتراوح اعمارها بين ٦ و ١٢ عام . منها ٣٩ جمل وناقة ترعى في محافظة الوادي الجديد و ٣٢ جمل وناقة من الحيوانات المرباة في محافظة أسيوط. هذا وقد كان عدد ٢٤ جمل وناقة من بين هذه الحيوانات (١٤ من نوق الوادي الجديد و ١٠ من نوق محافظة أسيوط) كانت في حالة صحية جيدة واثبتت الفحوص الاكلينيكية والتحليل المعملية خلوها من جميع الامراض واستخدمت المجموعتين كضوابط للبحث . اما باقى الحيوانات وعددها ٤٧ جمل وناقة فقد كانت تعاني من الهزال ودرجات متفاوتة من الضعف العام وبهتان في الاغشية المخاطية . بعض الجمال اختفى منها السنم وحدث لها ضمور في عضلات الساق واضمحلال في الدهون الموجودة تحت الجلد . ومجموعة اخرى كانت تعاني من التهابات وجروح وتشققات جلدية مع درجات متفاوتة من التقرن والقشور وتساقط الوبر . اما المجموعة الاخيرة فبجانب الضعف العام والهزال فقد كانت تعاني من اسهالات مزمنة . وبعد فحص الحيوانات اكلينيكيًا تم اخذ عينات دم منها وذلك لدراسة الصورة الدموية ودراسة الصورة البيوكيميائية في مصل دم هذه الحيوانات شاملة تركيز عناصر النحاس والحديد والزنك والمنجنيز . تم عمل التحاليل المعملية والاحصائية ووضحت النتائج ما يلي:

١- اصابة عدد ٢٠ حيوان من الجمال الهزيلة بالتريبانوسوما (١٠ جمال من حيوانات محافظة الوادي الجديد و ١٠ جمال من حيوانات محافظة أسيوط) ٢- اصابة عدد ٦ من حيوانات الوادي الجديد بالجرب . ٣- اصابة عدد ٩ من جمال الوادي الجديد بالتريبانوسوما والجرب ٤-

باقى الحيوانات كانت تابعة لمحافظة أسيوط وكانت تعاني من اسهالات مزمنة واخذت منها عينات بغض النظر عن سبب النزلات المعوية .
واوضحت نتائج تحليل الدم ان جميع الحيوانات الهزيلة تعاني من فقر دم شديد (انيميا) وقد انخفض مستوى عنصر النحاس فى مصل دم هذه الحيوانات وانخفض مستوى الحديد والزنك فى دم الحيوانات الهزيلة التابعة لمحافظة أسيوط فقط ولم يتأثر مستوى المنجنيز وكان فى الحدود الطبيعية . واوضحت الدراسة ان مستوى عناصر الحديد والزنك والمنجنيز كانت عالية فى مصل دم الحيوانات التابعة لمحافظة الوادى الجديد عن مثيلاتها التابعة لمحافظة أسيوط بينما انخفض نسبيا مستوى عنصر النحاس فى مصل جمال الوادى الجديد ربما لتأثره الشديد بالتركيزات العالية للعناصر المعدنية الأخرى التى ادت الى عدم الامتصاص والتمثيل الغذائى الأمثل لعنصر النحاس .

SUMMARY

A total number of 71 camels of both sex, 6-12 years old were investigated in this study. 39 camels belonged to animals raised in the New Valley Governorate and 32 camels belonged to camels reared in Assiut Governorate at the Nile valley. 24 camels of the 71 investigated animals (14 camels in the New Valley and 10 camels in Assiut Governorate) were clinically healthy and kept as two control groups. The rest of the animals were emaciated and showed various degree of debility. Studying the clinical, haematological and some trace elements status in blood serum of these camels were the main objectives of this study. Clinical examination of the emaciated camels revealed: weakness and paleness of the mucous membranes, some camels showed disappearance of the hump, atrophy of the thigh muscles and depletion of the sub-cutaneous fat, others showed alopecia, scales, keratinization and wounds of the skin and 12 camels were suffering from chronic diarrhoea. Clinical signs and laboratory findings of blood film and skin scraping revealed that 20 camels were suffering from trypanosomiasis (10 camels in the New Valley and 10 camels in Assiut Governorates), 6 camels suffering from *mange mite*, 9 camels suffering from *trypanosoma evansi* and *mange mite* and 12 camels suffering from chronic diarrhoea, emaciation and weakness. There were a highly significant decrease in the blood serum levels of copper in all the examined emaciated camels in the New Valley and Assiut Governorates. Blood serum levels of iron, zinc and manganese in camels in the New Valley were not affected however the levels of iron and zinc were significantly decreased and the level of manganese was not changed in the blood serum of emaciated camels reared in Assiut Governorate. The blood serum levels of iron, zinc

and manganese in healthy camels reared in Assiut Governorate were statistically lower than that of camels raised in the New Valley Governorate. This may be attributed to the high levels of these elements in the soils of the New Valley zones. Regarding the haematological investigation there were a decrease in the total count of erythrocytes, haemoglobin, PCV and MCHC, no changes in the MCV and MCH values and highly significant increase in the total count of leucocytes. These findings revealed that the examined emaciated camels were suffering from normocytic hypochromic anaemia with leucocytosis.

Key words: Emaciated camels, Trace elements, *Trypanosomiasis*, Mange, Chronic diarrhoea.

INTRODUCTION

The *dromedary camel* is primarily a browser although grass and other ground vegetation is eaten. Camels can feed on fodder and grains, some deficiency conditions have been identified but knowledge generally on this subject is sparse (Dorman, 1986). Trace elements play an important role in both nutritional and reproductive condition in animals. They are involved as component parts of many tissues and one or more enzymes activities and their deficiency leads to varieties of pathological consequences and metabolic defects (Underwood, 1977, Georgievskii, 1982 and Mills, 1983). Haematological and serum biochemical analysis are commonly used for monitoring health status and disease diagnosis in camels in veterinary practice (Barakat and Abd El- Fattah, 1970).

Trypanosomiasis, *sarcoptic mange* caused by *sarcoptic scabiei var cameli* and chronic diarrhoea are considered the serious debilitating diseases affecting camels (Higgins, 1986 and Sayed et al., 1997).

Trypanosomiasis is a chronic infection of camel caused by *Trypanosoma evansi* and characterized by huge production losses due to lower milk and meat yields in adults (Richard, 1979), abortion, premature births and an inability to feed the young (Yagil, 1982). Chronically infected animals may survive for three to four years, the disease in this form is characterized by anaemia, emaciation, recurrent fever, disappearance of the hump, atrophy of the thigh muscles, oedema of the limb, lower abdomen, thorax and facial region, corneal opacity, alopecia, diarrhoea and sexual excitement (Parker, 1980 ; Raisinghani et al., 1980 ; Singh, et al., 1980 ; Otify, 1981 ; Georgi, 1985 ; Nasser, 1992 and Mohammed, 1993). In

addition to severe anaemia the blood serum levels of copper (Cu), iron (Fe) and zinc (Zn) were significantly decreased while no change was found in blood serum level of manganese (Mn) in camel Trypanosomiasis (El-Magawary, 1983 ; Manna, 1990 ; Selim 1992 and Mohammed, 1993).

Sarcoptic mange is a highly contagious and debilitating skin disease that seriously threaten camels. The most important clinical signs of *mange mites* in camels included emaciation, anorexia weakness thickening of the skin, keratinization and alopecia associated with severe itching. The mangy areas were scattered all over the body or in the neck, head, shoulder regions, hind quarter or perineum regions (Rathor and Iodha, 1973 ; El-Magawary, 1983 ; Higgins, 1986 ; Manna, 1990 and Hafez, 1994). Analysis of blood serum of mangy camels for trace elements revealed a significant decrease in the levels of copper, iron, zinc and manganese (Tyeb et al., 1982 ; El-Far 1990 ; Selim, 1992 and Hafez, 1994).

Diarrhoea in camels is probably the commonest disorders which affect its incaptivity and performance and was very common in all the expedition. Enteritis is not only associated with dietary factors but also stress of management, transport and climatic changes are frequently responsible. Infection with helminthes, protozoa, bacteria and viruses have all been incriminated (Higgins 1986 and Sayed et al. 1997). Diarrhoeic camels showed usually decrease in blood serum levels of copper, iron, zinc and manganese (Ibrahim et al., 1981 and Selim, 1992).

Aim of this study: 1- Throw a light on the description of the clinical observations and the probable causes of emaciation and debility among camels in Assiut and New valley Governorates. 2- Estimation of blood serum levels of some trace elements (Cu, Fe, Zn, and Mn) in healthy and thin camels and monitoring the accompanied haematological changes in these animals.

MATERIALS and MMETHODS

Animals:

A total number of 71 camels (*Camelus dromedarius*) of both sex, 6 - 12 years old were used in this study. 39 camels were selected from the animals raised in the New Valley Governorate and 32 animals were selected from camels reared in Assiut Governorate at the Nile Valley. Of these 71 investigated camels 14 camels in the New Valley and 10 camels in Assiut Governorate were clinically healthy and subjected for laboratory investigation and proved to be healthy and were kept as two control groups

(control 1 and control 2). Forty seven camels showed various degree of debility, emaciation skin lesion and diarrhoea. Complete clinical examination of the diseased camels was don according to Higgins and Kock (1984). On the bases of the clinical and laboratory findings, the emaciated camels were classified into 5 groups: 1-Group suffering from Trypanosomiasis 2- group suffering from mange 3- group suffering from trypanosomiasis and mange 5- group suffering from chronic diarrhoea (table, 1).

Samples and adopted methods:

1-Whole blood samples with anticoagulant (disodium salts of EDTA) were collected for the determination of blood picture according to Coles (1986). The Giemsa stained blood films were carefully examined for blood parasites.

2-Whole blood samples without anticoagulants were collected for separation of serum to estimate blood serum levels of copper, iron, zinc and manganese (ug%) by means of Atomic absorption spectrophotometer (Perkin Elmer Model 2380 USA).

3-Skin Scrapings were collected for examination of metazoan parasites and dermatophytes according to the methods described by Coles (1986).

4-Faecal samples were collected for examination of gastrointestinal parasites according to the methods described by Coles (1986) to exclude the apparently healthy infested camels from the control groups.

5-Statistical analysis: Statistical analysis of the obtained data were done by means of soft ware computer program (SPSSWIN, 1995).

RESULTS

1-Clinical finding:

Forty seven camels (66 % of the total number) were thin and showed various degree of debility (table, 1). In addition to debility some camels showed emaciation, weakness, anaemia, disappearance of the hump, atrophy of the thigh muscles and depletion of the sub-cutaneous fat (fig. 1). Others suffering wounds, alopecia and keratinization of the skin (fig. 1, 3 & 4). The laboratory findings of blood film and skin scraping revealed that 20 camels suffering from trypanosomiasis (fig. 2 & 3), 6 camels suffering from *mange mite* (fig. 4) and 9 camels suffering from *trypanosoma evansi* and *mange mite* (fig. 1). The rest of the diseased group suffered from chronic diarrhoea, emaciation and weakness.

2-Laboratory findings:

The results of blood serum analysis of copper (Cu, ug%), iron (Fe, ug%), zinc (Zn,ug%) and manganese (Mn, ug%) are illustrated in table 2.

Total red blood cells (RBC, T/l), packed cell volume (PCV, %), haemoglobin concentration (Hb, g/l), mean corpuscular volume (MCV, fl), mean corpuscular haemoglobin (MCH, pg), mean corpuscular haemoglobin concentration (MCHC, gm/dl) and total leucocytic counts (WBC, G/l) are showed in table 3.

DISCUSSION

Camels are susceptible to a number of disorders associated with malnutrition and/or maldigestion (Higgins,1986). Bad management and close confinement, although tolerated well for short periods, can have a debilitating effect. Bad housing, presence of ectoparasites and insects and sudden change of management can upset camels with several debilitating diseases as trypanosomiasis, mange and diarrhoea (Higgins,1986 and Sayed et al.,1997).

This study was carried out on emaciated camels and the clinical observations on examined camels showed various degrees of debility. The observed signs of emaciation, weakness, anaemia, disappearance of the hump, atrophy of the thigh muscles and depletion of the subcutaneous fat (fig. 1 & 3) are typically of chronic trypanosomiasis. On the other hand the signs of alopecia, skin keratinization and scales, wounds, continuous itching of the animals and the characteristic mangy areas at different parts of the body are signs of *mange mites* infection (fig. 4). These signs either alone or with the previous signs of trypanosomiasis are usually found in cases of mixed infection (fig. 1). The results of laboratory investigations of blood films and skin scraping confirmed this diagnosis where the *trypanosoma evansi* parasites (fig. 2) were found in the thin Giemsa stained blood films of these camels and *sarcoptic scabiei var. cameli mite* was found in examined sediment of skin scraping. Similar findings were recorded by Higgins (1986) ; Manna (1990) and Mohammed (1993).

The last group of the emaciated camels was found suffering from chronic diarrhoea, partial loss of appetite, emaciation and weakness. Blood samples from these camels were investigated for haematological picture and determination of some trace elements irrespective to the cause of diarrhoea. Consequently findings of blood film and skin scraping from these camels showed negative results for blood parasites and *mange mites*.

Regarding the results of trace elements investigations, there were a highly significant decrease ($P < 0.01$) in the blood serum levels of copper of emaciated camels suffering from trypanosomiasis, mange and chronic diarrhoea in both Assiut and New Valley Governorates. Serum levels of iron and zinc were highly decreased ($P < 0.01$) only in camels of Assiut Governorate suffering from chronic trypanosomiasis and chronic diarrhoea while no alterations were found in blood serum levels of iron and zinc of camels in the New Valley, this may be attributed to the high levels of iron and zinc in the soil of the New Valley. Selim (1992) and Hafez (1994) recorded a significant decrease in serum level of iron and zinc in camel trypanosomiasis and mange. There were no alteration in the blood serum level of manganese in all examined emaciated and healthy camels. Selim (1992) reported that there was an insignificant change in blood serum level of manganese in camel trypanosomiasis but there was a significant decrease in its level in mangy camels. The decreased levels of trace elements in blood serum of emaciated camels may be attributed to the inappetance, anorexia, announce resulting from parasites, malabsorption and may be due to primary deficiency of trace elements in the ration.

There were a highly significant reduction in the total count of erythrocytes (RBC, T/l), packed cell volume (PCV, %), haemoglobin (Hb, gm/l) and mean corpuscular haemoglobin concentration (MCHC, gm/dl) with no changes in the values of mean corpuscular volume (MCV, fl) and mean corpuscular haemoglobin (MCH, pg) in the diseased emaciated camels belonged to New Valley and Assiut Governorates. These abnormalities mainly due to trypanosomiasis, mange and chronic diarrhoea. These finding revealed that the examined emaciated camels were suffering from anaemia. This anaemia can be classified on the bases of the obtained data as normocytic hypochromic type (MCV and MCH were normal while RBC, Hb, PCV and MCHC were reduced). The normocytic anaemia is the most common type found in domestic animals and as an indication that other disease condition are present. Such anaemia occur when there is a depression of erythropoiesis such as that occurring in chronic infectious diseases (Coles, 1986). In the present study the cause of anaemia is due to the chronic infection of the animals beside the disturbances occurred in the trace element status of them. The highly significant increase in the total leucocytic counts (leucocytosis) in all the examined emaciated camels mainly attributed to the chronic inflammations, parasitism, wounds and abrasion of the skin. These findings agreed with El-Magawary (1983); Higgins (1985) and Manaa (1990).

Regarding the localities, the blood serum levels of iron, zinc and manganese are highly elevated ($P < 0.01$) in camels living in New Valley Governorate when compared with those living in Assiut Governorate at the Nile Valley. This may be attributed to the high levels of these elements in the soil of New Valley which in turn leads to elevation of them in the plants and roughages consumed by the animals. On the other hand the level of copper was significantly elevated in blood serum of camels in the Nile Valley. The relatively lower level of copper in the blood serum of camels in the New Valley may be due to the effect of the high level of the other minerals which interferes with the absorption and metabolism of copper.

It could be concluded that camels are susceptible to a number of disorders and diseases associated with emaciation and debility. Trypanosomiasis, mange mites and chronic diarrhoea are considered the most important debilitating diseases of camels. Trace elements status and haemogram were affected and may be reduced secondary to chronic infection or primary due to bad management and deficiency. These conditions expose camels to several problems and hazards leading to great economic losses. The control of these problems needs special care and improvement of the managemental conditions with correct supplementation of feedstuffs given to the camels containing the needed amounts of mineral mixture specially trace elements in addition to administration of the suitable medical treatment.

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Table 1: Findings of clinical and laboratory investigations of the examined camels in the New Valley and Assiut Governorates.

Clinical state Locality	Control	Tryp.	Mange	Tryp. & Mange	Chronic Diarrhoea	Total
New Valley Governorate	14	10	6	9	0	39
Assiut Governorate (Nile valley)	10	10	0	0	12	32
Total	24	20	6	9	12	71

NB: Superscripts illustrated in the tables are,

a: Statistically significant ($P < 0.05$) and **aa:** Statistically significant ($P < 0.01$) between healthy (control 1) and emaciated camels in the New Valley Governorate.

b: Statistically significant ($P < 0.05$) and **bb:** Statistically significant ($P < 0.01$) between healthy (control 2) and emaciated camels in Assiut Governorate.

c: Statistically significant ($P < 0.05$) and **cc:** Statistically significant ($P < 0.01$) between healthy camels (control 1 & 2) in New Valley and Assiut Governorates.

\bar{x} : Mean value SD: Standard deviation of mean.

- Figures in the same raw having the same superscripts are not significantly different

Table 2: Blood serum levels of copper, iron, zinc and manganese (ug, %) in healthy and emaciated camels in the New Valley and Assiut Governorates.

Locality	Parameter	New Valley Governorate				Assiut Governorate (Nile Valley)			
		Control 1 (n= 14)	Tryp. (n= 10)	Mange (n= 6)	Tryp & Mange (n= 9)	Control 2 (n= 10)	Tryp. (n= 10)	Chronic Diarrh. (n=12)	
Copper	$\bar{x} \pm SD$	114.3 ± 47.8	68.2 ± 25.1 ^{aa}	84.9 ± 20.9 ^{aa}	66.3 ± 24 ^{aa}	156 ± 42.4 ^c	99 ± 28.8 ^{bb}	104.5 ± 34.2 ^{bb}	
	Range	81.5 - 271	32.6 - 108.7	54 - 109	27.2 - 102	100 - 244	56 - 151	56.1 - 147	
Iron	$\bar{x} \pm SD$	351.4 ± 142	248 ± 117.3	280 ± 153	303 ± 106	212 ± 51 ^c	131 ± 45 ^{bb}	134.2 ± 14 ^{bb}	
	Range	156.3 - 625	78 - 468.8	136 - 468	156 - 469	137.4 - 282	65 - 208	115 - 148	
Zinc	$\bar{x} \pm SD$	165.2 ± 32	177 ± 44.2	163.7 ± 32.3	141.1 ± 36	119 ± 21.9 ^{cc}	96.7 ± 19 ^{bb}	96.2 ± 17.6 ^{bb}	
	Range	120.6 - 241	120.7 - 241	103 - 190	78 - 190	80 - 151	67 - 118	65 - 114	
Manganese	$\bar{x} \pm SD$	36.4 ± 11.4	35.6 ± 18.7	27.9 ± 8.2	29.9 ± 17.3	22.6 ± 7.8 ^{cc}	22.8 ± 7.2	18.2 ± 4.3	
	Range	33 - 66.7	6.7 - 60.7	16.7 - 33.3	7.1 - 50	15 - 40	12 - 35	12 - 23	

Table 3 : Blood picture in healthy and emaciated camels in the New valley and Assiut Governorates.

Locality		New Valley Governorate						Assiut Governorate (Nile Valley)			
		Control ₁ (n=14)	Tryp. (n=10)	Mange (n=6)	Tryp. & Mange (n=9)	Control ₂ (n=10)	Tryp. (n=10)	Chronic Diarrh. (n=12)			
RBC (T/l)	$\bar{x} \pm SD$	8.2 ± 1.7	5.3 ± 0.9 ^{aa}	7.4 ± 1.6 ^a	6.11 ± 1.1 ^{aa}	8.4 ± 1.7	7.5 ± 1.1 ^b	5.9 ± 0.92 ^{bb}			
	Range	5.1 - 11.5	4.2 - 7.1	5 - 10	4.8 - 8.2	6.5 - 11.7	6.1 - 9.8	4.5 - 7.1			
PCV (%)	$\bar{x} \pm SD$	31.4 ± 3.1	22.1 ± 3.5 ^a	31.8 ± 4.6	27.7 ± 6.4 ^a	30 ± 4	28.7 ± 2.8 ^b	25 ± 3.3 ^b			
	Range	25 - 36	18 - 30	25 - 36	19 - 38	25 - 38	25 - 34	21 - 30			
Hb (gm/l)	$\bar{x} \pm SD$	122.7 ± 18.9	82.2 ± 15.6 ^{aa}	87 ± 10.8 ^{aa}	87.3 ± 11.4 ^{aa}	137.8 ± 17	101.7 ± 16.2 ^b	99.6 ± 10.6 ^b			
	Range	95 - 155	61 - 109	74 - 102	59 - 97	124 - 166	74 - 123	85 - 115			
MCV (fl)	$\bar{x} \pm SD$	39.3 ± 7	42.2 ± 3.7	43.8 ± 6.7	45 ± 5.3	35.47 ± 7.98	38 ± 6.1	42.84 ± 6.6			
	Range	30.4 - 49.3	37.7 - 48.9	34.7 - 50.7	39.6 - 52.8	25.6 - 47.6	30.6 - 51.6	33.6 - 53.3			
MCH (pg)	$\bar{x} \pm SD$	15.3 ± 3.6	15.76 ± 3	12.1 ± 2.1	14.7 ± 3.2	16.8 ± 2.4	13.9 ± 3.1	17.1 ± 2.5			
	Range	11.1 - 21.6	11.7 - 21.8	8.5 - 14.4	9.4 - 19.6	12.7 - 19.7	10.24 - 18.46	14.8 - 20.3			
MCHC (gm/dl)	$\bar{x} \pm SD$	38.7 ± 6.6	37.6 ± 7.5	27.9 ± 5.4 ^a	33.2 ± 9.3 ^a	46.2 ± 5.1	35.75 ± 6.6 ^b	40.39 ± 6.4 ^b			
	Range	28.6 - 48.9	25.4 - 54.5	22.5 - 35	18.4 - 46.5	41.2 - 57.4	25.5 - 45.6	35 - 50			
WBC (G/l)	$\bar{x} \pm SD$	7.7 ± 1.9	14.6 ± 3.5 ^{aa}	15.6 ± 3.4 ^{aa}	17.1 ± 4.8 ^{aa}	8.2 ± 2.2	15.7 ± 7.3 ^{bb}	15.5 ± 2.8 ^{bb}			
	Range	5.1 - 10.1	9.4 - 19.1	11.1 - 21.2	9.5 - 23.2	5.3 - 12.4	8.4 - 35	12 - 20			

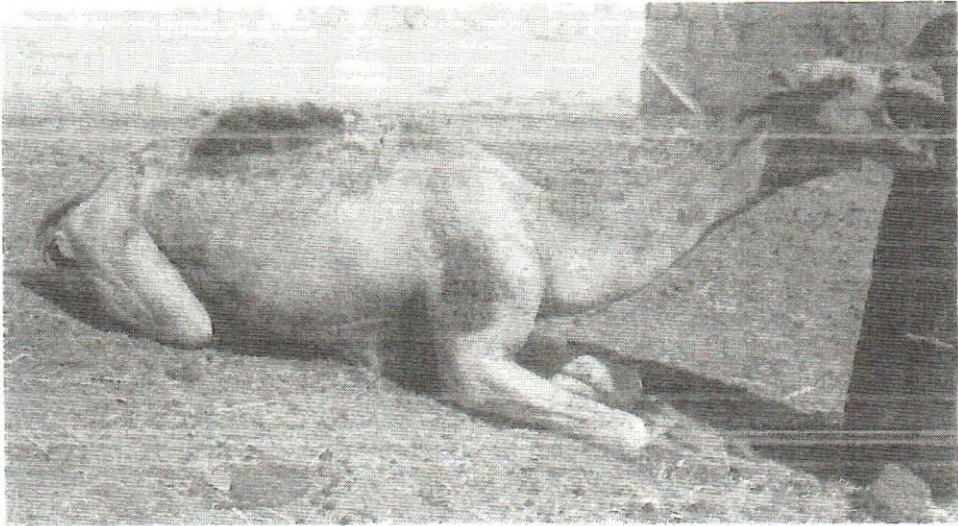


Fig. 1: Emaciated camel suffering from chronic trypanosomiasis and mange: showing disappearance of the hump, depletion of the sub-cutaneous fat and alopecia, wounds, scales and keratinization of the skin.

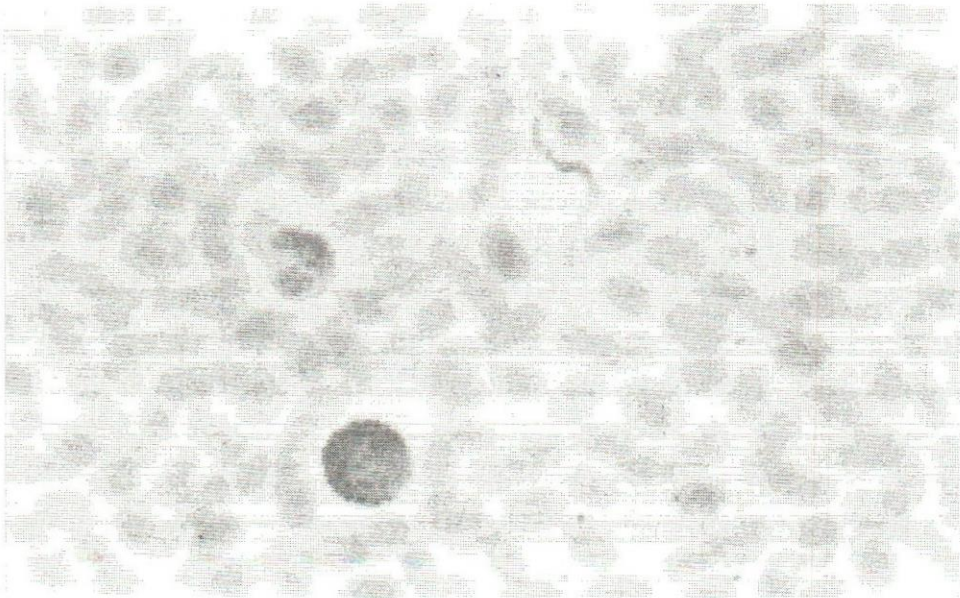


Fig. 2: Giemsa stained blood film, positive for *trypanosoma evansi*.

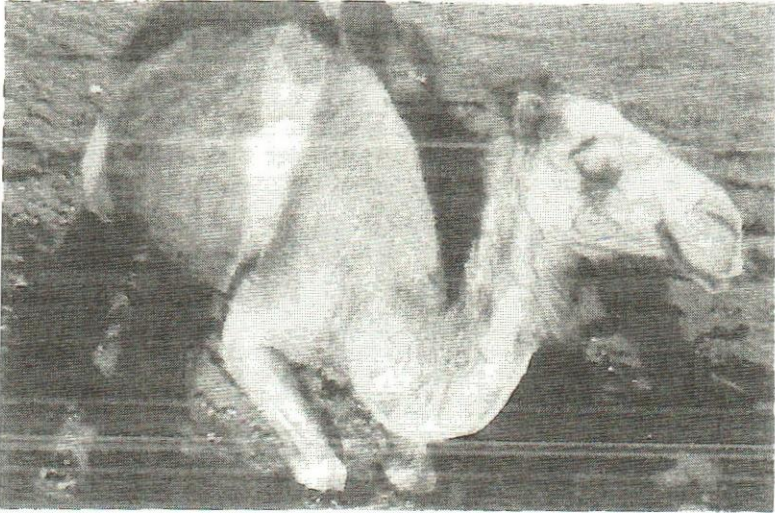


Fig.3: Emaciated camel suffering from trypanosomiasis, showing depression, thin disappeared hump and half closed eyes.

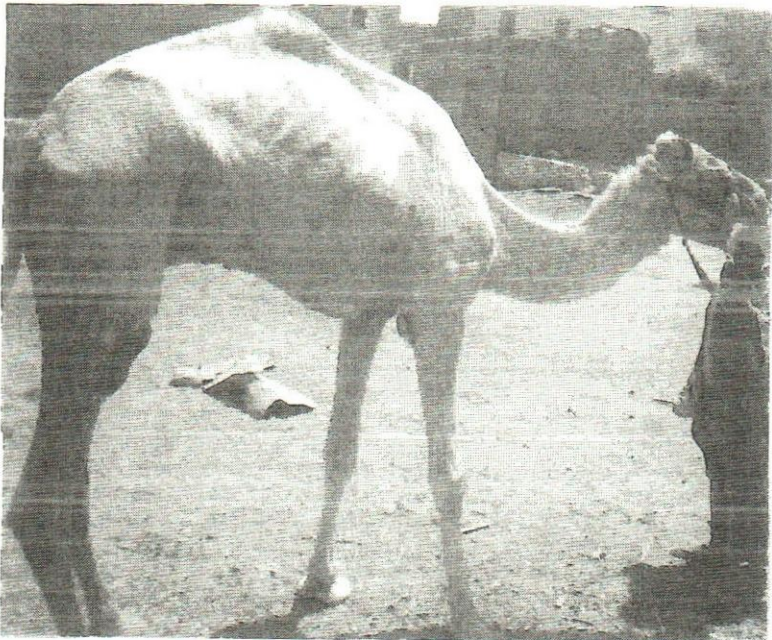


Fig.4: Emaciated camel suffering from *mange mites* showing, rough coat, alopecia, wrinkling, scales and keratinization of the skin..

