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## دراسات الكلينيكية وبيوكيميائية عن التسمم المزمن بالفلورين والكبريت في الجمال

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يشكل التلوث خطورة شديدة على صحة الانسان والحيوان ويظهر أثره جليا في المناطق

الصناعية •

وتمثل الجمال جزء كبير من الثروة الحيوانية في مصر فهي حيوانات عمل من الدرجة الاولى وتربي كذلك لانتاج اللحوم • ومن هنا كانت الاهمية لدراسة تأثير مركبات الفلور والكبريت على صحة الجمال وتقييم التغيرات الكلينيكية والبيوكيميائية التي تطرأ عليها •

أجري البحث على عدد ١١٤ حيوان متقاربة الاعمار وموزعة على أبعاد مختلفة من مصدر التلوث (مصنع سوبر فوسفات أسيوط) ، بالفحص الكلينيكي والمعملي تبين أن ٥٥ جمل ظهرت عليها أعراض التسمم المزمن بالفلورين والكبريت بينما ٢٢ حيوان كانت سليمة الكلينيكية ، وأختير عدد ٣٧ حيوان من منطقة منفلوط وهي بعيدة تماما عن تأثير مخلفات المصنع حيث وضعت كضوابط للبحث •

وقد اتضح من الدراسة مايلي :-

- ١ - الاعراض الكلينيكية كانت أكثر وضوحا في الحيوانات القريبة من المصنع حتي مسافة ٢ كم حيث تمثلت في ضعف البنية - الهزال - جفاف الجلد - خشونة الشعر - بهتان الأغشية المخاطية - تلون الاسنان بمختلف درجات اللون البنى وتآكل الاسنان وتعرضها للسقوط •
- ٢ - ارتفاع معنوي في نسبة الفلورين والكبريت في أمصال دم الحيوانات بالمناطق المجاورة للمصنع حتى مسافة ٢,٥ كم وهذا يعلل ظهور الاعراض الكلينيكية للتسمم بمخلفات المصنع •

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**CLINICAL AND BIOCHEMICAL STUDIES ON  
CHRONIC FLUOROSIS AND SULPHUROSIS IN CAMELS**  
(With 2 Tables & 7 Figs.)

By  
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**SUMMARY**

The present study have been carried out to investigate the effect of fluorine, sulphur dioxide and sulphur trioxide gases emitted from Manqubad Super-phosphate Factory, Assiut province, Egypt. which pollute the area around the factory and affect animal health.

During this investigation 114 camels were chosen from different areas at various distances from the factory. The affected animals showed various clinical signs of chronic fluorine and sulphur intoxications. These signs included emaciation, paleness of the mucous membranes, anaemia, general poor health and dental lesions, in the form of staining mottling, brownish discolouration and wearing of the teeth.

As a conclusion camels present in highly polluted areas were affected by the toxic fumes and showed the signs of intoxication. Camels like other animal species showed the symptoms of fluorosis and sulphurosis.

Finally it is important to prevent or even minimize the environmental pollution by sulphur and fluoride compounds to protect the animal health and production.

**INTRODUCTION**

Industrial pollutin is today a serious problem which arises great interest not only among research workers but also among the general public and medicine. The problem require a study of medical and veterinary aspects. Pollutants are specially harmful to animals, when emitted into etmosphere by industry (fluoride, sulphur and sulphur oxides). Industrial fluorosis in livestock is today a disorder well known by veterinarians in all industrial countries (ENDER, 1969).

**Chronic Fluorosis:**

BODDIE (1947) recorded variation in effects produced by fluorine ingestion. The author stated that dental fluorosis involved the permanent teeth. The obvious sings were mottling of incisors, thinning, wearing away with the upper edge breaks and projected little above the level

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\* This is part of M.V.Sc. thesis presented by A.S. Sayed, Faculty of Vet. Med., Assiut University.

of the gum. The author added that in heavy contamination there will be signs of generalized effects, loss of appetite, stiffness, lameness, and articular pain. Similar signs were recorded by BLAKEMORE, et al. (1948), AGATE, et al. (1949), TOWERS (1954), BURNS and ALLCROFT (1964), CRISMAN, et al. (1979), ABD-ALL (1980), and KARRAM (1982) summarized the clinical signs of chronic industrial fluosis as dental changes of various degree in sheep and goat respectively. These changes varies from brownish colouration to mottling and wearing of teeth with bulging of the later above the gum level. Debility and emaciation were major signs in these animals.

#### Chronic Sulphurosis:

UNDERWOOD (1962) described anemia, neonatal ataxia, loss of wool and bone fracture in sheep suffering from sulphate poisoning.

IBRAHIM (1980) recorded that chronic sulphurosis in sheep and goat reared at the vicinity of super-phosphate factory inducted emaciation, palness of mucous membranes, dehydrated skin and tuft of wool.

WEETH and CAPPS (1972) recorded that heifers consumed 2814 PPM. sulphate were anemic, emaciated and showed reduction in weight gain.

IBRAHIM (1983) mentioned that the main toxic signs of sulphur poisoning in buffaloes were emaciation, rough easily detached hair, paleness of nasal and conjunctival mucous membranes, and often enteritis with signs of dehydration, respiratory distress.

At Assiut Governorate, Egypt, Manqubad Superphosphate Factory was established. During the industrial process of manufacturing the fertilizer, fumes and wastes were emitted polluting the area around the factory. These fumes and wastes contained mainly SO<sub>2</sub>, SO<sub>3</sub> and hydrofluoric (Hf) gases. Animals in the areas around the factory suffer from chronic fluorosis and sulphurosis (ABD-ELALL, 1980; KARRAM, 1982; IBRAHIM, 1983).

The present study aimed to investigate the clinical manifestations of chronic fluorosis and sulphurosis in camels supported by determination of fluorine and sulphur levels in blood serum of affected animals.

## **MATERIAL and METHODS**

### Materials:

A total number of 114 camels (*Camelus dromedarius*) were examined in the present study. The animals were selected from different areas around Manqubad superphosphate factory (Fig.3) Assiut Governorate, Egypt, to investigate the effect of the factory by-products specially fluorine and sulphur compounds upon the examined animals. By clinical and laboratory examination 55 camels showed the clinical signs of intoxication and the rest (22) were proved to be clinically healthy. Animals of the control group (37) were chosen from area far away from the factory.

Blood serum samples were obtained from jugular vein according to the method of COLES (1980). The non haemolysed serum samples were used for determination of fluoride and sulphur levels.

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Burns, K.N. and Allcroft, R. (1964): General fluorosis. *Vet. Rec.* 78: 507-510.

Crissman, J.W.; Mylin, G.A. and Krook, L. (1979): New York State and U.S. Federal fluorine pollution standards do not protect cattle health. *Cornell. Vet.* 70: 183-192.

Coles, E.H. (1980): *Veterinary Clinical Pathology*. 3rd edition. W.B. Saunders Comp. Philadelphia, London, Toronto.

Ender, F. (1969): The effect of air pollution in animals, *Proc. 7th European Congress on the influence of air pollution on plants and animals*, 245, Centre of Agric. Publ. and Documen., Wageningen.

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## FLUOROSIS IN CAMEL

Methods:Determination of fluoride (p.p.m):

Fluoride ions were determined by fluoride electrode using ion analyzer EA 290, Orion Research, according the method of FRAY and TAVES (1970).

Determination of Sulphur (mg%):

## FLUOROSIS IN CAMEL

- Fray, B.W. and Taves, D.R. (1970): Serum fluoride analysis with the fluoride electrodes. *J. Lab. & Clin. Med.* 75: 1020-1024.
- Ibrahim, Th.A. (1980): Effect of some waste products of chemical factories in Assiut Province on animal health. M.V.Sc. Thesis, Assiut University.
- Ibrahim, Th.A. (1983): Toxicological effects of the byproducts of the superphosphate plant on Egyptian buffaloes in Assiut Province. Ph.D. Thesis, Assiut University.
- Karram, M.H. (1982): Studies on fluorosis in goats in Assiut Province. Ph.D. Thesis, Assiut Univ.
- Luedke, A.J.; Bratzler, J.W. and Dunne, H.W. (1959): Sodium metabisulfite and sulphur dioxide gas (Silage preservative) poisoning in cattle. *Am. J. Vet. Rec.*, 20: 290-296.
- Radeleff, D.R. (1964): *Veterinary Toxicology*. 2nd edition. PP. 146-148. Lee & Febiger, Philadelphia.
- Snedecor, G.W. and Cochran, W.G. (1974): *Statistical Methods*. 6th Ed. Iowa State Univ. Press Ames, Iowa, USA.
- Stockholm, M. and Koch, F.C. (1923): In: Quantitative method for determination of total sulphur in biological material. *J. Am. Ch. Soc.* 45, pp. 1953-1956.
- Suttie, J.W.; Carlson, J.R. and Faltin, E. (1972): Effect of alternating periods of high and low fluorine ingestion on dairy cattle. *J. Dairy. Sc.*, 55: 790-804.
- Suttie, J.W.; Clay, A.R.; Shearer, T.R. (1985 a): Dental fluorosis in bovine temporary teeth. *Am. J. Vet. Res.* 46, No. 2: 404-408.
- Suttie, J.W.; Hamilton, R.J.; Clay, A.C.; Tobin, M.L. and Moore, W.G. (1985 b): Effects of fluoride ingestion on white Tailed Deer. *J. of Wildlife Disease*, 2 (3): 283-288.
- Towers, R.G. (1954): Chronic fluoride poisoning associated with industry. *Vet. Rec.* 66: 355-358.
- Underwood, E.J. (1962): Trace elements in human and animal nutrition. 2nd. Ed., pp. 26. Academic press, N.Y.
- Weeth, H.J. and Cappd, D.L. (1972): Tolerance of growing cattle for sulphate water. *J. of Animal Science.* 34 (2): 256-250.
- White, B.J. (1964): Sulphur poisoning in ewes. *Vet. Rec.* 10, 76: 278-281.

**LIST OF FIGURES**

- Fig. (4): Normal colouration of teeth.
- Fig. (5): Dental fluorosis showing brownish discolouration.
- Fig. (6): Dental fluorosis showing dark brown colour of teeth.
- Fig. (7): Dental fluorosis showing nearly complete attrition of the teeth to be at the level of the gum.

Table (1)  
Serum fluoride levels (ppm) of the examined camels at the studied areas

Localities	Distance from the factory (Km.)	Animals	
		Males	Females
Gaz.El-Akrad	adjacent to the factory	19.00±3.00** 7-35	12.50±0.70** 7-18
Ezb.Mohamed	1.5-2.5	12.00±0.93** 9-16	8.90±1.62** 8-13
Gaz.El-Tawabyia	0.5-1.0	4.40±0.33 3.90-5.00	4.50±1.24 1.20-7.40
Manquabad	1-2	5.80±0.53* 3.50-7.60	5.90±0.31* 5.00-6.50
Ilwan	2	4.80±1.14 2.70-6.60	3.63±0.127 1.10-5.10
El-Walidyia	4	2.54±0.70 1.20-6.30	3.30±0.60 2.10-5.00
Manfalut	25	3.03±0.19 2.00-5.20	3.00±0.16 1.90-4.30

\*\* LSD( t 0.01)  
\* LSD( t 0.05)  
± Standard error.

ANOVA of serum fluoride levels(ppm).

S.V.	D.F	S.S.	M.S.S.	F
Area	6	2535.1	422.52	38.01**
Sex	1	92.89	92.89	8.356**
Interaction	6	161.5	26.92	2.42*
Error	98	1089.4	11.116	
Total	111	3878.9		

\*\* Highly significant (P 0.01)  
\* Significant (P 0.05).

## FLUOROSIS IN CAMEL

Table (2)  
Serum sulphur levels (mg%) of the examined camels at the studied areas

Localities	Distance from the factory (km.)	Animals	
		Males	Females
Gaz.El-Akrad	adj. to the factory	2085.5±295.8** 1090-3847	1882.1±261.76** 1360-3122
Ezb. Mohamed	1.50-2.50	1703.7±279.2** 1090-2885	2011.3±218.10** 1450-2473
Gaz. El-Tawabyia	0.50-1.00	1926.6±527.6** 1090-2900	2273.8±448.4** 1687-3847
Manquabad	1.00-2.00	1771.8±254.1** 1136-2880	1732.8±293.5** 937-2363
Ilwan	2	981.3±159.9 687-1237	928.0±163.9 714-1250
El-Walidyia	4	886.3± 45.93 687-1094	736.0± 96.043 1020-612
Manfalut	25	449.2±51.9 220-1090	503.4± 67.8 274-820

\*\* LSD (t 0.01).  
\* LSD (t 0.05).  
± Standard error.

## ANOVA of serum sulphur levels (mg%)

S.V.	D.F.	S.S.	M.S.S.	F.
Areas	6	48760337.7	8126722.95	23.499**
Sex	1	266835.7	266835.7	0.772 N.S.
Interaction	6	530329.7	88388.28	0.256 N.S.
Error	93	32162573.2	345834.12	
Total	106	81720074.0		

\*\* Highly significant (P 0.01)  
\* Significant (P 0.05)  
N.S.: Non significant.

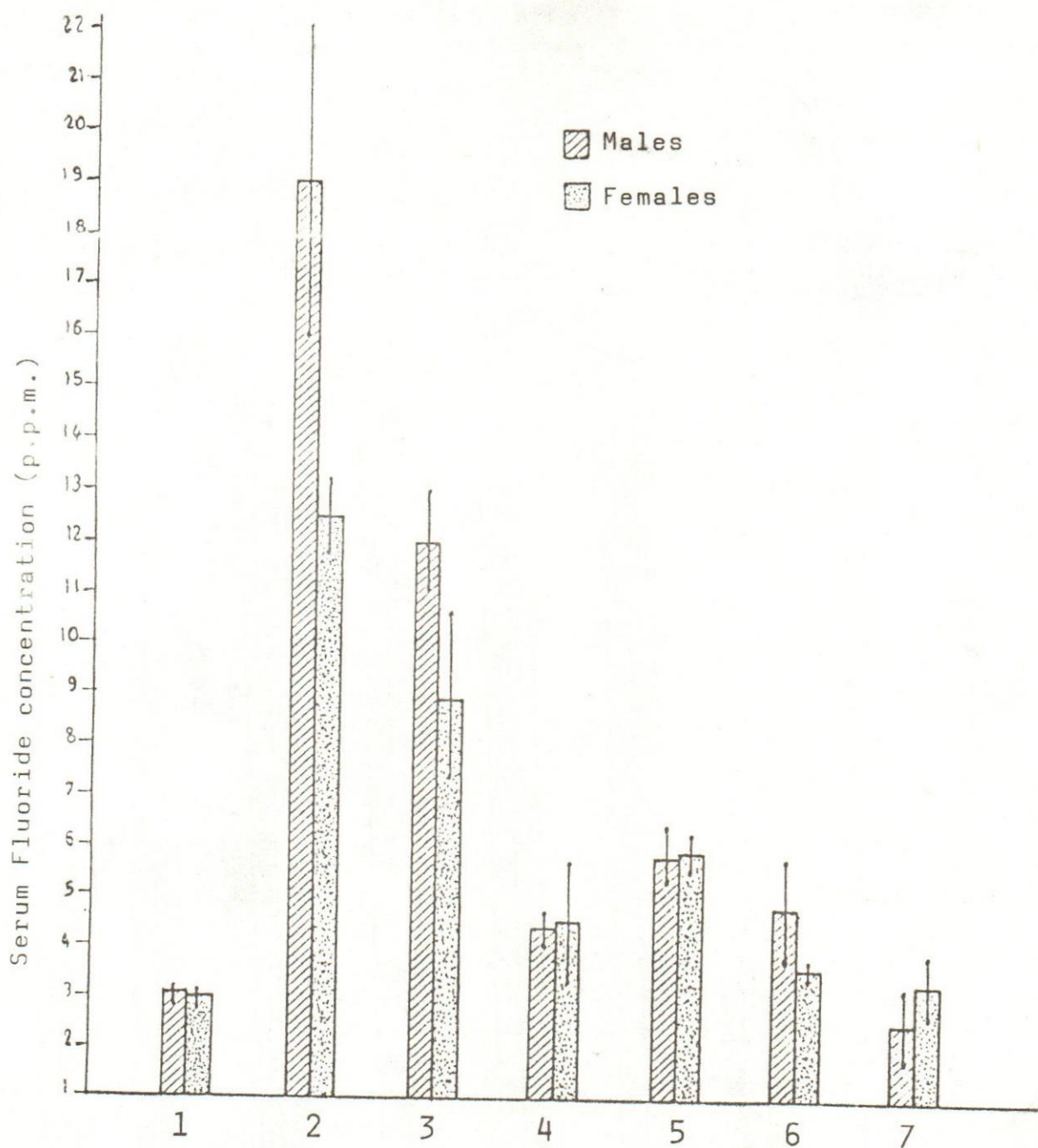


Fig.( 1):Mean values and standard errors of fluoride levels(p.p.m.)in the blood serum of the examined camels at the studied areas

1- MANFALUT (CONTROL)  
 2- GAZERAT EL-AKRAD  
 3- EZBAT MOHAMED  
 4- GAZERAT EL-TAWABYIA.

5- MANQUABAD  
 6- ILWAN  
 7- EL-WALIDYIA

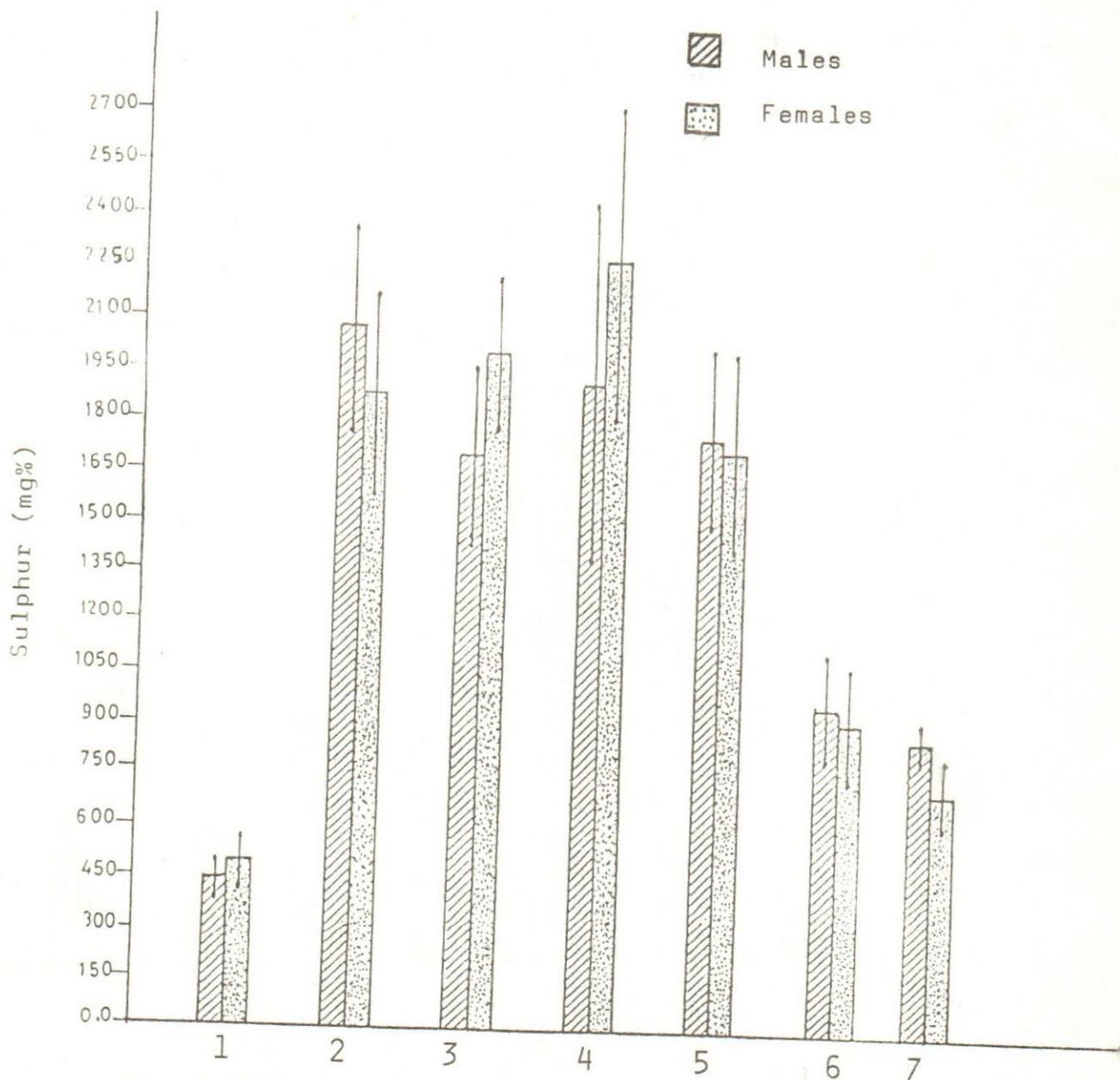


Fig. ( 2 ): Mean values and standard errors of Sulphur (mg%) in the blood serum of the examined camels at the studied areas.

1-MANFALUT (CONTROL)

5-MANQUABAD

2-GAZERAT EL-AKRAD

6-ILWAN

3-EZBAT MOHAMED

7-EL WALIDYIA

4-GAZERAT EL-TAWABYIA



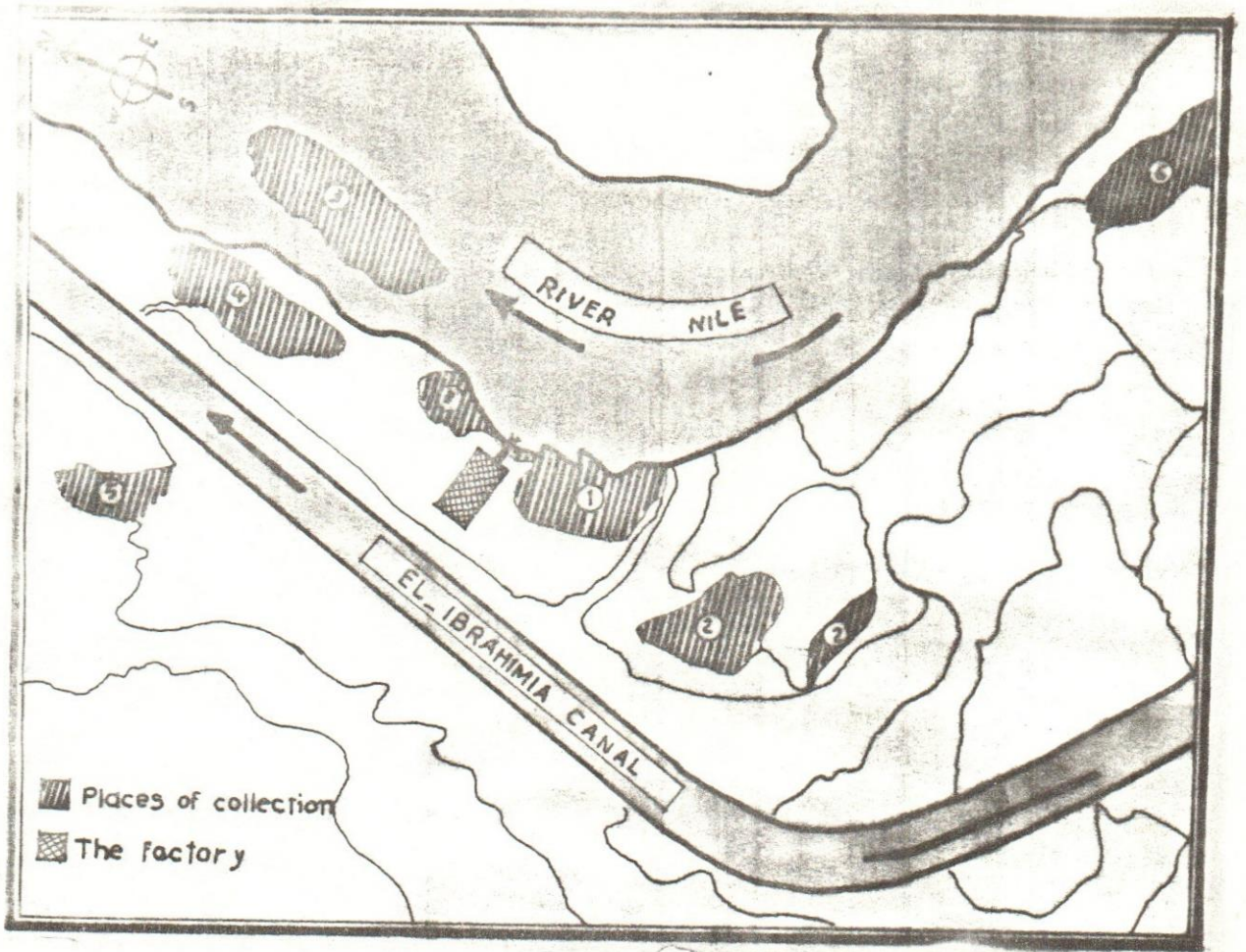


Fig. (3)

- |                         |                 |
|-------------------------|-----------------|
| (1) Gazerat El-Akrad.   | (4) Manquaba    |
| (2) Ezbat Mohamed       | (5) Ilwan       |
| (3) Gazerat El-Tawabyia | (6) El-Walidyia |



