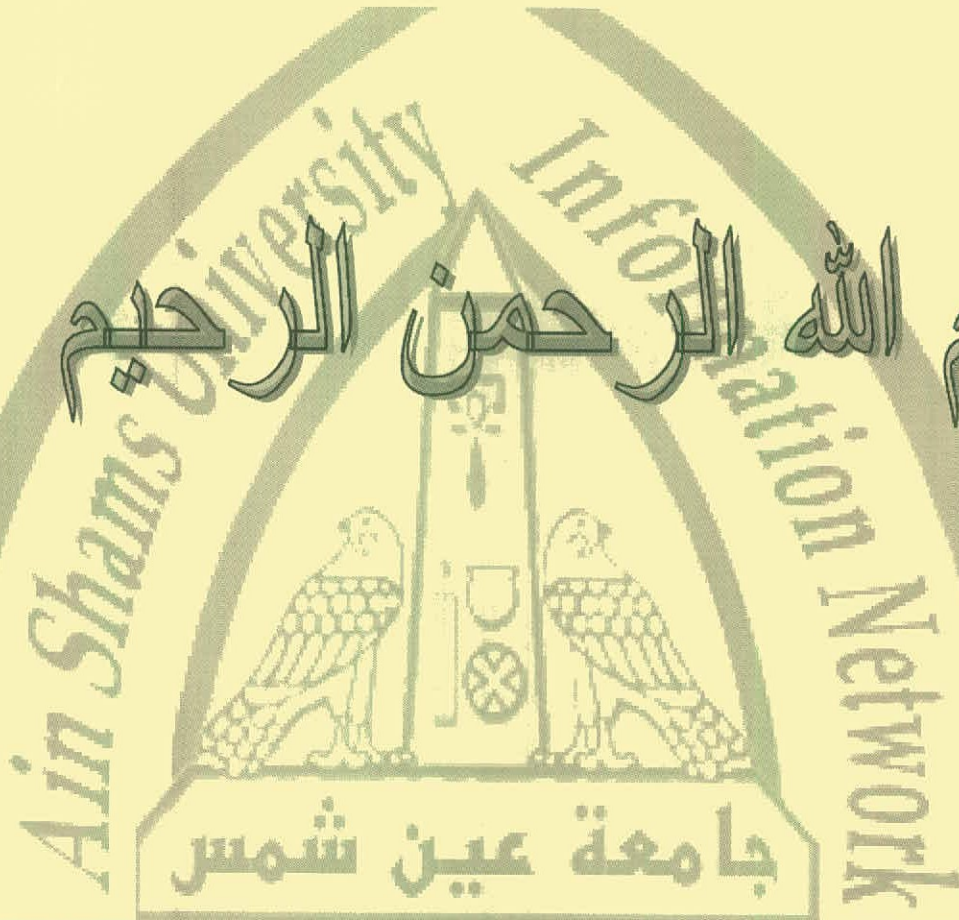




شبكة المعلومات الجامعية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



شبكة المعلومات الجامعية  
@ ASUNET



# شبكة المعلومات الجامعية التوثيق الالكتروني والميكروفيلم



شبكة المعلومات الجامعية

# جامعة عين شمس

التوثيق الالكتروني والميكرو فيلم

## قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها  
علي هذه الأفلام قد أعدت دون أية تغيرات



## يجب أن

تحفظ هذه الأفلام بعيدا عن الغبار

في درجة حرارة من ١٥-٢٥ مئوية ورطوبة نسبية من ٢٠-٤٠%

To be Kept away from Dust in Dry Cool place of  
15-25- c and relative humidity 20-40%

# بعض الوثائق الأصلية تالفة

# بالرسالة صفحات لم ترد بالاصل

***CONTRASTING REDOXIMORPHIC PATTERNS AS  
A FUNCTION OF SOIL PEDOGENIC PROCESS IN  
EL FAYOUM AREA, EGYPT***

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***THESIS***

***Submitted in Partial Fulfillment of the Requirements for the Degree of  
Master of Agricultural Sciences***

***IN  
SOIL SCIENCE***

***Soils and Water Department  
El Fayoum Faculty of Agriculture  
Cairo University***

**2001**

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## ABSTRACT

This study aims at identifying iron transformations as a result of preferential oxidation-reduction of iron forms (redoximorphic features) in the presence of a seasonally high water table at El Fayoum depression. The obtained data are suggested in the following items.

In general, the oxidized soil horizons are characterized by a very dark grayish brown to very pale brown, coarse sub-angular to medium angular blocky and slightly hard, may be due to the dominance of ferric oxides. Whereas, the reduced ones have a dark gray to pale yellow, structureless or massive and hard to very hard, due to the dominance of ferrous oxides. The mottled zones are yellowish brown (jarosite) in the upper stratum, pale yellow for iron oxide in the middle portion, reddish (hematite) for the upper fringes of ground-water and yellowish (goethite) at the greater depth.

It was noticed that the yellow zones have less clay than the gray ones of the same horizon, may be due to the ferrous oxides are occurred in the colloidal particles of clay. Soil bulk density value tends to decrease in the oxidized state as compared to those have a reduction phase, since the influence of ferric form was enhanced the coagulation of particles and create a renewed stable aggregates that accompanied by large pores and improve the soil aeration and permeability. Whereas, the gray zones (reduced) have smaller pores, resulting slowly oxygen diffusion in the wet periods, Fe oxides can be allocated to goethite and a much lower Fe.

Soils subjected to oxidized state, in general, are free from sodicity, while the reverse is true for those exhibited reduced one during the continuous wetness. X-ray diffraction patterns show that pyrite is more abundant in reduced zones and suggested the youngest age of that soil, the reverse is true for oxidized ones, where hematite, jarosite and goethite are dominated. Also, iron bearing minerals (jarosite, hematite and goethite) are considered as new formations, mostly derived due to the weathering of ferromagnesian minerals (hornblende, augite and biotite) or oxidation of iron in clay minerals under the arid environments of El Fayoum region.

The main micromorphic iron features are represented by *skeletal allogenic* (inherited grains from the parent material), *pedogenic* (in situ, clay minerals or calcareous fine crystals, mostly mixed with amorphous iron compounds as patches, mo-, ma- and in-sepic plasmic fabrics), *orthic concretions*, hypoferri-argillans (neo- or quassi-ferrans, especially in the gley horizons), infillings and crystallite forms. The dominance of *pyrite* in lacustrine and fluvio-lacustrine deposits, reflects their enrichment in  $\text{SO}_4^-$  and  $\text{H}_2\text{S}$  and better environments for transforming the amorphous ferric

oxide ( $\text{Fe}_2\text{O}_3$ ) to pyrite ( $\text{FeS}_2$ ) during the periodic reduction of immobile ferric iron to mobile ferrous iron.

Redox potential figures varied from +453 (oxidized zone) to -165 mv (reduced one), the well-aerated soil had a positive value of (+453 to +307 mv), while water-logged ones had redox potentials as negative as -25 to -165 mv. The faster and greater decrease in oxidation-reduction potential in the water-logged zones may be attributed to the smaller oxygen reservoir as can be expected from their lower state of soil aggregation and air porosity. It was noted that the latter decrease in redox potential was paralleled by a significant reduction of iron oxides, which reflected by a relatively high intensity peak of pyrite in the x-ray diffraction.

The comparatively high of  $\text{Fe}^{3+}$  (crystalline form) concentration in the oxidized zones above the pyritic substratum, suggests that the rate of pyrite oxidation is higher in young soils than in the old ones. This is probably due to a relatively rapid lowering of the ground-water, and in turn easy access of air to the pyritic zone during the early stages of soil development.

As for soils developed on the shale deposits, the remaining oxidized phase may be attributed to extremely adverse conditions for microorganisms, high stability of ferric oxides and nearly absence of pyrite. The occurrence of jarosite accounts as a part for the presence of the relatively large amounts of ferric oxides in the substratum, may be enhanced by the relatively high pH and low concentrations of sulfate and potassium.

**Key words:** Soils of El Fayoun depression, iron forms, oxidation-reduction potential, mineralogy of iron oxides and factors controlling redoximorphic features.

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