RESULTS AND DISCUSSION

4. RESULTS AND DISCUSSION

4.1. Soil morphology

A soil profile means vertical exposure of a surfical portion of a soil individual that includes all the layers that have been pedogenically altered during the process of soil formation and also deeper layers that are influenced by the pedogenesis. In this field, a soil individual is a soil body that may be defined in trems of profile features whose arrangement and combinations over a geographic area are unique.

The morphological properties of the soil profiles and surface samples could be considered as indication of the soil formation processes that act up on soil body. Also, they represent a tool for predicting the type or types of parent materials, the mode of deposition and the nature of soil forming factors that dominated over the soil system.

The field observations show that the soils of Ramlet Homyir are mainly formed of alluvial deposits derived from igneous, metamorphic and sedimentary rocks.

The land scape is almost flat to gently undulating and the soils are covered with desert pavement. The soils are deep, dominated with sand texture, yellow (10YR 8/8, dry) colour and the value decreased throughout the control section to (10YR 5/8, dry) $CaCO_3$ is present in spots, segregations and concretion forms. Soil structure is single grains, while soil consistence coincides well with soil texture being non sticky and non plastic.

The following sheets represent the detailed notes concerning the morphological characteristics of the representative soil profiles and surface samples, using the Guideline for soil description of **FAO (1990).**

Description of soil profiles

Profile No:	**1**
Location:	Ramlet Homyir area.
Topography:	Almost flat.
Surface cover:	Many fine to coarse gravels.
Vegetation:	None.
Water table:	more than 150 cm depth.

Depth (cm)	Description
0-60	Yellow (10YR 8/8, dry) to brownish yellow (10YR 6/8, moist) sandy, loam, single grain; structure loose; non sticky; non plastic; slightly calcareous, clear smooth boundary.
60-120	Yellow (10YR 8/8, dry) to very pale brown (10YR 8/4, moist) sand; massive non sticky; non plastic; slightly calcareous.

Profile No: **2**

Location: Ramlet Homyir area.

Topography: Almost flat

Surface cover: Many fine to coarse gravels.

Vegetation: Very few scattered desert shrubs

Water table: More than 150 cm depth.

Depth cm	Descriotion
0-60	Very pale brown (10YR 7/3, dry) to very pale (10YR 7/4, moist); sand, single grain; structure loose; non sticky; non plastic; non calcareous; diffused smooth boundary.
60-120	Very pale brown (10YR 7/3, dry) to pale brown (10YR 6/3, moist) sand, single grain; structure loose; non sticky; non plastic; slightly calcareous.

Profile No: 3

Location: Ramlet Homyir area.

Topography: Gently undulating.

Surface cover: Many fine gravels and sand dunes.

Vegetation: None.

Water table: More than 150 cm depth.

Depth (cm)	Description
0-60	Very pale brown (10YR 8/3, dry) to very pale brown (10YR 7/4, moist); sand; single grain; structure loose; non sticky; non plastic; slightly calcareous; diffused wavy boundary.
60-120	Very pale brown (10YR 7/3, dry) to pale brown (10YR 6/3, moist); loamy sand, single grain; structure loose; non sticky; non plastic; slightly calcareous.

Profile No: 4

Location: Ramlet Homyir area.

Topography: Almost flat.

Surface cover: Many fine gravels and sand dunes.

Vegetation: None.

Water table: More than 150 cm depth.

Depth (cm)	Description
0-60	Very pale brown (10YR 8/3, dry) to very pale brown (10YR 7/4, moist); sand, single grain; structure loose; non sticky; non plastic; moderately calcareous; clear smooth boundary.
60-120	Very pale brown (10YR 8/8, dry) to brownish yellow (10YR 6/8, moist); loamy sand, single grain; structure loose; sticky; non plastic; moderately calcareous.

Profile No: 5

Location: Ramlet Homyir area.

Topography: Almost ftat.

Surface cover: Many fine gravels

Vegetation: None.

Water table: More than 150 cm depth.

Depth (cm)	Description
0-60	Yellow (10YR 7/8, dry) to brownish yellow (10YR 6/8, moist); Loamy sand; single grain; structure loose; non sticky; non plastic; moderately calcareous; clear smooth boundary.
60-120	Yellow (10YR 7/7, dry) to brownish yellow (10YR 6/6, moist); sand, single grain; structure loose; non sticky; non plastic; moderately calcareous.

Sample No: 1

Location: Ramlet Homyir area.

Topography: Almost flat.

Surface cover: Many fine gravels and few sand dunes.

Vegetation: None.

Depth (cm)	Description
0-60	Very pale brown (10YR 7/3, dry) to very pale brown (10YR 7/4, moist); sand, single grain; structure loose; non sticky; non plastic; non calcareous.

Sample No: 2

Location: Ramlet Homyir area.

Topography: Gently undulating

Surface cover: Few fine gravels.

Vegetation: Few scattered desert shrubs.

Depth (cm)	Description
0-60	Very pale brown (10YR 7/3, dry) to very pale brown (10YR 7/4, moist); sand, single; grain; structure loose; non sticky; non plastic; moderately soft $CaCO_3$ segregations; moderately calcareous.

Sample No:	**5**
Location:	Ramlet Homyir area.
Topography:	Alamost flat
Surface cover:	Many fine to medium gravels
Vegetation:	None.

Depth (cm)	Description
0-60	Yellow (10YR 8/6, dry) to brownish yellow (10YR 6/6, moist); sand; single grain; structure loose; non sticky; non plastic; fine soft lime segregations; moderately calcareous.

Sample No:	**6**
Location:	Ramlet Homyir area.
Topography:	Almost flat
Surface cover:	Many fine gravels.
Vegetation:	None.

Depth (cm)	Description
0-60	Very pale brown (10YR 7/3, dry) to very pale brown (10YR 7/4, moist); sand; single grain; structure loose; non sticky; non plastic; very few fine soft lime spots; slightly calcareous.

Sample No: 7

Location: Ramlet Homyir area.

Topography: Gentely undulating

Surface cover: Many fine gravels.

Vegetation: None.

Depth (cm)	Description
0-60	Very pale brown (10YR 8/3, dry) to very pale brown (10YR 7/4, moist); sand; single grain; structure loose; non sticky; non plastic; non calcareous.

Sample No: 8

Location: Ramlet Homyir area.

Topography: Gentely undulating

Surface cover: Many fine gravels.

Vegetation: Few scattered desert shrubs

Depth (cm)	Description
0-60:	Very pale brown (10YR 8/3, dry) to very pale brown (10YR 7/4, moist); sand; single grain; structure loose; non sticky; non plastic; few fine dead roots; very fine soft $CaCO_3$ spots, slightly calcareous.

Sample No: **9**

Location: Ramlet Homyir area.

Topography: Almost flat

Surface cover: Few fine gravels .

Vegetation: None.

Depth (cm)	Description
0-60	Very pale brown (10YR 7/4, dry) to light yellowish brown (10YR 7/4, moist); sand; single grain; strucrute loose; non sticky; non plastic; few soft lime concretions; slightly calcareous.

Sample No: **10**

Location: Ramlet Homyir region.

Topography: Almost flat.

Surface cover: Many fine gravls and few sand dunes.

Vegetation: None.

Depth (cm)	Description
0-60	Very pale brown (10YR 7/4, dry) to very pale brown (10YR 7/4, moist); sand; single grain; structure loose; non sticky; non plastic; moderate soft lime segregations moderately calcareous; very few fine dead roots.

Sample No: **11**

Location: Ramlet Homyir region.

Topography: Gentely undulating

Surface cover: Many fine gravels.

Vegetation: None.

Depth (cm)	Description
0-60	Very pale brown (10YR 7/4, dry) to light yellowish brown (10YR 6/4, moist); sand, single grain; structure loose; non sticky; non plastic; many soft $CaCO_3$ spots. moderately calcareous; very few dead roots.

Sample No: **12**

Location: Ramlet Homyir region.

Topography: Almost flat.

Surface cover: Many fine and medium gravels .

Vegetation: Few scattered desert roots

Depth (cm)	Description
0-60	Very pale brown (10YR 7/4, dry) to very pale brown (10YR 7/3, moist); sand, single grain; structure non sticky; non plastic; many soft and hard $CaCO_3$ concertions; strongly calcareous; few fine dead roots.

4.2.4. Soil reaction

Data presented in Table (3) reveal that pH values of the studied soils ranged from 7.1 to 8.2 indicating that the studied soils are neutral to moderately alkaline.

4.2.5. Chemical composition of the soil saturation paste extract.

Data presented in Table (3) indicate that the amount of total soluble salts, as expressed by the electrical conductivity (dSm^{-1}) of the soil saturation past extract varies in a narrow limit among the different investigated soil profiles and surface samples. The studied soils are characterized by low salinity, where ECe values ranged from 0.6 to 2.9 dSm^{-1} indicating that the soils are non saline.

With regard to the cationic composition, the soluble cations are dominated with Ca^{++} followed by Mg^{++}, Na^{+}, while K^{+} ions constitutes the least soluble cation. An exceptional case was detected in the deepest layers of profiles (3) and (4), all layers of profile (5) and the surface samples No. (3) and (11) where the cations followed the order Mg^{++}> Ca^{++}>Na^{+}>K^{+}.

Soluble anions are dominated with SO_4^{--} and or Cl^{-}, while HCO^{-}_3 anions was the least abundant soluble anion. CO_3^{--} ion was not detected in all the studied samples .

Table (3): Chemical composition of the soil saturation paste extract.

Profile No.	Depth (cm)	pH	ECe dSm^{-1}	Soluble cations (med./L)				Soluble anions (me./L)			
				Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$SO^{=}_4$	Cl^{-}	HCO_3^{-}	$CO^{=}$
1	0-60	7.4	2.90	9.18	3.69	18.0	0.48	16.85	13.0	1.5	nil
	06-120	8.1	1.80	8.4	7.8	2.4	0.33	6.73	10.0	2.2	nil
2	0-60	8.0	0.60	2.55	2.39	0.83	0.35	1.62	2.5	2.0	nil
	06-120	8.1	1.40	6.9	5.2	1.6	0.32	5.0	7.0	2.2	nil
3	0-60	7.7	0.80	4.59	1.85	1.8	0.32	2.54	4.5	2.0	nil
	06-120	8.1	1.20	4.0	5.2	1.6	0.36	3.56	5.0	2.6	nil
4	0-60	7.8	1.50	4.59	2.33	8.2	0.5	4.62	9.5	2.5	nil
	06-120	8.2	1.30	5.1	5.7	2.0	0.4	7.6	7.0	2.2	nil
5	0-60	7.6	0.95	3.06	3.87	1.8	0.42	6.56	1.3	2.0	nil
	06-120	8.2	1.40	3.6	8.8	1.5	0.33	9.23	3.0	2.0	nil
Surface samples No.											
1	0-60	7.9	0.80	3.37	2.57	2.3	0.4	2.14	4.5	2.0	nil
2	0-60	7.8	0.70	5.10	1.83	1.3	0.42	2.65	3.5	2.5	nil
3	0-60	7.5	1.40	4.06	3.37	8.7	0.35	10.48	4.0	2.0	nil
4	0-60	7.1	0.80	4.08	2.36	1.3	0.4	3.14	3.0	2.0	nil
5	0-60	7.4	0.90	5.10	2.82	1.5	0.35	4.77	3.0	2.0	nil
6	0-60	7.5	0.95	5.10	2.33	1.5	0.46	3.89	3.0		nil
7	0-60	7.4	1.40	5.61	5.28	2.3	0.46	8.15	3.0	2.5	nil
8	0-60	7.5	0.90	4.59	2.24	1.8	0.4	4.03	2.5	2.5	nil
9	0-60	7.7	0.80	4.65	2.25	1.3	0.45	3.15	3.0	2.0	nil
10	0-60	7.6	1.70	8.16	3.23	5.7	0.7	7.79	8.0	2.0	nil
11	0-60	7.7	0.90	4.59	1.35	3.7	0.35	4.49	2.0	2.5	nil
12	0-60	7.5	0.95	4.59	3.33	1.5	0.45	3.87	4.0	2.0	nil

SO_4^{2-} : calculated by difference between cations and anions.

4.3. Statistical size parameters

Certain statistical parameters are often taken as indices of profile origin and mode of deposition. The degree of sorting and skewness could be used as a better calculation on the basis of the soil fraction precentage. Graphic presentations of the clay, silt and sand fractions are given in Figures (6 and 7). The statistical parameters, medium diametes (Md), sorting coefficient (SO) and skewness (SK) are calculated as described by **Pettjohn (1957)** and given in Table (4).

Parameters such as sorting coefficient (SO) and the skewness (SK) were obtained according to the following equations.

$$\text{Sorting coefficient (SO)} = \sqrt{Q3 / Q1}$$

Where Q1 is the first quarter, the diameter corresponding to the frequency of 25%.

Q3 is the third quarter, the diameter corresponding to the frequency of 75%.

The skewness "SK" the symmetry of the distribution towards finer or coarser sediments is given in the following equation:

$$SK = \sqrt{\frac{Q3 / Q1}{Md^2}}$$

where Md is the medium diameter, which represents the middle of the distribution. The relation between the degree of sorting and mode of deposition according to the scale of **Fucht Bauer (1974)** was used it is well known that the sediments transported by wind are usually well sorted, while those transported by water as weathered in situ are usually poorly sorted. **Folk and Ward (1957)** stated that sorting is a sinusoidal function of mean size, so the value increases with transport owing to the decrease in the mean size sediments.

Cumulative curves of the studied soil profiles are given in Figs (6,1-5) and these of the surface soil samples are given in (Fig. 7,1-12), and their statistical size parameters are computed in Table (4). The data reveal that the soils of Ramlet Homyir are characterized by well sorted sediments throughout the depths of the studied profiles and the surface soil samples, except for the surface layer of profile (1) and the deepest layer of profile (3) which exhibited moderately sorted sediments. This finding indicates that the sediments were generally transported and deposited under wind action except for these repersented by the surface and the deepest layers of profiles (1) and (3) which were mainly found under the combined action of both water and wind.

The data also show that the skewness values (log SK) in the studied soil profiles and surface soil samples ranged from 1.01 to 0.101 indicating that these soils have coare skewness, except for the deeper layer of profile (1), and the sunface layer of profile (5),besidesthe surface samples No (3), and (12) where the skewness values decreased toward finer diametr.

Discussing the mode of deposition of sediments in the investigated soils, one makes use of the previously mentioned frequency curves as well as, the statistical size parameters. The quartile measures showed clearly that these sediments are either of alluvial or aeolian sources or even a mixture of both. In this connection, it is concluded that wind and / both water and wind are the two main factors responsible for transport and formation of these soils.

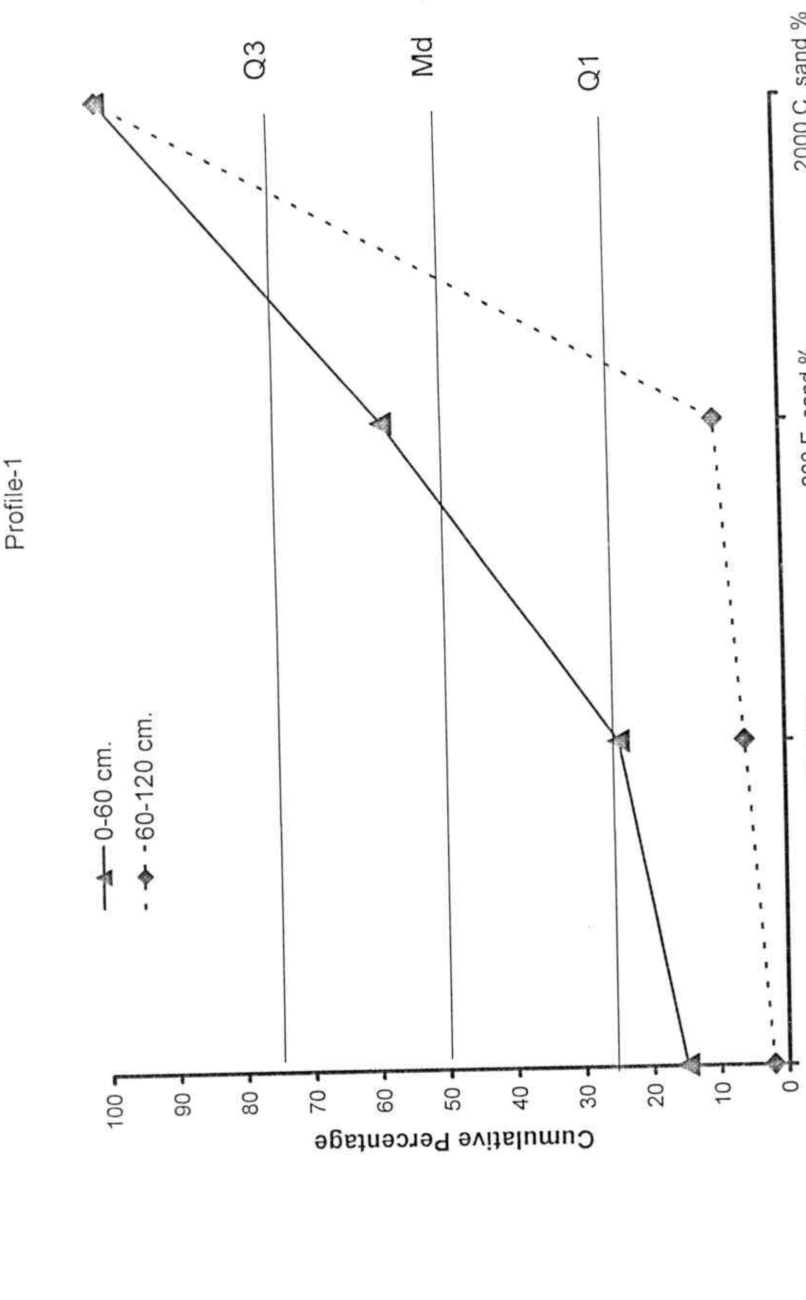


Fig (6-1) Particale size distriputionof of both layers profile (1) Diameter in micron

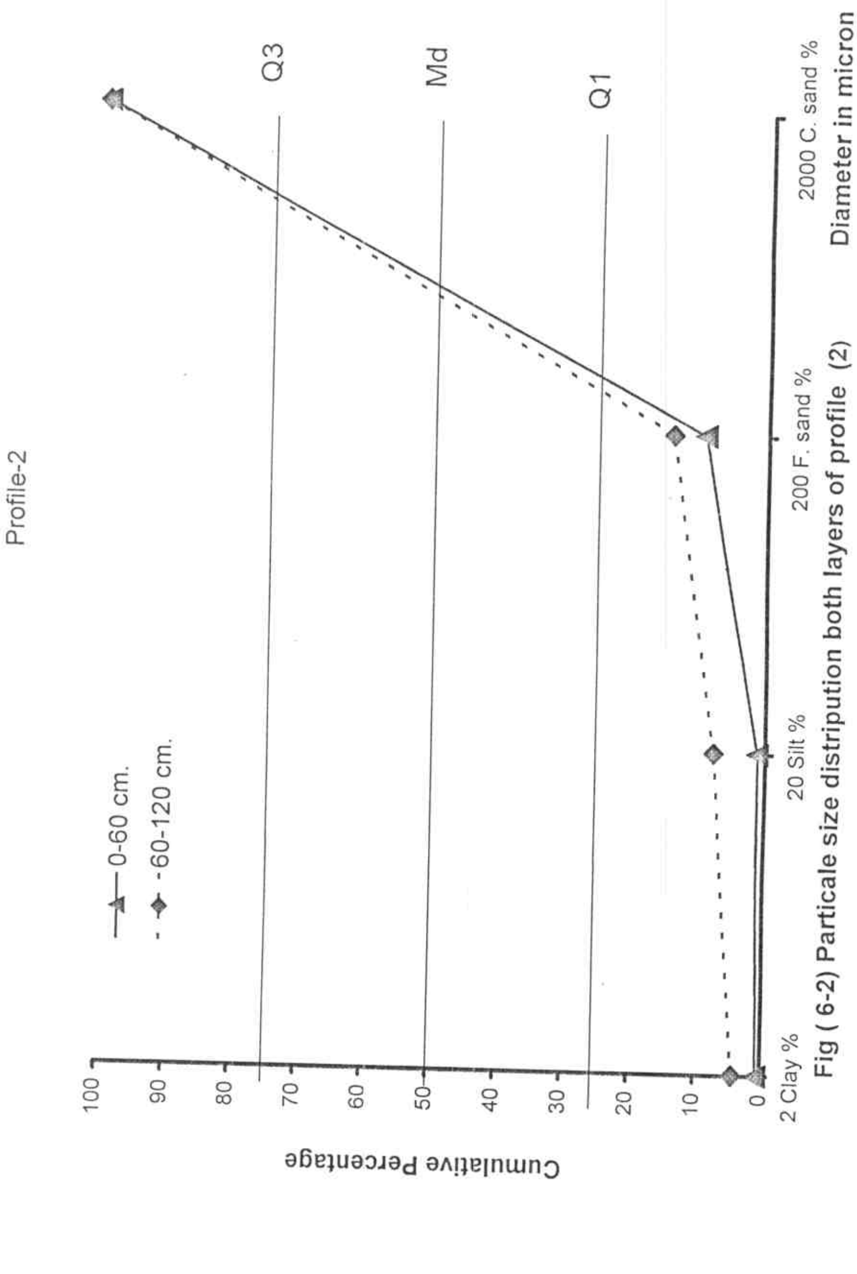


Fig (6-2) Particale size distripution both layers of profile (2)

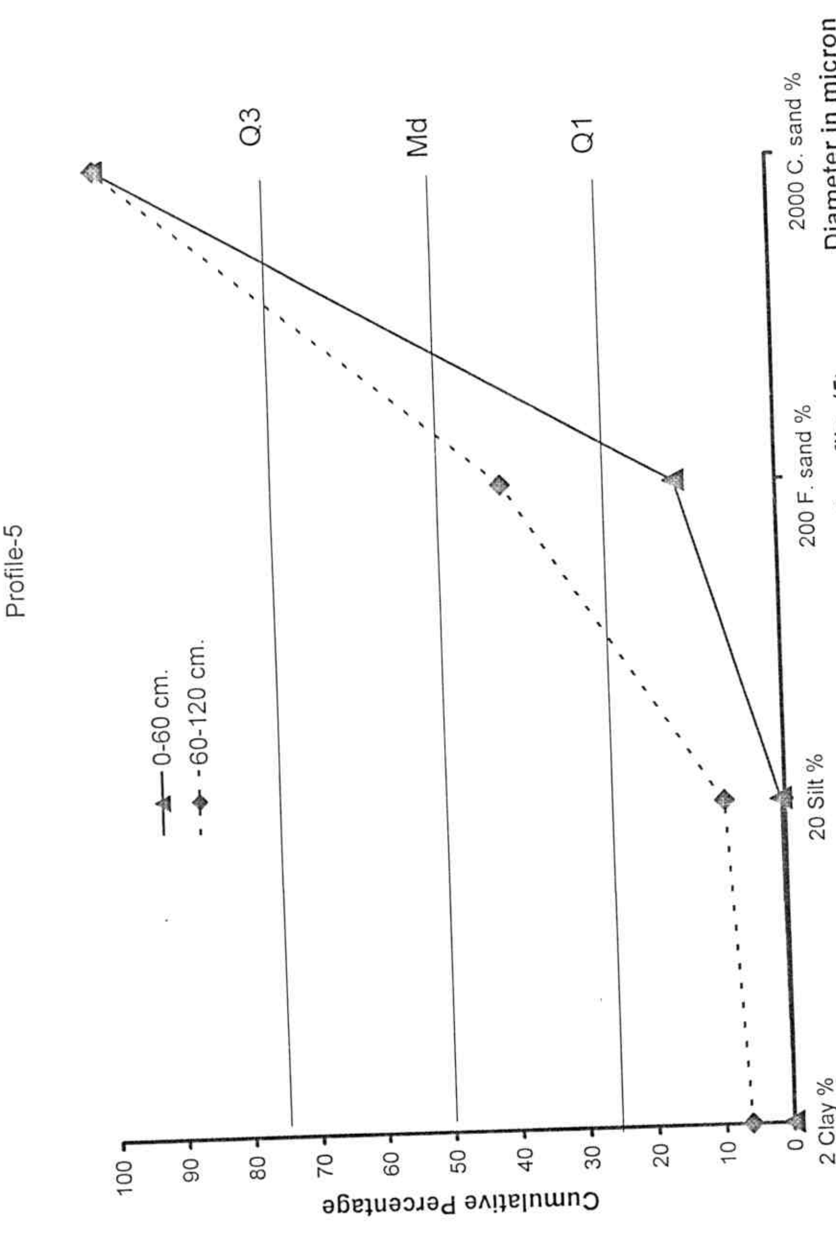


Fig (6-5) Particale size distripution both layers of profile (5)

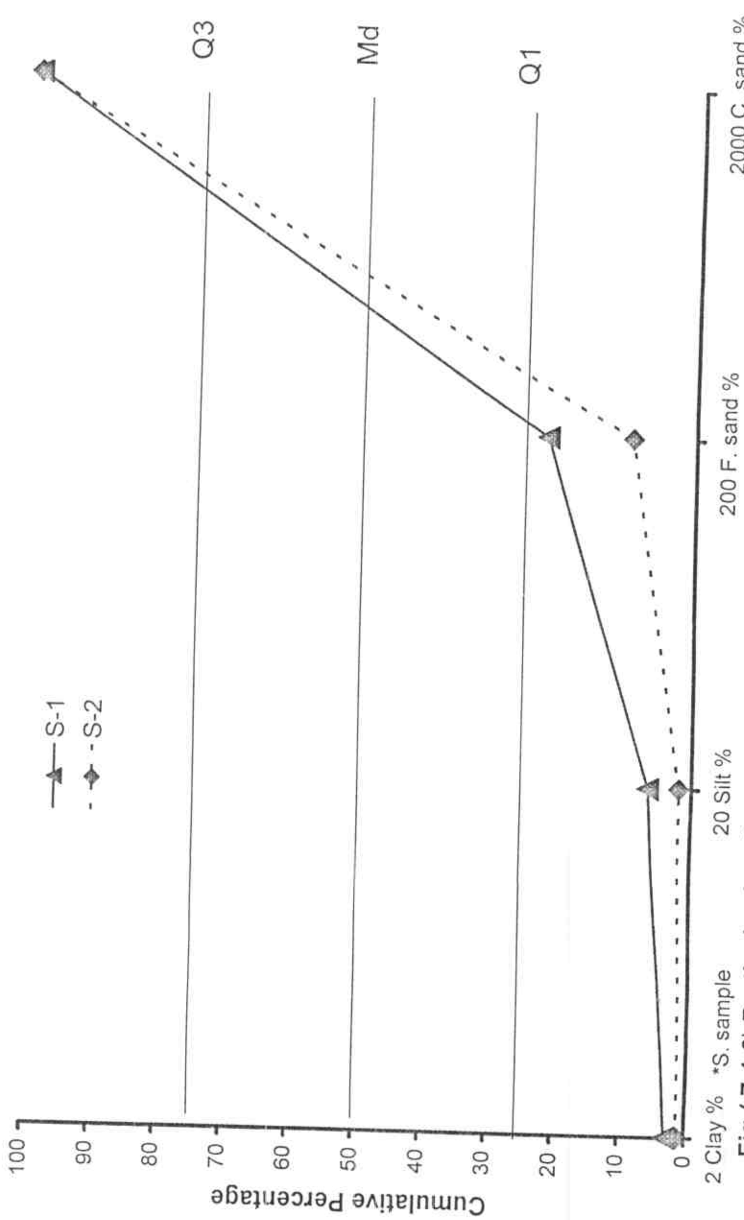


Fig (7-1,2) Particale size distripution both the soil sample (1 and 2) Diameter in micron

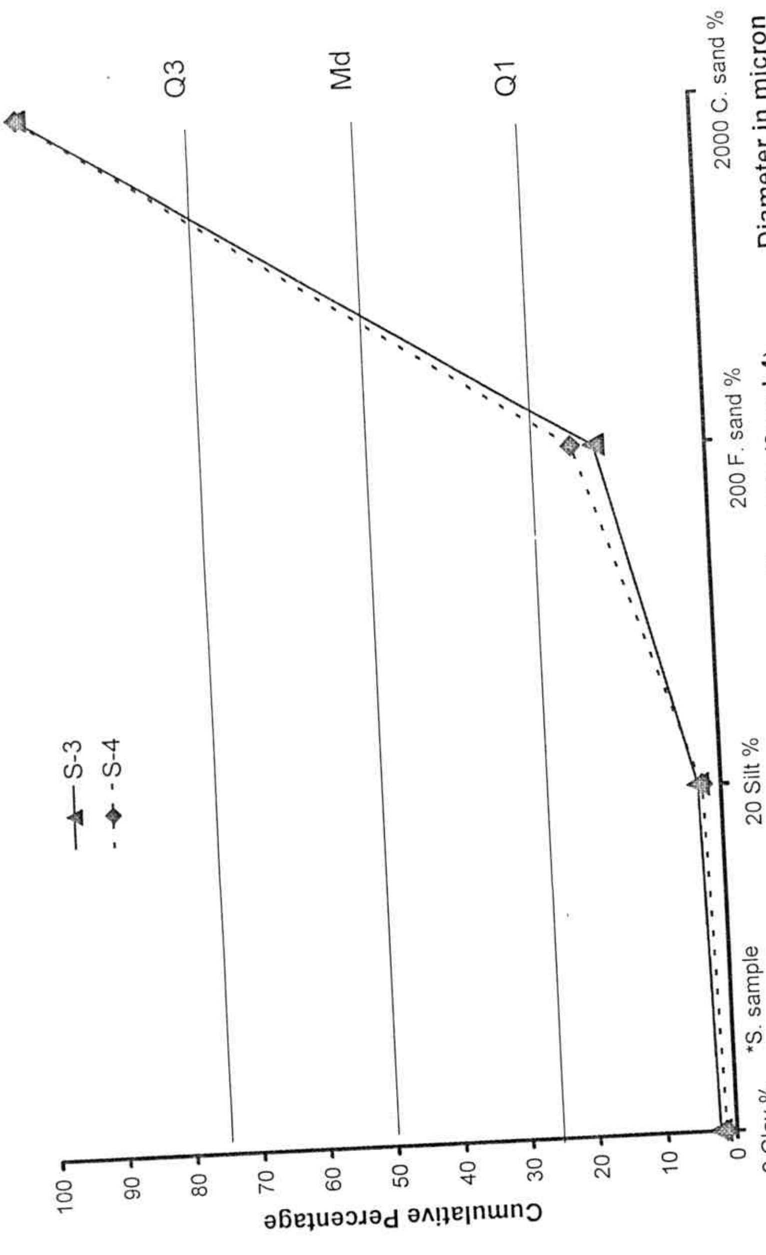


Fig (7-3,4) Particale size distripution both the soil sample (3 and 4)

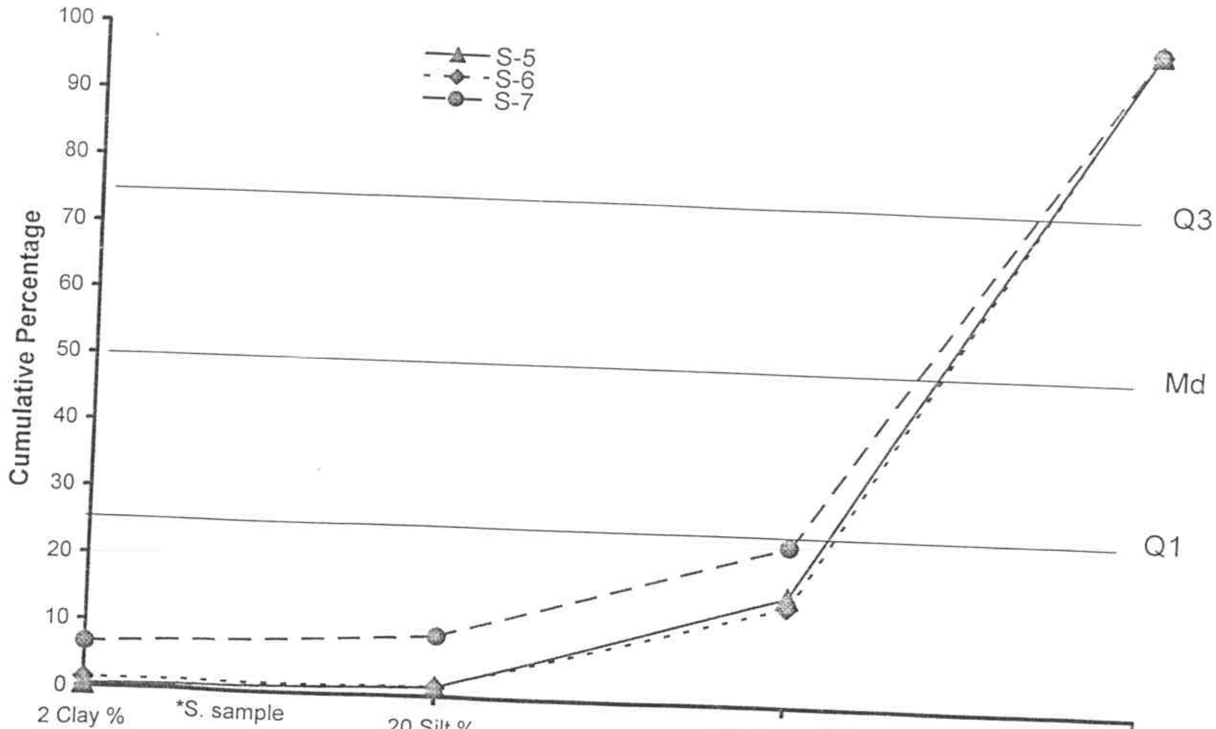


Fig (7-5,6,7) Particale size distripution both the soil sample (5,6 and 7)

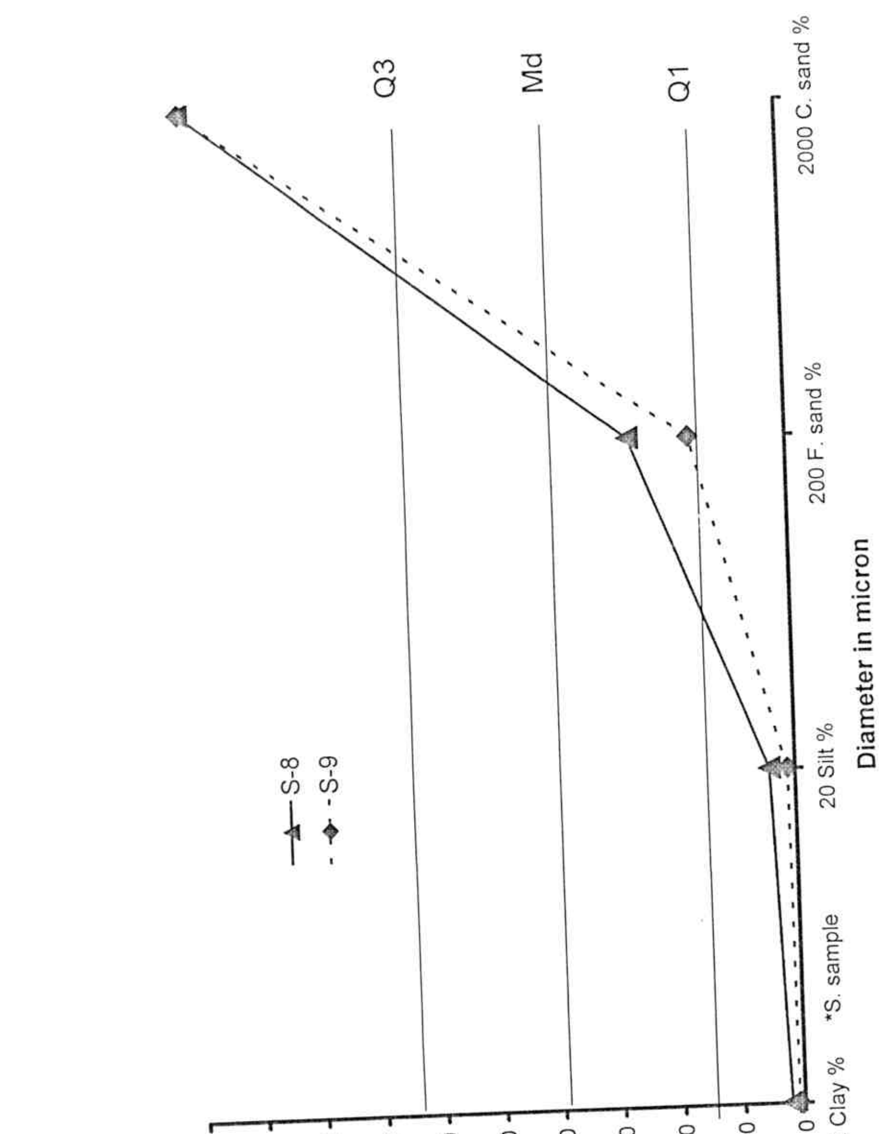


Fig. (7-8,9) Particle size distripution of both thesoil samples (8and9)

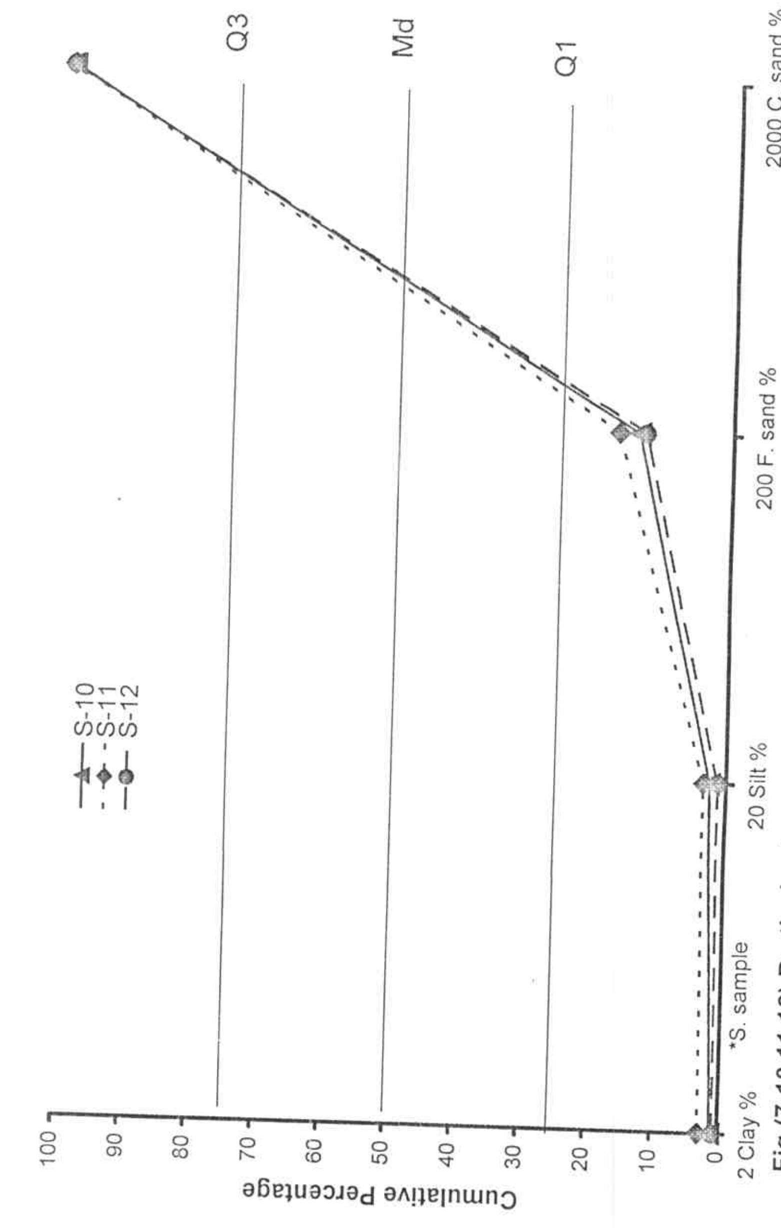


Fig (7-10,11,12) Particale size distripution both the soil sample (10,11 and 12) Diameter in micron

Table (4): Statistical size parameters and sorting coefficient of the studied soil profiles and surface samples.

Profile No.	Depth	Q1	Q3	Md	SQ_1	SQ index	SK	Log SK	
1	0-60	22	250	110	3.37	Mode.	0.674	-0.171	coarse
	60-120	230	400	300	1.32	Well	0.101	+4.77x10	fine
2	0-60	240	310	410	1.37	Well	0.665	- 0.1769	coarse
	60-120	220	390	290	1.33	Well	1.01	+ 4.34 x 10^{3}	coarse
3	0-60	200	360	270	1.34	Well	0.993	-2.69 10^{3}	coarse
	66-120	32	260	140	2.85	Mod.	0.651	- 0.186	coarse
4	0-60	230	390	300	1.30	Well	0.998	- 7.25 x 10^{-4}	coarse
	60-120	23	110	52	2.23	Well	0.946	- 0.024	coarse
5	0-60	220	390	290	1.33	Well	0.01	+ 4.24 x 10^{-3}	fine
	60-120	66	310	220	2.17	Well	0.65	- 0.1869	coarse
Surface sample No.									
1	0.60	210	370	280	1.33	Well	0.995	-1.947 x 10^{-3}	coarse
2	0.60	230	400	310	1.32	Well	0.976	-9.46x10^{-3}	coarse
3	0.60	220	390	290	1.33	Well	1.01	+4.345x10^{-3}	fine
4	0.60	210	370	280	1.32	Well	0.995	-1.947x10^{-3}	coarse
5	0.60	230	390	300	1.30	Well	0.996	-7.25x10^{-4}	coarse
6	0.60	220	380	290	1.34	Well	0.997	-1.29x10^{-3}	coarse
7	0.60	200	370	280	1.36	Well	0.971	-0.0125	coarse
8	0.60	190	360	270	1.37	Well	0.966	-0.013	coarse
9	0.60	220	390	290	1.33	Well	1..01	+4.34x10^{-3}	fine
10	0.60	230	310	300	1.30	Well	0.998	-7.25x10^{-4}	coarse
11	0.60	220	380	300	1.31	Well	0.963	-0.0160	coarse
12	0.60	230	400	300	1.32	Well	1.01	+4.77x10^{-3}	fine

4.4. Micromorphological studies

From the description of the studied soil sections, *it is* quite clear that the micromorphological features of soil matrix are difined into.

a- Skeleton grains: the examined samples have common coarse to fine angular or subangular single grain dominanted by quartz followed by feldspars with few amount of heavy minerals (ziron, amphiboles, opaques and hornblend)

b- Voids: The dominant void types are simple packing voids, vughs and few vesiciles void patterns in the studied soil samples.

c- Plasma: It is mainly as a weak skelespic plasmic fabric in the studied soil samples.

- Pedological features

In the studied soil samples, these were few calcic nodules and concertinos or few segregation calcitans. Moreover common iron–manganese complexed nodules were detected in the studied samples.

- Description of soil samples relating to the thin section under investigation :

Sample No. 3.

General description :

The rock composed mainly of QZ grains of subrounded forms measured = 0.1 – 0.5 mm, few crystals rocks the peple grian size= 4 mm. and few grains are hornblende.

The matrix is mainly iron oxides with irregular distribution about 20% of the rock.

- **The name of rock:** QZ wockes................(sand)

- **Accassory:** zircon occuring as rounded crystals with smooth bonding.
- The rock contian apprecible amount of zircon crystals.

No. of. Photo:-

(1) Rounded crystal of zircon x32.

(2) Zoned crystals of zircon x32

(3) Xenotine x32

(4) Euhedral crystals (well sorted) zircon x32.

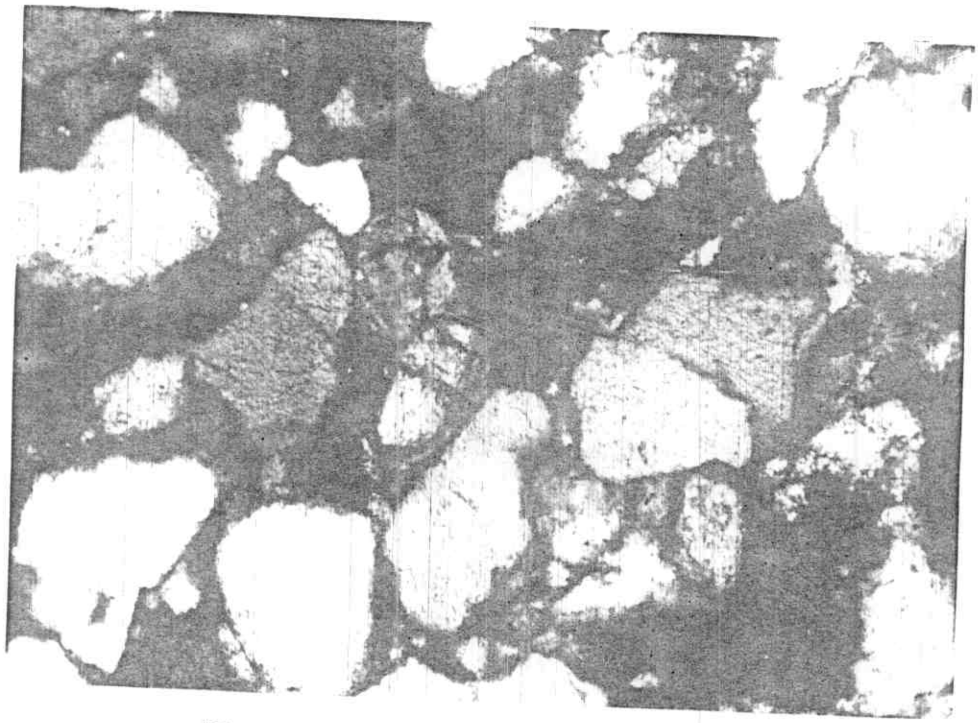


Photo (1): Rounded crystal of zircon x32

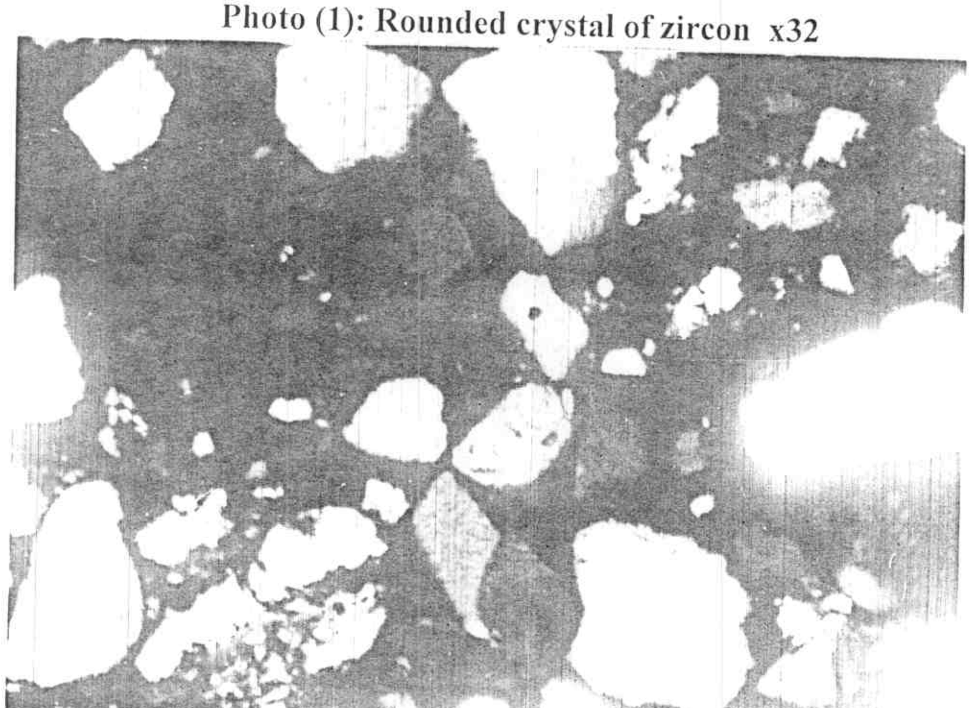


Photo (2): Zoned crystals of zircon x32

Sample No. 14.

General description of rock.

The rock composed mainly of QZ grains in matrix of iron oxides.

- QZ is angular and completely cracked associated by few flakes of muscovite.
- The matrix represents about 20% of the rock.
- **Sorting:-** well sorted.
- **Ranging of grains:** measured as 0-15 mm.
- **Accesory:** euhedral crystals of zircon zonned.
- **Name of rock:-** QZ wockes.

No. of photo:-

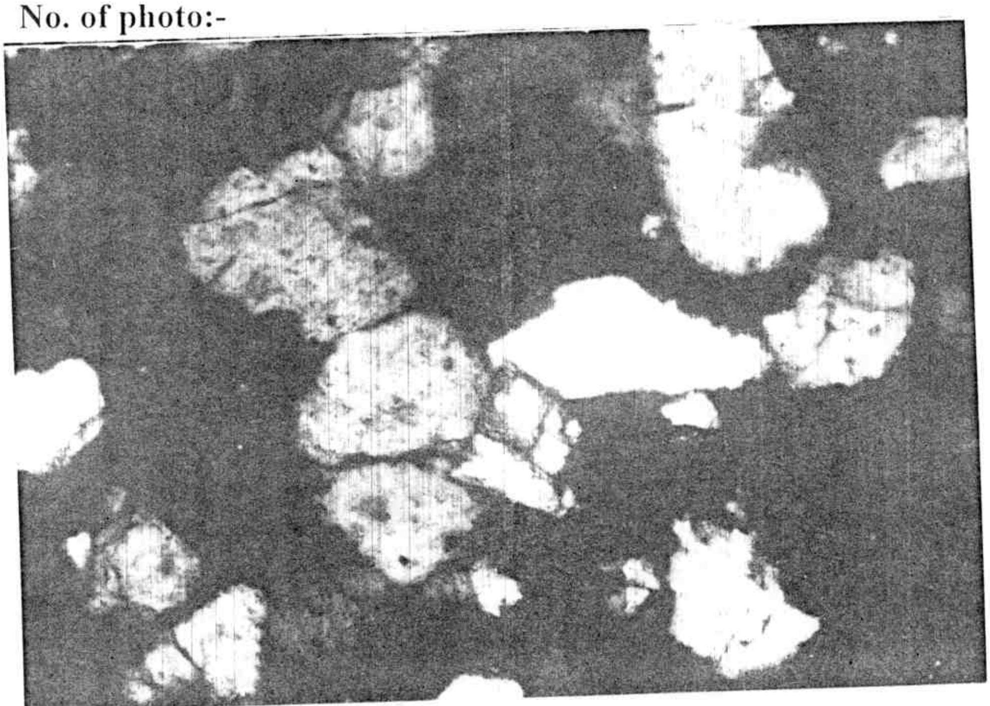


Photo (6): Euhedral zircon x63.

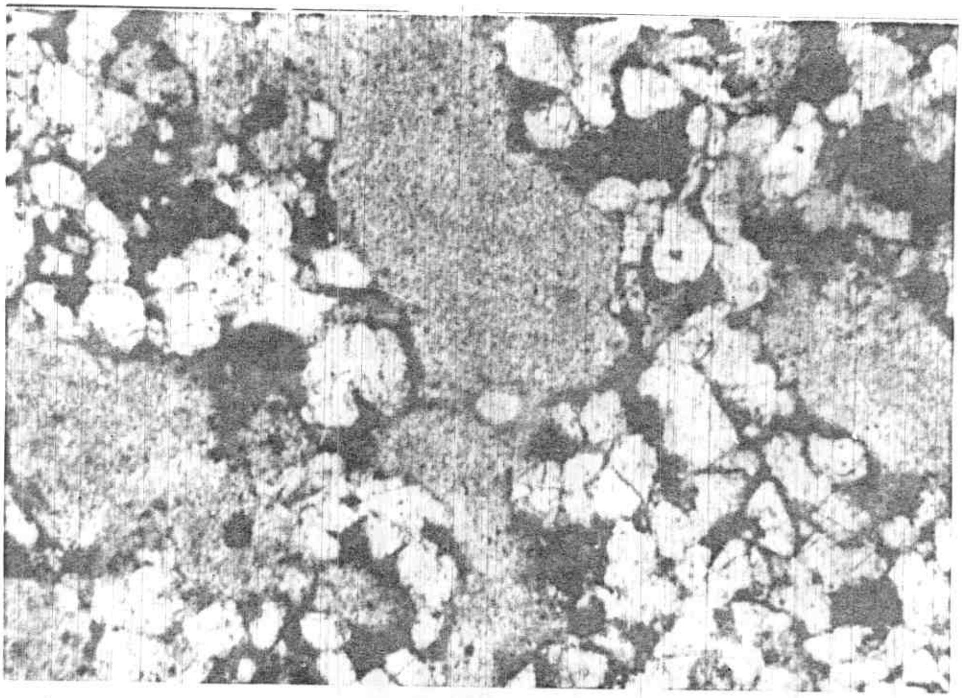


Photo (7): High porosity x63.

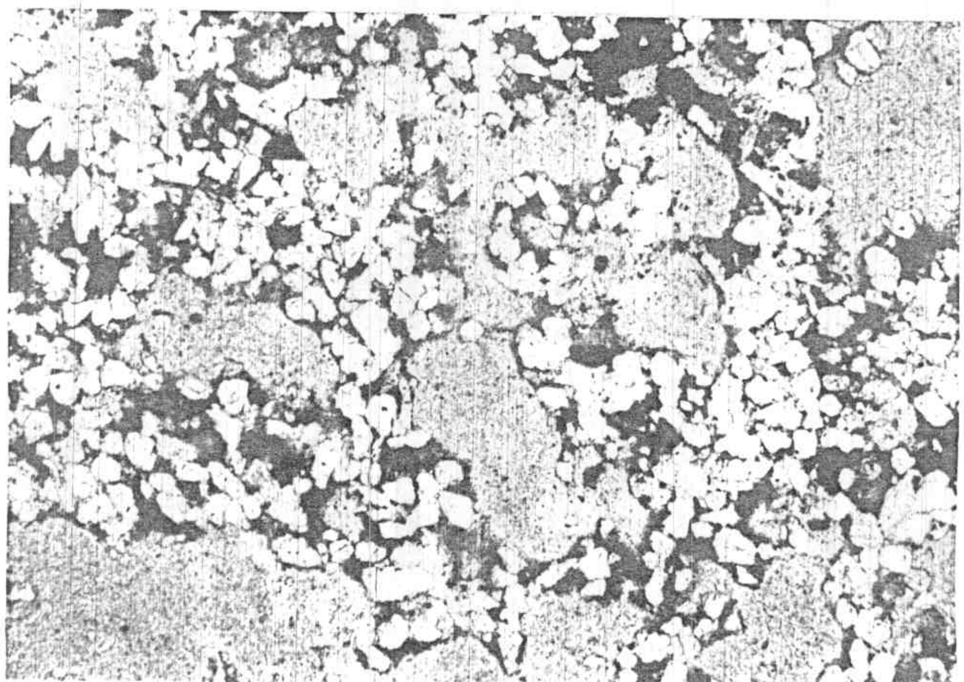


Photo (8): High porosity showing irregular pores in the rock x63.

Sample No. 16.

General description of rock.

The rock composed mainly of QZ grains in matrix of sericite. and this rock contains fine flake of muscovite are also present in amount not more 0.05%.

- matrix is < 15% occuring as sericite.
- Rock name. Sand stone.
- **The grains size of QZ ranging:-** 0.15-0.65 mm
- **Forming:-** ranging in the form of sub angular to subrounded.
- **Sorting:-** poorly sorted.
- **No. of. Photo:-**

(9) Cluster of subangluar grains of QZ cemented by thin film of carbonate X10

(10) Angular grains of plagioclase X16

(11) Matrix flake is muscovite. X32

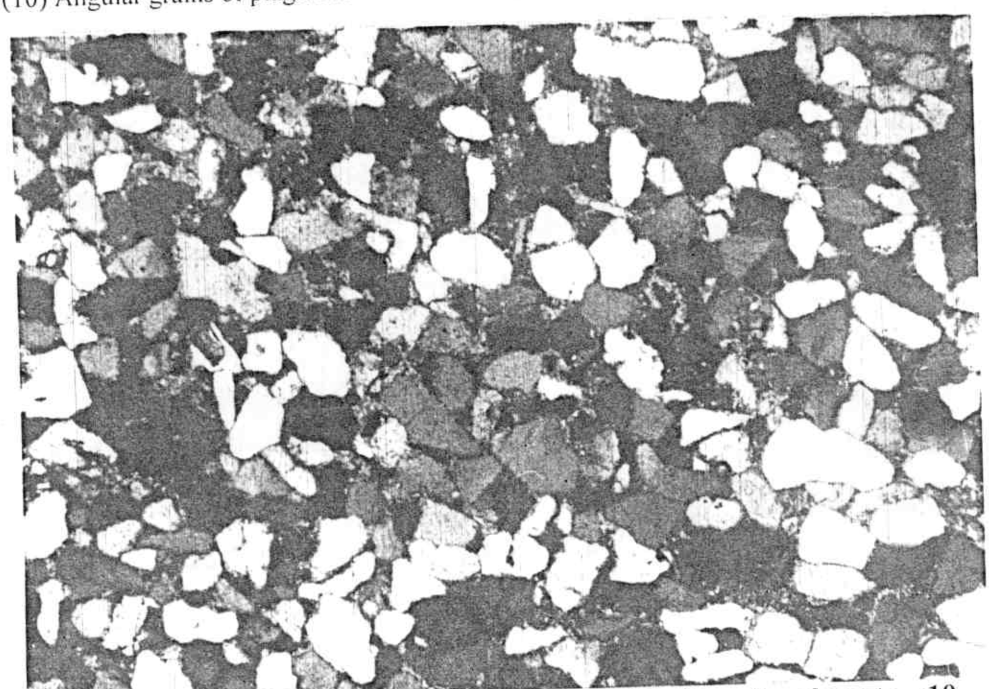


Photo (9): Subangular grains of QZ cemented by thin film of carbonate x10.

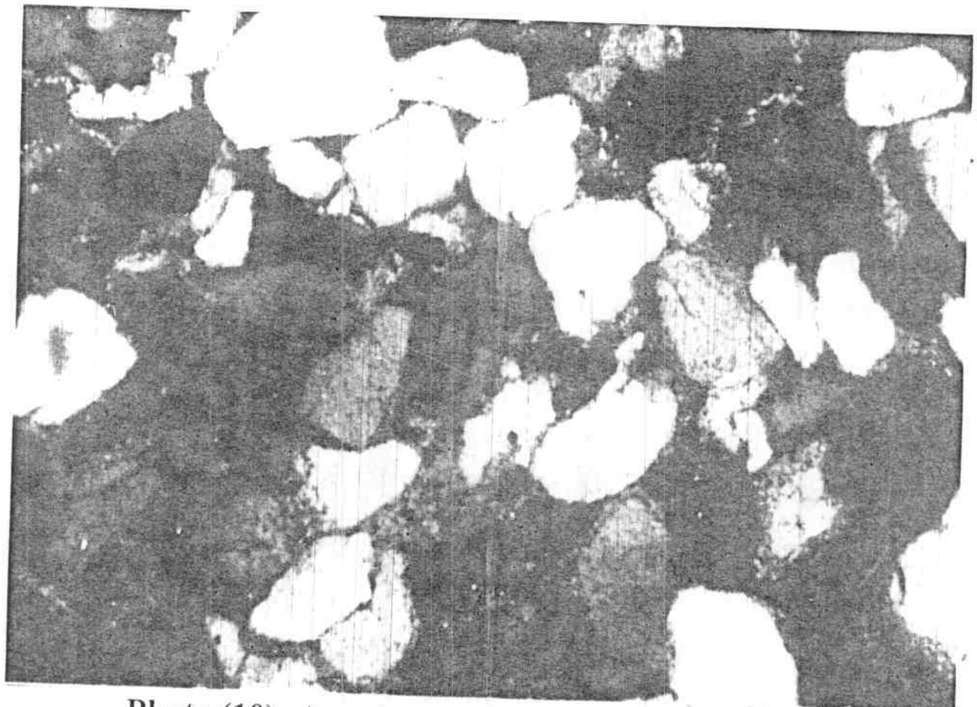


Photo (10): Angular grains of plagioclase. X16

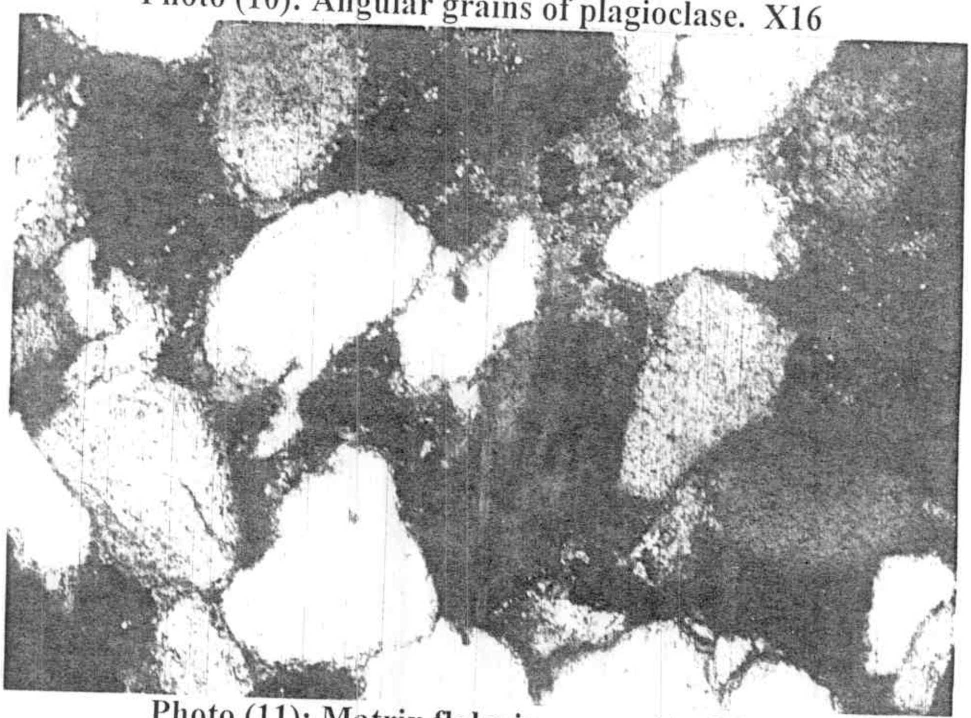


Photo (11): Matrix flake is muscovite. X32

Sample No. 17.

General description of rock.

The rock composed mainly of iron oxides ranging in colour from brown to brownish black, enclusing very fine grains of Qz of silty size.

- **Rock name:** Iron stone.
- **No. of photo:-** No photographs

Sample No. 18

General description of rock.

- The rock composed mainly of quartz grains embeded in a matrix of iron oxides.
- These are characterized by heterogenity in distribution of the matrix, suggest that it may be deposited along different stages… (multistages).
- The grain size of quartz ranging 0.15-04 mm.
- Rock name QZ wockes.
- Cement represents about 30% of the rock with heterogeneous distrbution.
- The content changes form carbonate to more dominant iron oxides sugesting the dissolution replacemut of carbonate by ironoxides.

No. Photo: (12) (x10)

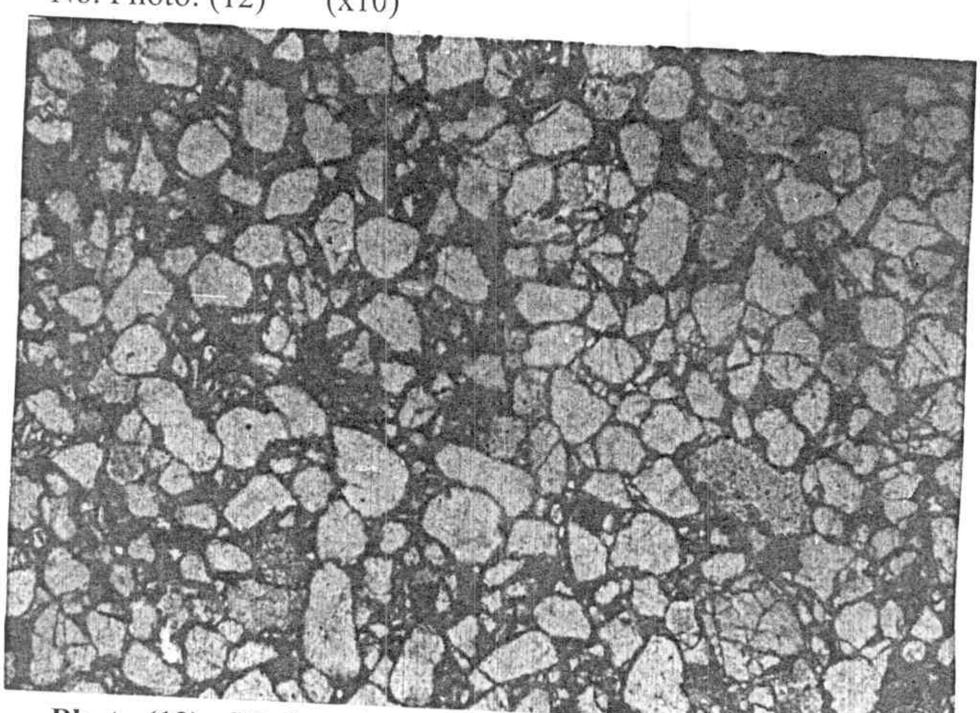


Photo (12) : Moderatly sorted Qz grains in ferregens matrix

Sample No. 19.

General description of rock.

- The rock compesed mainly of iron oxides about (80)% of the rock, enclusing rounded crystal of QZ of sandy size.
- Ranging of grains size is about 0.45 mm.
- Rock name iron stone

Sorting: The grains well rounded and well sorted.

No. of. Photo (13) x32.

Notes: subanguler grains of QZ in matrix of iron oxides representing about 20% of the rock.

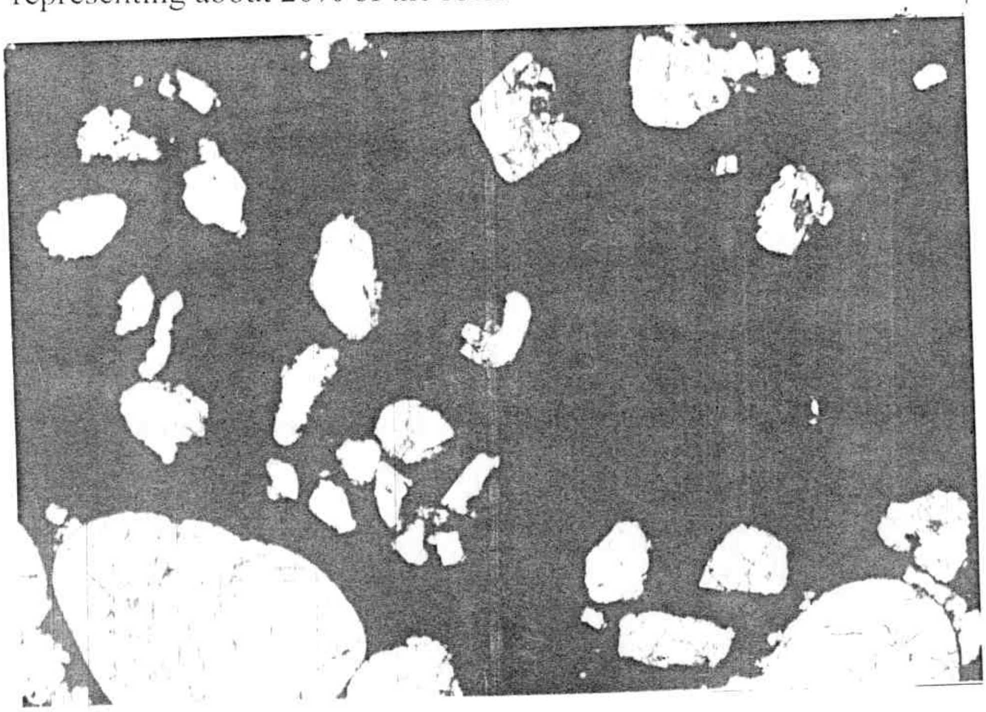


Photo (13): Subanguler grains of QZ in matrix of iron oxides representing about 20% of the rock

Sample No. 20

General description of Rock.

- The rock composed mainly of quartz grains with few grains of amphiboles embeded in matrix of iron oxides.
- The grains size of quartz ranging about 0.15 mm, well sorted and subanguler form.
- Rock name = QZ wockes.
- The matrix is mainly iron oxides representing about 25% of the rock.
- Accessory :- one or two crystals of zircon.

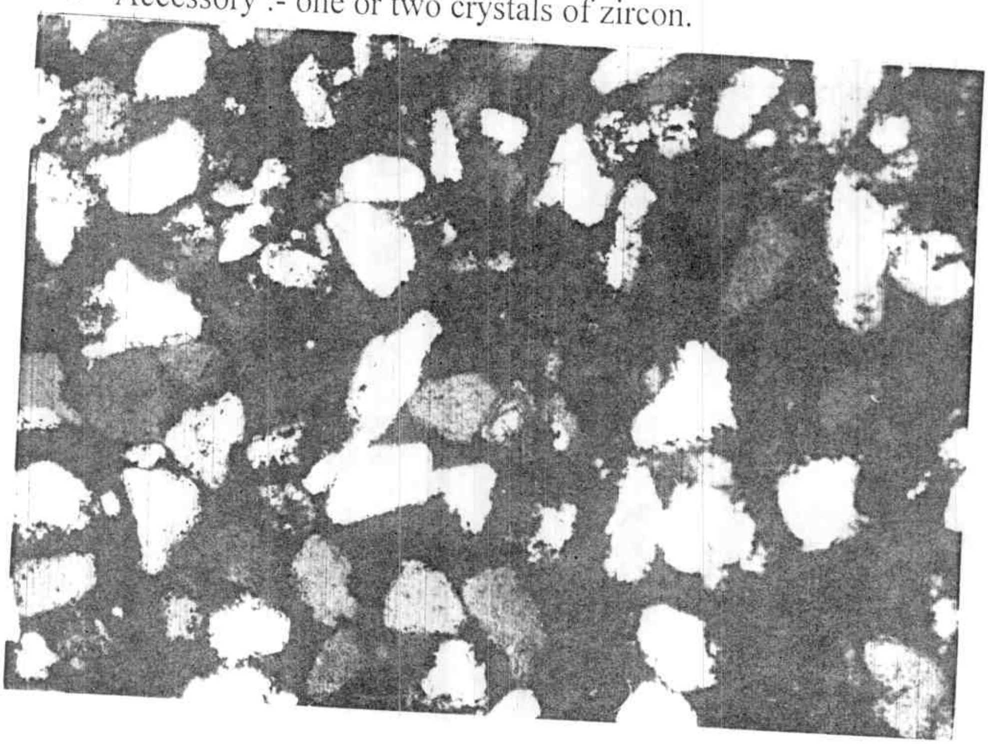


Photo (14): Euhedral crystal of zircon, surrounded with sub angular graing of QZ .X 32.

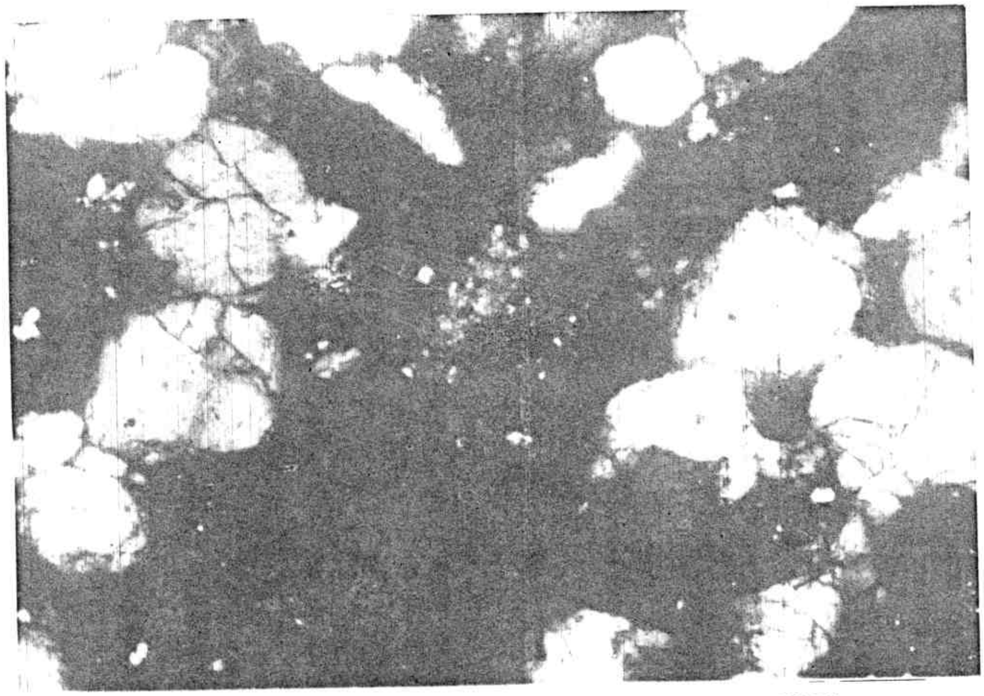


Photo (15): Euhedral crystal of zireon X63.

Sample No. 21.

General description of rock.

The rock composed of fine grains of quartz of silty size and flake of muscovite embeded in matrix of clay and ironoxides and amorphous silicat.

* The rock may be contian lenses of silty.

* Fine grains (ranging) 0.05- 0.1 mm.

* Rock name silt stone the fine grains of(<0.1 mm) are anguler in shape .

* The matrix are clays and amorphous silica representing about 15% of the rock. Some beds are copact and charactrized by oriented grains referring to static pressure effecting on the rock.

* **Accessory:** zircon.

No of photo. (14) showing zircon x63

(15) Crossed Nical } Bedding show content x10 beds
(16) Polarized }

(17) Euhedral of crystal of zircon x63.

(18) Directional orientation of muscovite x 32.

(19) Euhedral crystal of ziron and rutile x63.

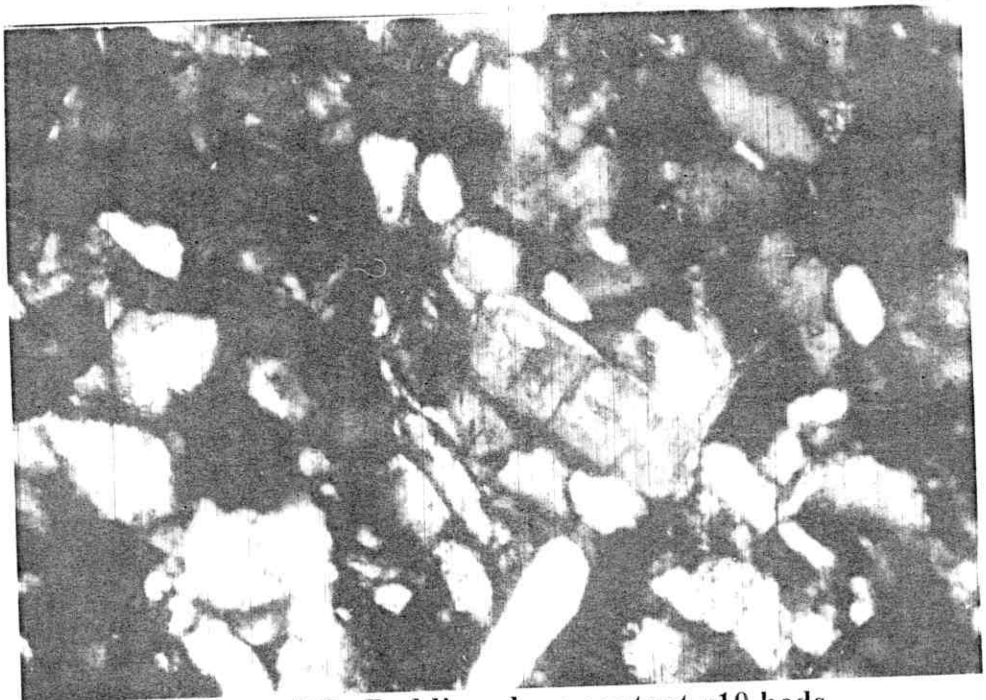


Photo (16): Bedding show content x10 beds

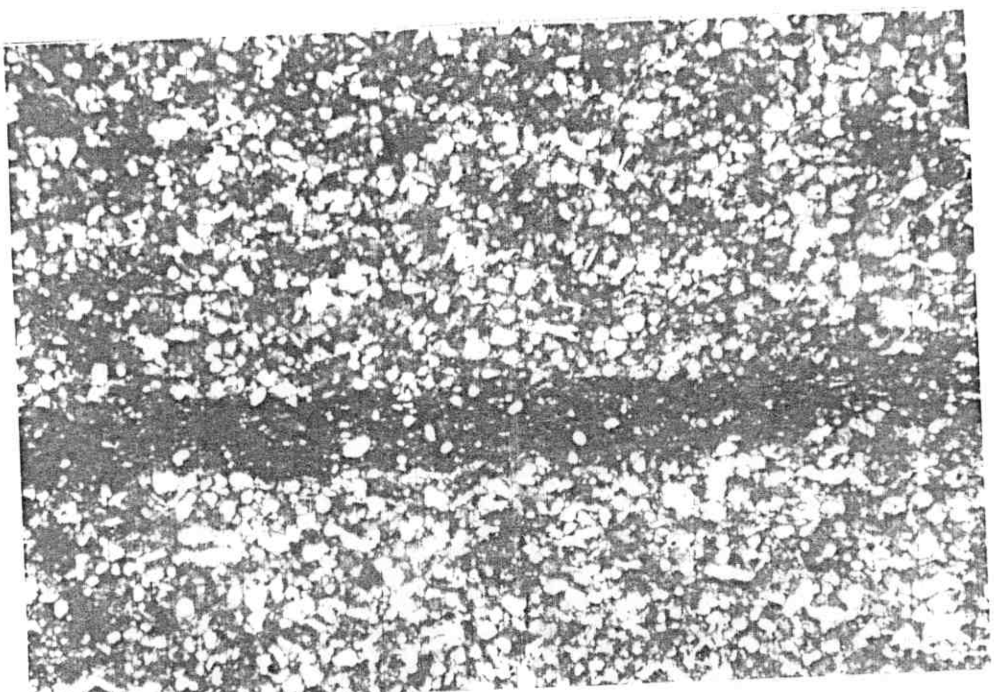


Photo (17): Bedding show content x10 beds

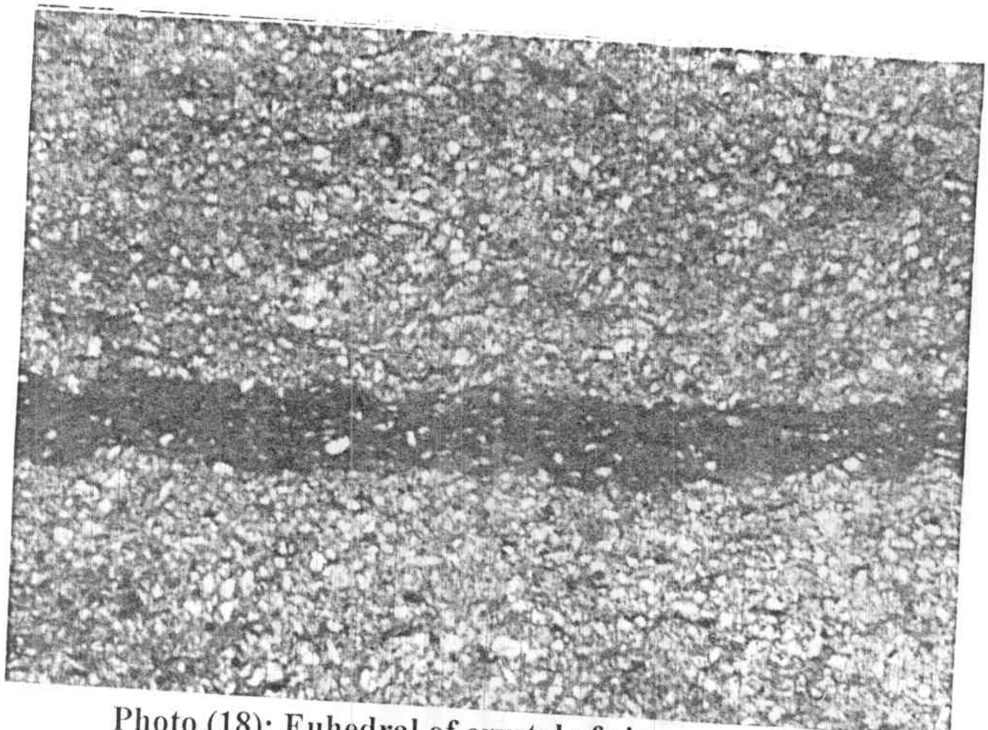


Photo (18): Euhedral of crystal of zircon .x63.

Photo (19): Directional orientation of muscovite x 32.

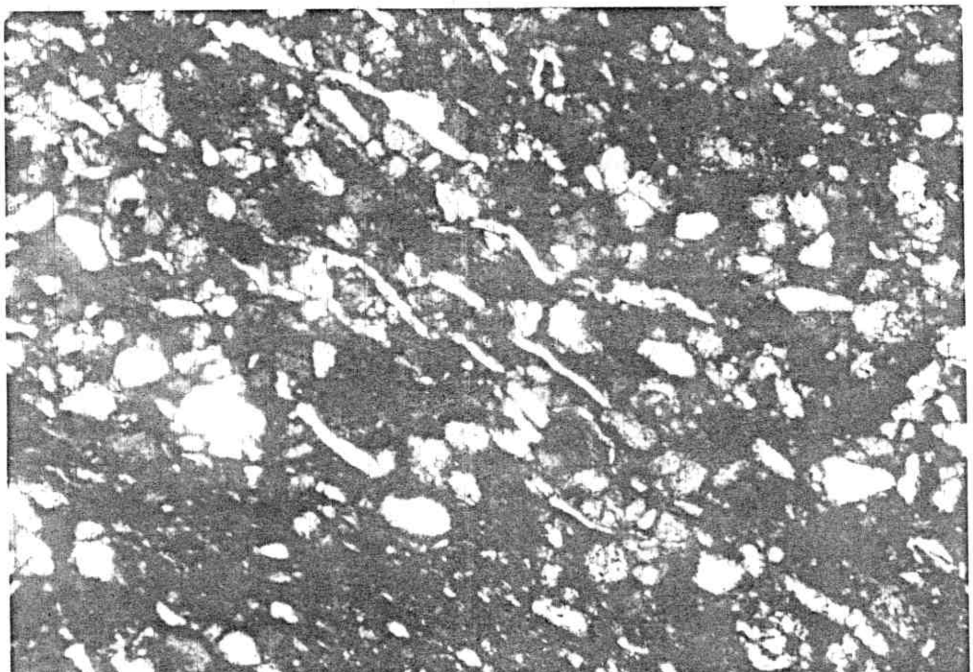
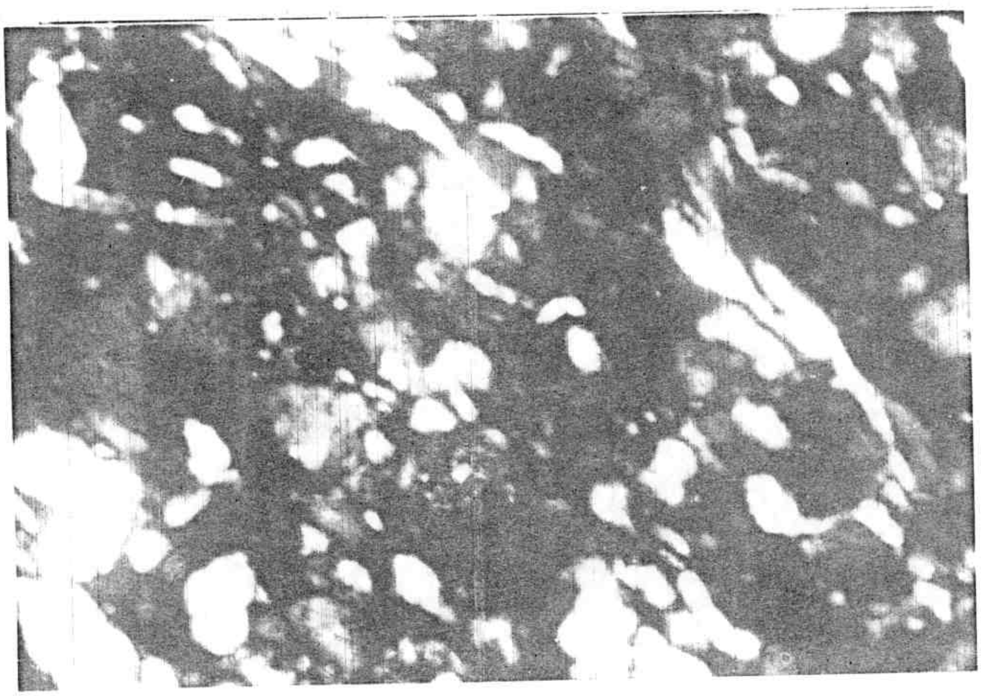


Photo (20): Euhedral crystal of ziron and rutile x63.



Sample No. 22.

General description of rock.

The rock composed mainly of QZ embeded in matrix of clay, fine flaks of muscovite are also present and minor crystal of hornblende.

- **Matrix.** represent about 40% as clay.
- **Grian size.** < 0.1%.
- **Rock name** QZ wockes.
- **Accessory.** Fine crystal of allonite.

Notesing:- Opaque occurs as irregular grains dessiminated in the rock.

No. of photo. 21……..x10

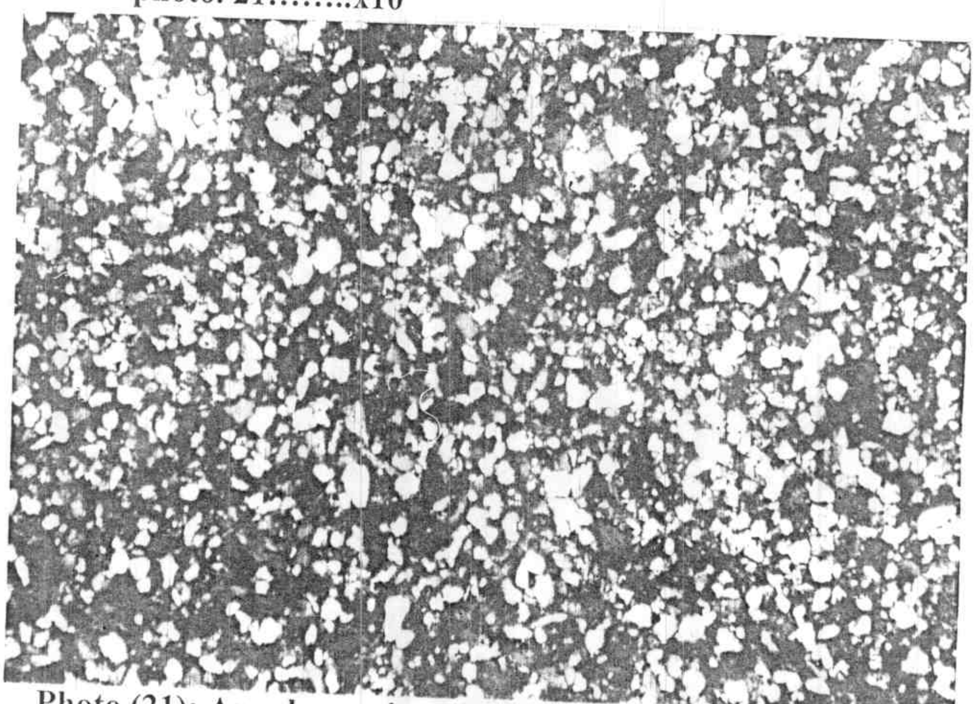


Photo (21): Angular grains of QZ cemented by amorphous silica

4.5. Geochemical studies

4.5.1. Chemical composition

Approaohing the soil chemical composition, it is useful to note the mineralogical composition of the various rock types in which the chemical elements are held in the mineral portion of soils and soil parent materials. The chemical composition of the main individual mineral components of rock types, are given by **Jackson (1973).**

Therefore, the content of elements may give some information about the nature of sediments and minerals forming the soil matrix. As for a certain elements, their contents may vary from soil to another according to the nature of the parent material that is determining the total content of elements inherited by soil.

The studied soil samples have been examined in order to obtain information about the normal distribution and variability of major elements. Table (5) gives the values of ignited soil for each element in the representative soil samples of the investigated area. The obtained data show that the elements distribution was as follows.

1- Silica (SiO_2)

Silica content is the most predominate constituent in all the studied soil samples. Its content in the rock sample ranged from, 50.2 - %. 29 %. The lowest content was detected in the rock sample No.17, while the highest one was associated with the rock sample No.16 As for the surface soil samples, SiO_2 content ranged from 80.54 to 92.24%, and the high percentage

Table (5): Major element (oxides %) of the studied soil samples.

Profile No.	Deoth (cm)	SiO_2	TiO_2	$AL_2 O_3$	$Fe_2 O_3$	Fe O	Mn O	Mg O	Ca O	$Na_2 O$	K_2O	P_2O_5	I. O. I.	Total
1	0-60	80.54	0.11	0.13	4.48	0.359	0.2	2.52	1.4	0.837	0.679	0.547	8.0	99.8
3	0-60	89.92	0.15	0.13	2.08	0.179	0.3	0.504	0.7	0.193	0.206	0.249	5.2	99.84
5	0-60	90.69	0.07	0.13	1.3	0.215	2.2	0.504	0.7	1.93	0.177	0.32	3.0	99.49
Surface samples														
1	0-60	90.62	0.16	0.13	1.82	0.502	0.12	0.504	0.4	0.193	0.295	0.614	3.9	99.55
2	0-60	91.96	0.2	0.26	1.3	0.287	0.15	1.08	0.7	0.193	0.177	0.388	2.8	99.49
3	0-60	90.0	0.16	0.13	1.3	0.21	0.16	2.01	1.4	0.096	0.147	0.398	3.5	99.51
4	0-60	90.59	0.22	0.78	1.82	0.21	0.25	0.504	0.7	0.161	0.265	0.493	2.4	99.39
5	0-60	91.52	0.3	0.52	1.3	0.215	0.3	0.504	0.7	0.096	0.147	0.356	3.3	99.25
6	0-60	91.4	0.11	0.13	1.3	0.215	0.11	0.501	0.7	0.129	0.206	0.799	4.0	99.49
7	0-60	88.83	0.15	0.26	3.24	0.179	0.25	1.08	1.4	0.322	0.413	0.276	3.4	99.8
8	0-60	89.0	0.11	0.13	1.56	0.359	0.12	2.01	1.4	0.193	0.295	0.327	3.8	99.34
9	0-60	89.0	0.23	0.52	2.3	0.179	0.6	0.504	0.7	0.096	0.177	0.269	4.8	99.67
10	0-60	92.24	0.09	0.26	2.34	0.125	0.12	-	0.7	0.129	0.236	0.271	2.9	99.29
11	0-60	92.2	0.08	0.26	1.3	0.322	0.61	1.08	0.7	0.129	0.118	0.37	2.3	99.46
Rock samples														
13		90.0	0.27	0.78	0.52	0.359	0.14	-	0.7	0.54	0.738	0.58	4.9	99.52
14		80.4	0.28	0.78	7.8	0.251	0.5	1.512	2.1	0.161	0.118	0.511	5.2	99.61
15		90.88	0.19	0.26	3.38	0.179	0.2	0.504	0.7	0.129	0.177	0.299	2.8	99.49
16		96.29	0.21	0.26	0.52	0.215	0.11	-	0.7	0.193	0.059	0.348	0.9	99.69
17		50.2	0.32	0.52	41.86	-	0.15	0.504	0.7	0.193	0.118	1.45	3.1	99.11
18		94.69	0.11	0.13	1.3	0.143	0.44	0.504	0.7	0.128	0.059	0.29	0.9	99.39
19		75.86	0.22	0.26	13.5	-	0.32	1.08	0.7	0.258	0.118	0.379	7.2	99.89
20		87.26	0.09	0.12	6.5	0.174	0.05	1.08	0.7	0.451	0.118	0.355	2.4	99.29
21		91.76	0.11	1.04	0.78	0.287	0.12	0.504	0.5	0.451	0.62	0.523	2.5	99.39
22		89.78	0.3	0.78	1.82	0.215	0.24	1.08	0.7	0.129	0.591	0.462	3.1	99.19
23		75.0	0.2	0.26	17.68	-	1.8	0.504	0.7	0.354	0.177	0.522	2.4	99.59
24		85.5	0.612	0.52	10.14	-	0.17	-	0.7	0.177	0.177	0.615	1.2	99.31

of silica in the studied soil samples may be attributed to the predominance of sand fraction as well as the presence of high content of quartz in most cases.

2- Allumina (Al_2O_3)

Data in Table (5) show that Al_2O_3 content ranged from 0.12 to 1.04%. The lowest content was found in the rock sample No.20, while the highest one charactrized rock sample No.21 As for the surface samples, AL_2O_3 content ranged from 0.13 to 0.76 %. Generally, the Al_2 O_3 content was very low, this trend of alumina could be attributed to the decrease of clay content of soils of this area.

3- Iron (Fe_2 O_3)

Iron oxide (Fe_2O_3) is generally present in very low content where it ranged between 0.52 and 41.86% in the rock. The relatively highest content of Fe_2O_3 was detcted in rock sample No.17 while the lowest one was found in the rock samples No.13 and 16. As for the surface soil samples, Fe_2O_3 content ranged between 1.3 and 4.48%. The relatively high content of iron oxide (Fe_2O_3) may indicated to the presence of some crystalline iron oxide minerals such as geothite and hematite (opaque. minerals).

4- Magnesium (Mg O)

Data in Table (5) reveal that MgO content in the studied soil samples ranged from 0.50 to 2.52%. The highest content was found in the surface sample of profile No.1, whereas the lowest one was detected in the sample No.6. In the rock samples. MgO cantent ranged from 0.504 to 1.512%. The high content of MgO in the studied samples may be due to the addition of weathering products from the basaltic lava flows in the neighbourhood of these location. Also, the variations in the MgO content of the analysed samples may also be partly related to the presence or absence of the chain silicate minerals.

5- Calcium (CaO)

CaO is present in all the studied rock samples, its content was very low and varied in narrow limit from 0.5 to 2.1%. The highest content was detected in the rock sample No 14, while the lowest one was detected in the rock sample No. 21. In the surface soil samples CaO content varied from 0.4 to 1.4%. The relatively low content of CaO in the studied area may be attributed to the low content of calcite and dolomite minerals.

6- Sodium and potassium (Na_2O and K_2O)

Data in Table (5) reveal that total sodium and potassium contents in the studied soil samples ranged 0.096 - 0.837 and 0.059 - 0.738%, respectively. The low contents of Na_2O and K_2O in the studied area may be due to the low contents of K-bearing hydrous mica,and Na-bearing mineral (Na-feldspar).

7- Titanium and phosporous (TiO_2 and P_2O_5)

Table (5) reveals that TiO_2 and P_2O_5 contents ranged 0.07 - 0.612% and 0.29 - 1.45%, respectively. Generally, the low content of TiO_2 and P_2O_5 in the studied area may be due to the natural sediments of these soils.

8- H_2O (L. O. I)

The determined water content lost between 100°C and 950°C was found to be low and ranged 0.9 - 7.2%. The relatively low water content in the studied are a is possibly related to their low content of clay minerals.

Table (6) chemical composition of rocks

	Average igneous rocks	Average shale	Average sand stone	Average limestone	Average sediment*	Average sediment
SiO_2	59.14	58.1	78.33	5.19	57.92	44.5
TiO_2	1.05	0.65	0.25	0.06	0.57	0.6
Al_2O_3	15.34	15.40	4.77	0.81	13.39	10.9
Fe O_3	3.08	4.02	1.07	0.54	3.47	4.0
Fe_2O	3.8	2.42	0.30	-	2.08	0.9
Mg O	3.49	2.44	1.16	7.89	2..65	2.6
Ca O	5.08	3.11	5.5	42.57	5.89	19.7
Na_2 O	3.84	1.3	0.45	0.05	1.13	1.1
K_2 O	3.13	3.24	1.31	0.33	2.86	1.9
H_2 O	1.15	5.0	1.63	0.77	3.21	-
P_2 O_5	0.30	0.17	0.08	0.04	0.13	0.1
CO_2	0.10	2.63	5.03	41.54	5.38	13.4
SO_3	-	0.64	0.07	0.05	0.54	-
Ba O	0.06	0.05	0.5	-	-	-
C	-	0.8	-	-	0.66	-
Mno	-	-	-	-	-	0.3
	99.56	100.0	100.0	99.84	99.94	100.0

After leithe and Mead (1955) .

After Mason, (1966).

4.5.2. Trace elements geochemistry

In the fine grained sediments, such as soils, silt and clay fractions, trace elements may be carride into solutions as finely divide suspended detritus and/or in lattice position with existing minerals. The abundance and distribution of the trace elements in Ramlet Homyir soils are listed in Table (7). The following is, however, a short account of some of the analyzed trace elements.

1- Barium

Barium is the most dominant element in samples of Ramle Homayir. Its content ranged from 79 to 1786 mg kg^{-1} in the rock samples. The highest content is detected in the sample No.21, while the lowest one was detected in the sample No. 19. In the soil samples, Ba content ranged from 101 to 1445 mg kg^{-1}. According to the chemical composition of rock after Mason (1966), Table (8), data show that barium values are higher than those reported for shales and igneous rocks.

2- Strontium

Data in Table (7) reveal that the amounts of Sr in the studied rock samples varied considerably from 20 to 10000 mg kg^{-1}. The lowest content characterized the sample No 16, whereas the highest one was found in the sample No. 23. After the surface soil samples Sr content ranged from 31 to 207 mg kg^{-1}. Also strontium values of the studied soil samples are comparatively higher than the values reported for igneous and shale rocks.

3- Zircon

Data illustrated in Table (7) represent the amounts of Zr in the studied samples. It is evident that Zr content ranged between 34 and 1125 mg kg^{-1} in the studied rock samples. The highest content was associated with the surface layer No. 23, while the lowest content characterized the sample No.16. In the surface soil samples Zr content varied from 83 to 2322 mg kg^{-1}. Generally Zr content of the studied samples are higher than in any other reported rocks.

4- Heavy metals

Eleven heavy metals namely, V, Cr, Co, Ni, Cu, Zn, Ga, Rb, Y, Nb and Pb were determined in the studied samples. These heavy metals occur in rather low concentrations, except sometimes for Y, which follows to a great extent the trend of Zr.

Table (7): Trace elements analyses of the studied samples (mg Kg^{-1}).

Profil. No	Depth (cm)	V	Cr	Co	Ni	Cu	Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Pb
1	0-60	28	37	11	11	13	45	6	11	207	155	322	15	776	34
3	0-60	7	22	4	76	11	36	<2	2	100	95	192	11	222	30
5	0-60	5	14	3	6	11	20	<2	5	46	71	142	16	192	32
Surface sufle No.															
1	0-60	6	16	3	6	6	21	6	5	90	79	165	<2	177	24
2	0-60	5	17	2	6	11	21	<2	3	65	60	128	6	157	30
3	0-60	4	17	2	7	10	19	<2	2	84	110	228	5	148	26
4	0-60	4	18	2	7	10	19	<2	3	75	75	154	<2	166	25
5	0-60	4	17	2	6	10	18	<2	2	57	71	144	4	133	26
6	0-60	4	17	3	8	8	17	5	3	42	136	269	6	159	33
7	0-60	12	28	5	8	12	37	2	6	154	89	184	7	386	31
8	0-60	8	22	3	7	12	24	<2	4	87	97	205	14	277	30
9	0-60	5	16	2	6	12	23	<2	3	68	71	147	4	163	29
10	0-60	3	14	2	6	11	21	<2	2	31	50	102	6	1445	31
11	0-60	4	14	2	6	12	20	<2	3	36	40	83	<2	101	27
Rock samples															
13		43	44	7	8	25	31	15	4	165	169	352	11	132	78
14		39	38	15	8	280	22	<2	<2	292	144	294	14	659	40
15		21	51	9	13	13	42	<2	<2	1690	188	386	14	340	47
16		3	14	2	5	12	13	<2	<2	20	16	34	5	59	31
17		54	103	80	6	5	20	4	<2	870	97	105	8	293	43
18		9	35	4	10	12	20	<2	<2	106	51	68	<2	125	28
19		20	28	19	17	100	547	<2	<2	116	19	37	4	79	49
20		46	146	14	7	16	19	5	<2	104	259	230	27	669	39
21		٥٢	٤٩	٣	٨	٣٩	٤٤	٢٣	١١	١٣٠	217	٤٤٨	٩	١٧٨٦	51
22		٥٤	٤٨	٧	٨	٣٤	٤٠	٢١	١١	١٦٤	٢٤١	٤٨	٢٧	١٧٦٣	٥٣
23		٧٨	١٣٦	٣٥	١٨	٢٣	٦٧	١٨	<2	>10000	٥٥٥	١١٢٥	٦٣	١٠٤٠	١٦٨
24		٧٠	٢٥٠	٢٠	٤٠	<2	<2	<2	<2	440	١٥٢	٢٤١	١٨٤	١٠٦٥	٨٩

Table (8) : chemical Composition of rocks

Elements	Shales	stone stones	Carbonate	Igneous rocks
V	130	20	20	135
Cr	90	35	11	100
Co	19	0.3	0.1	25
Ni	68	2	20	75
Cu	45	-	4	55
Zn	95	16	20	70
Ga	19	12	4	15
Rb	140	60	3	90
8r	300	20	610	375
Y	26	40	30	33
Zr	160	220	19	165
Nb	11	0.0	0.3	20
Ba	580	0.0	10	425
Th	12	1.7	1.7	9.6
U	3.7	0.45	2.2	2.7

After Mason. (1966)

4.5.3. Radiometric studies

Natural radio nuclides in agricultural environments were recently explored in order to set levels of environments quality control in this area. These radioactive elements may occur naturally in some parent materials drived from rich radioactive rocks. Adding fertilizers, especially phosphate rock and K salts, may add radionuclides to intensively managed soils.

The major radioactivity in rocks is a result of the natural decay of three radioactive sources of uranium – radium family, thorium family and of the radioactive isotope of potassium K^{40}

(Adams and Weaver, 1958). Each rock type has its own specific radioactivity that is commonly known as natural radioactivity; may be produced α,β and γ rays. The decay series of U^{238} ends with stable Pb206,

U^{235} ends with stable pb^{207} while Th^{232} ends with stable Pb^{208}. Potassium (K^{40}) disntegrate to give argon Ar^{40}, which is stable. The process is more complex for uranium and thorium, which give a series of isotopes, some of which are gamma ray emitters. **According to Adams and Weaver (1958),** the relative ratio of gamma activity for K: Th: U is 1:1300: 3600. The radioactive isotope U^{235} is much less abundant than U^{238}, as it represents only 0.72%, while the later constitutes the remaining 99.28% of the U in nature. Radioactivity values are exceeding 3 times the background of a specific rock, that is considered as a radiometric anomaly and may be logicallylitho and / or structurally controlled.

Ibrahim et al. (1995) detected a uranium bearing samarskite within a decitic rock of the Dokhan volcanics cropping out of the east of EL-Qaa plain, where U content ranges between 22 and 75mg kg^{-1}. Th content ranged from 36 to 80 mg kg^{-1}. This occurrence of highly elevated levels of radioactive elements enhanced their determination in soils of EL-Qaa plain.

Normal igneous rocks, basic and acidic, are known to have average uramium and thorium contents ranging between 0.6 and 4.5 mg kg^{-1}. As for U, it ranges from 3 to 15 mg kg^{-1} for the acidic rocks such as granite, that is usually containing the upper limits of the average, **IAEA 1988**). The same Agency reported variable values of uranium in soils ranging from less