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Marl qualitative effects on the distribution of Quaternary deposits

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ABSTRACT

Marls with badland, waterway, torrent, surface, rill, gully, rock and tunnel erosion, as the most sensitive lithology against erosion and weathering, have a major role in the sedimentation of watersheds. Marls of Iran based on minerals solvability are divided into two types: Evaporative and non-evaporative which have Special features and have been distributed in Tehran province. Formations and units of geology are important in sediments production and distribution marl units. In Tehran province, from the geological point of view, there is a combination of Alborz and Central Iran sedimentary units that based on maps geology information, on a scale of 1: 100000 and 1:250000 such as Tehran, Semnan, Amol, Ghazvin-Rasht, Marzanabad (Chalus) the geology formations and units exist often. There isn't any gap in geology maps. Often marl geology formation and units such as Karaj, Ziarat, upper red and under red formation, are Cenozoic age and has been distributed in Tehran province North. Based on studies and this research geology marl Formations and units have been effective about percent 10 on sediment production and quaternary distribution in Tehran province

Keywords: Marl formations and units, Quaternary units, Erosion types, Tehran Province

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INTRODUCTION

In general, marls of Iran from point of view of minerals such as gypsum, salt, anhydrite with solvability are divided into two major categories: evaporative marls (to the Neogene age) and non-evaporative marl (before the Neogene), each of which have unique features and in general, the land surface of the province of Tehran has the presence in both types of marl (Asadi, 2006). Marl units and formations due to their specific physical and chemical characteristics have very little vegetation in most arid and semi-arid regions; the vegetation

cover has been limited to a number of constraints. These units have very erodibility in comparison with other geological formations (Varavipour, Asadi, & Arzjani, 2010).
Marl formations in watersheds are always problematic and are considered as one of the most important sources of sediment production. Studies that have been carried out on the sedimentation of watersheds both inside and outside of the country have identified the important role of marl formations in sediment production (Vaezi & Gharehdaghlii, 2013). Investigation and study of marl soils and various types of erosion in Iran shows that Marl in dry areas have a significant difference in erodibility and sedimentation in different lands. Due to the lack of vegetation, the erosion process in marls reduces permeability, as a result, various types of erosion, such as badland, waterway, torrent, surface, rill, gully, rock and tunnel erosion, can be clearly seen in marl areas (Tamartash, Tatian, Reihani, & Shokrian, 2010). Seasonal and raw material effects on erosion by water of erodible soils in eastern Spain shown that the nature of raw materials plays an essential role in hydrological phenomena and erosion in erodible soils in areas lacking vegetation. Studies on three types of soil including marl, clay and sand showed that marl soils had the lowest penetration, the highest runoff (81%) and the highest erosion(Mashhadi & Reihan, 2008). In Table.1, some of these features, especially clays, outcrops are shown (Table.1). There is not much information about the possibility of the vegetation establishment with a protective role on the marls, and the initial studies carried out on this proposal indicate that there are no papers and research in this case study (Amiri & PYROVAN, 2010).

Table 1 - Formations or units of type and percent clay mineral geology in the region

Number	Marl unit of name	Illite (%)	Collorite (%)	Vermiclyte (%)	Montmrilonite (%)
1	Om	0-38	0-22	0-7	0-25
2	Ols	0-28	0-35	0-15	0-11
3	Olg	0-31	0-28	0-9	0-17
4	M3	0-30	0-15	0-27	0-18
5	M2	0-45	0-25	0-13	0-20
6	M1	0-50	0-40	0-12	0-10
7	Ek	0-15	0-25	0-40	0-40

The Iranian marl in terms of having dissolved gypsum, salt and anhydrite minerals are divided into two major categories: evaporative marls (Neogene age) and non-evaporative marl (before the Neogene), each of which has unique characteristics (Asadi, 2006). The characteristics of non-evaporative marls of Iran are as follows:

-The location of their formation is often the sea with normal salinity and calcium carbonate that is one of the main components of the chemical composition of this type of marl.

-They are older than the evaporative marl in terms of age, and they are mostly "shallow sheet erosion and shallow rill erosion. This marls are not colorful and often found in cream color and lacking evaporative minerals of gypsum, salt and anhydrite, and alternate with calcareous and shale layers.

-For this marls there is possibility of deployment of vegetation on them.

In Marl units, due to Ionic balance, as well as severe and salt stress too, deployment, germination and vegetation growth, has encountered a problem, because the surface of this formation has mainly less vegetation (Varavipour et al., 2010). Study of marl erosion indices in Chaharmahal and Bakhtiari province showed that extent of marl formations in Chaharmahal va Bakhtiari province is 1074 square kilometers, equivalent to 6.5% of the area of Chaharmahal and Bakhtiari province, extending in the center, west and south of this province (Mashhadi and Reihan 2008).
In the meantime, Gurpi Formation is one of the main factors of sediment production in the province and, in general, in the area of active Zagros folded belt.
Marls belonging to this formation with an area of 678.3 square kilometers cover about 15.4% of the province's extent, and thus contain more than 64% of the total Marl outcrops of the province. Most of these outcrops are located in the Vestgan area of Borujen city (Amiri & PYROVAN, 2010). The results of regression analysis indicated that 4 factors of absorbable potassium, exchangeable sodium, total lime and clay percentage, respectively, showing the highest variation of sediment in marl units. The results of correlation indicate a positive and good correlation between soil texture and sediment yield and a good and negative correlation between sediment yield and silt and between clay and sedimentation a non-correlation of sand with sedimentation.
Unfortunately, unplanned exploitation on the one hand, and non-management and maintenance of principles on the other hand, has increased the vegetation destruction and, consequently, the degradation of marl soils. In the classification of marls based on physicochemical characteristics in the Tafresh area, sodium element is an important chemical factor in generating all types of erosion in marls (Hosseini, ALIPENHANI, & Senemari, 2013). The effect of physical and chemical properties of soil on the number of Haloxylon plants in the marl plains of the Tabas margin indicated that there was a significant correlation between the percentage of vegetation and the number of Haloxylon plant species in the land with soil characteristics, but the correlation with soil characteristics is different.

MATERIALS AND METHODS

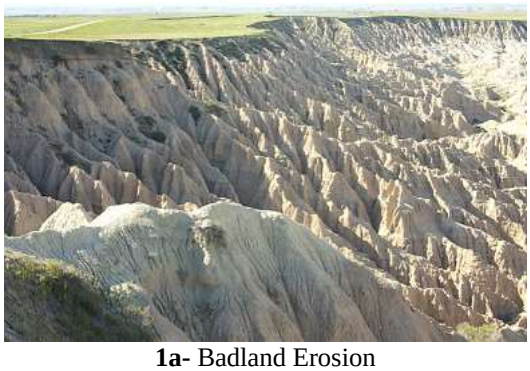
At first in Tehran province based on maps geology information with 1:100000 and 1:250000 the map of area extracted that includes Tehran, Semnan, Amol, Ghazvin-Rasht, Marzanabad (Chalus) and often including marl formations and units (Sharifi, 2016). Study result showed that there isn't any gap in geology maps and often marl geology formation and units such as Karaj, Ziarat, upper red and under red formation, occurred in Cenozoic age and distributed in Tehran province North (Sharifi, 2018).
In this comparison, all geological units and geology formations are reviewed for age, geomorphic characteristics and their dominant lithology, which in Table 2 is briefly summarized (Table 2).

Table 2 - Geology formations or units in the Region

Number	Formation or unit	Age	Geomorphology of most type	Most lithology
1	Terrace .U.	Quaternary(Holocene)	Plain	Alluvial
2	Kahrizak .F.	Quaternary(Pleistocene)	Hill- Plain	Sand and Silt
3	Hezardarreh. F.	Miocene- Pleistocene	Hill	Conglomerate
4	Kand .F.	Late Eocene	Hill	Conglomerate – Sandstone
5	Karaj.F.	Eocene	Hill-Mountain	Volcanic Rocks
6	Ziarat.F.	Eocene	Hill-Mountain	Limestone
7	Fajan.F.	Eocene	Hill-Mountain	Limestone
8	Tizkoh.F.	Cretaceous	Mountain	limestone-Conglomerate – Sandstone
9	Lar.F.	Upper Jurassic	Mountain	Limestone
10	Dlichai.F.	Middle Jurassic	Mountain	Limestone
11	Shemshak.F.	Lower Jurassic	Mountain	Sandstone-Siltstone-Shale
12	Elika.F.	Permian	Mountain	Dolomite
13	Dorud.F.	Lower Permian	Mountain	Sandstone-Siltstone-Shale
14	Mobarak.F.	Lower Carbonifrous	Mountain	Limestone
15	Zagon.F.	Cambrian	Mountain	Sandstone- Shale
16	Barute.F.	Cambrian	Mountain	Sandstone-Siltstone-Shale
17	Soltanieh.F.	Cambrian-Pre Cambrian	Mountain	Dolomite –Shale
18	Bayandor.F.	Pre – Cambrian	Mountain	Sandstone – Dolomite

Based on this studies extracted marl in terms of having dissolved gypsum, salt and anhydrite minerals was extracted and divided into two major categories: evaporative marls (Neogene age) and non-evaporative marl (before the Neogene), each of which has unique characteristics (Asadi, 2006). The characteristics of non-evaporative marls of Iran include there are some things that are fully mentioned in the introduction section. Also, in picture.1 based on geological maps and aerial photographs and Satellite Images along with Field Survey, erosion types such as badland, waterway, torrent, surface, rill, gully, rock and tunnel erosion are explored and qualitatively identified and summarized (picture. 1&2).

Fig 1: a- Badland erosion, **b-**Waterway Erosion, **c-**Torrent erosion, **d-**Surface erosion



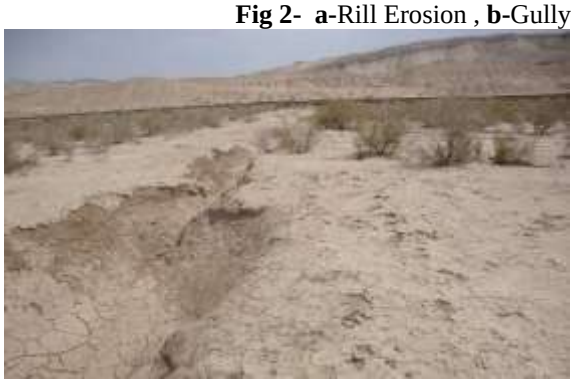
1a- Badland Erosion

1b -Waterway Erosion

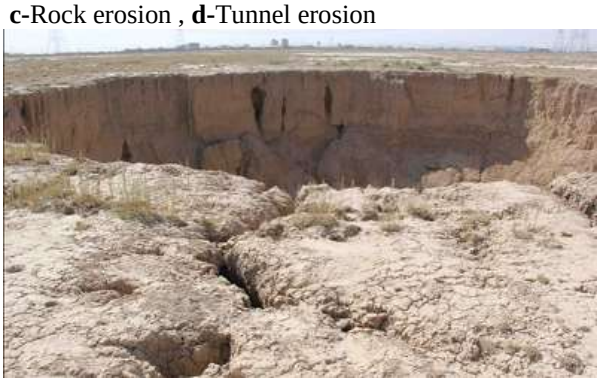
1c-Torrent Erosion

1d- Surface Erosion

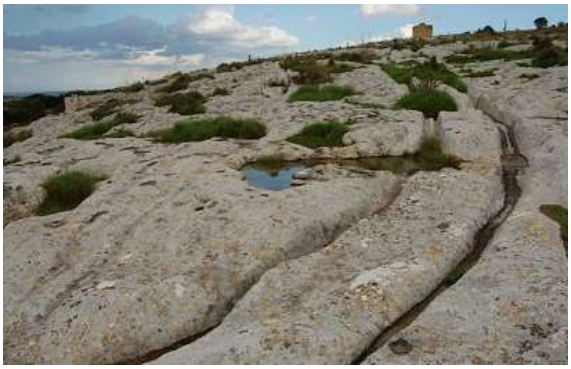
Fig 2- **a**-Rill Erosion , **b**-Gully erosion, **c**-Rock erosion , **d**-Tunnel erosion



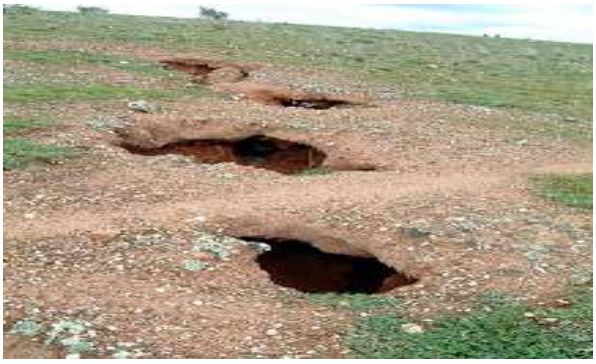
2a- Rill Erosion



2b- Gully Erosion



2c-Rock Erosion



2d-Tunnel Erosion

Finally, in table.3 based on geological maps and aerial photographs and Satellite Images along with Field Survey, marl units such as om, ols, olg, M3, M2, M1, EK are explored and this units are reviewed for age, geomorphic characteristics and their dominant lithology (Heshmati, Majid, Jusop, Gheitury, & Abdu, 2013), which in Table. 3 is briefly summarized (Table 3).

Table 3 - Name OF Marl unit and Erosion, Geomorphology types, Most lithology in the region

Number	Name of Marl unit	Age of Marl unit	Erosion type	Most lithology	Geomorphology type
1	Om	Oligocene	waterway, rill	Limestone, Marl	Rock Outcrop
2	Ols	Oligocene	rill, waterway, gully	Marl, Salt	Mountain
3	Olg	Oligocene	Rill, waterway, tunnel	Marl, Gypsum, Anhydrite	Rock Outcrop
4	M3	Miocene	rock, waterway	Conglomerate, Sandstone, Marl	Mountain
5	M2	Miocene	rock, rill, badland	Marl-Conglomerate – Sandstone	Mountain
6	M1	Miocene	rill, surface, waterway , gully	Marl, Gypsum, Shale, Sandstone	Mountain
7	Ek	Eocene	rill, rock	Limestone, Marl, Sandstone	Rock Outcrop

DISCUSSION

Marl formations and units have physical properties such as constructional nature and high deposits of high silt and low clay, and also have chemical properties of calcium carbonate, gypsum, anhydrite and salt, and therefore among marl formations and units highly erodibility protected and most of them are very limited in terms of vegetation (Sharifi, 2016). Marl formations and units have a major role in the production Sediment and the development of quaternary units in terms of erosion. These units and marl formations as one of the most sensitive geological units against erosion and weathering have a major role in the sediment production and sedimentation of watersheds. In most of the watershed areas of the province and even the country, it is always problematic and in production sediment is considered as one of the most important sources. Therefore, due to the spread of marl in the land of Tehran province, any activity in order to recognize, expand, study quantitatively and qualitatively (marl units and formations) is of particular importance and has an acceptable economic justification (Sharifi, 2018).

CONCLUSION

Marine formations and units will have a major role in erodibility in the production of sediments and the development of quaternary units. According to stratigraphic information obtained from the integration of the stratigraphic column in the geological maps of the study area, Tehran province has the most geological formations of Precambrian time to Holocene

(present era), and smaller has less gap stratigraphy (Ghauomiyan, ShariatJafari, Shoaie, Charkhabi, & Sharifi, 2011). Marl formations and units exist in most geological periods, especially in the third geological period, which are spread by distribution in the northern parts of the province of Tehran, and its expansion is considerable than the size of the province and with sediment production of about 10%, definitely it will have a significant contribution in expansion of Marl units of Tehran province.

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