



Analytical and Laboratory Evaluation of the Solubility of Gypsiferous Soils

Aliabbas Afsharian^{a*}, Nader Abbasi^c, Amir Khosrojerdi^d, Hossein Sedghi^b

^a PhD Student, Department of Water Science, Science and Research Branch, Islamic Azad University Tehran, Iran.

^b Associate Professor, Agricultural Engineering Research Institute, Education and Extension organization (AREEO), Karaj, Iran.

^c Assistant Professor, Department of Water Science, Science and Research Branch, Islamic Azad University Tehran, Iran.

^d Professor, Department of Water Science, Science and Research Branch, Islamic Azad University Tehran, Iran.

Received 10 October 2016; Accepted 28 November 2016

Abstract

Gypsum soil is one of the problematic soils because of considerable solubility for Gypsum particles in contact with water. In this research the effects of three factors including: gypsum percent, hydraulic gradient and soil texture were studied on solubility of gypsum soils. To do this, samples of gypsum soils were provided artificially by adding various rates of natural gypsum rock including 0, 5, 10, 20 and 30 percent weight of 3 kinds of soil textures including clay, silty clay and sand. Totally, 15 types of gypsum soils were prepared. Then each of gypsum soils were leached under five hydraulic gradients levels 0.5, 1, 2, 5 and 10. The results of the test indicated that the rate of Gypsum in the soil had direct effect on the rate of soluble and by increasing the percent of Gypsum, the rate of solubility was increased. In addition, by increasing hydraulic gradient, the speed of water existing soil media in a specified time was increased and also higher rate of Gypsum was derived. Also the soil texture has a considerable effect on the rate of solubility of soil. In this study, rate of solubility of gypsum soils with sandy soils was determined as 1.5 to 2 times more than the rate of clay soils. The statistical results show the highest impact of gypsum percentage and lowest impact of hydraulic gradient soil on solubility of particles in different types of soils and it has no significant effect on the overall equation of the soil texture.

Keywords: Gypsum soil; Hydraulic Gradient; Solubility Speed; Statistical Analysis.

1. Introduction

Gypseous soils are found in arid and semi-arid areas. These soils are developed in vast areas of Asia such as Iran, Syria, Iraq, China, Uzbekistan and Kazakhstan. The increase of population and the necessity of execution of development plans have led to the development of Gypsum soil operation in recent years. Some of these plans are irrigation, conveyance canals and pipes, Roads and Highways, Railway, Airport bands; Establish Industrial cities and oil and gas fields, etc. The Gypsum soil is extended in most areas of Iran such as; Khozestan, Khorasan, Yazd, Isfahan, Ilam, Zanjan, Sistan etc. and it is of great importance because of the arid and semi-arid climate. Mahmoodi et al. [9] reported that the Gypsum soils of Iran are 28 million hectare, about 17 percent of all Iran fields. Based on a report of FAO, the Gypsum soil of Ilam with the same common border with Iraq are 14600 hectare and semi Gypsum soils are 629960 hectare. In this area, the construction of water structures on Gypsum soils is unavoidable and it is necessary to do some actions for safety and stability of the structures. For example, the path of main canal in Konjancham irrigation network is on Gypsum soils where the path of canals is changed and it is a costly alternative. So in most cases, Gypsum crystals with their special physicochemical properties are effective on some characteristics of soils such as strength, settlement, compaction, Atterberg limits, particle size, etc. In recent decades, the destruction of structures on Gypsum soil creates some problems namely in gypsum soil area. Based on the reports, various structures are destroyed

* Corresponding author: ali_afshar49@yahoo.com