Soil Environ. 43(2): 248-257, 2024
DOI:10.25252/SE/2024/243389
Online ISSN: 2075-1141
Print ISSN: 2074-9546

The compression behavior of riverine fine-grained soils treated with organic matter

Murtadha A. Alfaris[1], Aymen A. Alrubaye[2], Wisam R. Muttashar[2*] and Edward L. Lo[3]
[1]Department of Agriculture Machines and Equipment, College of Agriculture, University of Basrah, Basrah, Iraq
[2]Marine Geology Department, Marine Science Center, University of Basrah, Basrah, Iraq
[3]School of Earth, Environment and Sustainability, Georgia Southern University, Statesboro, Georgia, USA
***[Received:** March 22, 2024 **Accepted:** September 23, 2024 **Published Online:** September 23, 2024]*

Abstract

This study aimed to experimentally examine the impact of organic matter content on some of compression characteristics of fine-grained riverine soils from southern Iraq. A total of eight soil samples were collected from two various riverine areas, presenting natural levee and basin (fine-grained) soils, in the eastern Basrah region. The research explored the correlation between organic matter content and compression characteristics, highlighting changes in unit weight, permeability, and compressibility. Findings showed that higher organic matter content led to lower density, increased permeability, and higher compressibility. The research offers valuable contributions to understanding the relationship between organic matter and soil compressibility, particularly relevant for sustainable soil management in the lower Mesopotamia region of southern Iraq, where those areas are vulnerable to climate change..

Keywords: Compression, fine-grained soil, riverine, organic matter, natural levee, iraq

Introduction

The presence of organic matter, derived from the decomposition of plants and animals, is a significant determinant of soil compression, also known as compaction. The compression process can be defined as is a rise in bulk density or a decrease in void ratio in response to applied stresses. This process demonstrates a bi-linear relationship between the logarithm of the applied stress and reduction of the void ratio (Oh *et al.*, 2017; Muttashar *et al.*, 2019). Several factors can be inferred from this association, such as compression and swelling (recompression) indices, compressibility, and permeability characteristics. These compression soil parameters are affected by several elements, including the soil's grain-size distribution (Muttashar *et al.*, 2020), porosity (or void ratio) (Abed *et al.*, 2022), water content, and organic matter (Arvidsson, 1998).

Soils that are considered organic typically have a 5–10% organic matter concentration which has a potential to cause expansion soil when it enters the interlaminar space of the soil structure, decreasing its shear strength and permeability (Zhang and Wen, 2022).

Many researchers (O'Sullivan, 1992; Etana *et al.*, 1997; Arvidsson, 1998; Kumar *et al.*, 2020) have addressed the effect of organic matter on compaction in a variety of soil conditions by employing various compression tests, such as confined uniaxial compression tests. This compression test is commonly employed to investigate the compression properties of soils for agricultural purposes, however, its application lacks standardization (Arvidsson, 1998). For example, about the duration of loading, Larson et al. (1980) allocated around 30 minutes for each stress application. O'Sullivan (1992) employed a 10-minute timeframe, Angers (1990) utilized a 60-second duration, and others advocated a uniaxial test with a constant strain. Some instances included increasing the stress on the same sample, while others used a new specimen for each stress. The samples' sizes and the likelihood that the soil would recover following compression also varied. The current study aims to experimentally examine the impact of organic matter content on several compression characteristics, including compression and swelling indices, compressibility, permeability, and unit weight, by using a one-dimensional consolidation standard test. The research focused on specific types of fine-grained natural levee and basin soils of the riverine soils situated in southern Iraq. Findings of this research have significant relevance in the field of soil management, in this specific location of the lower Mesopotamia basin in southern Iraq which is very vulnerable to the effects of climate change (Asd *et al.*, 2022).

***Email:** wisam.muttashar@uobasrah.edu.iq
Cite This Paper: Alfaris, M.A., A.A. Alrubaye, W.R. Muttashar and E. Lo. 2024. The compression behavior of riverine fine-grained soils treated with organic matter. 43(2): 248-257.