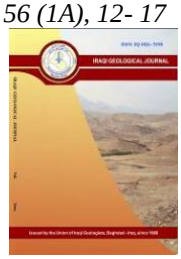
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The Relationship between Organic Matter and Soil Reflectance at Ramadi Iraq

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Abstract

Soil characteristics change with certain stimuli, which change their reflectivity and therefore lose their characteristic properties. This research focuses on measuring the effect of organic matter on soil reflectivity, especially the lack of any standard soil reflectivity samples in the research area, and will be the first step in designing these diagrams. Pear leaf was selected, the leaves were taken, then buried at depths 40 cm and 100 cm. and their reflectivity and surrounding soil were measured for 6-months period. The results showed that the rate of reflectivity decreased by 26% during this periods at a wavelength of 900nm with an increase in organic matter on depth 40cm, reflectivity decreased by 13% during this periods in wavelength of 900nm with increasing in the organic carbon in the depth of 100cm ,and no clear effect of humidity on organic matter changes was observed. These results should be used in any future study of the area of research, and the difference in reflectivity should be calculated to prevent miscalculations in the future.

Keywords: Soil reflectivity; Remote sensing ; Wavelength ; Organic matter

1. Introduction

The organic matter is the most essential soil's component and one of the most significant markers of soil fertility and reflectance spectrum. It's makes up just 10% or less of total soil composition, but importance cannot be overstated. Organic matter is necessary for agricultural productivity, soil preservation, and plant development, also for soil quality and plant health. As a result, we must assure the efficiency and accuracy of such estimates when calculating the level of organic matter in soil(Xie & Xiao, 2018). This organic matter in soil component it is made up of animals and plants,. Soil Organic Matter often includes living creatures (those smaller than 2 mm)(Manson, 2018). Many soil scientists and geologists believe that soil is distinguished from the underlying rock and parent material by the effect of organic materials and biological activity (Murphy, 2014). Previous studies of Soil organic matter content indicated a broad range of spectral impacted by this feature, suggesting that organic matter is a major chromosphere over the whole spectrum area. When content of organic matter surpasses 2 g 100g-1, reflectance decreases, especially in the visible spectrum, and can conceal absorption bands of other materials. When the organic matter level falls below 2 g 100g-1, these masking qualities become less effective. Organic elements have varied degrees of influence on soil reflectance (Vlasova, 2019). In the visible and infrared portions of the spectrum analyzed, no absorption peak linked to soil organic matter was detected (Krishnan et al., 1980). When the humidity level rise, the reflectance

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reduced. Soil reflectance increased with soil moisture after a critical level, on the other hand (Weidong et al., 2002). The Organic matter in soil is constituted of chemically distinct and naturally stable molecules (Lehmann & Kleber, 2015). Soils from various temperate and tropical forests with extremely different flora composition and soil mineralogy were strikingly comparable in terms of total organic carbon forms (Lehmann et al., 2008). The purpose to this study to know the effect of organic matter on soil reflectance. The study area is Sofia-Ramadi city is located in the west of Iraq between the longitudes of 33˚29 '07"N and latitudes 43˚12'58¨E as show in Fig.1.

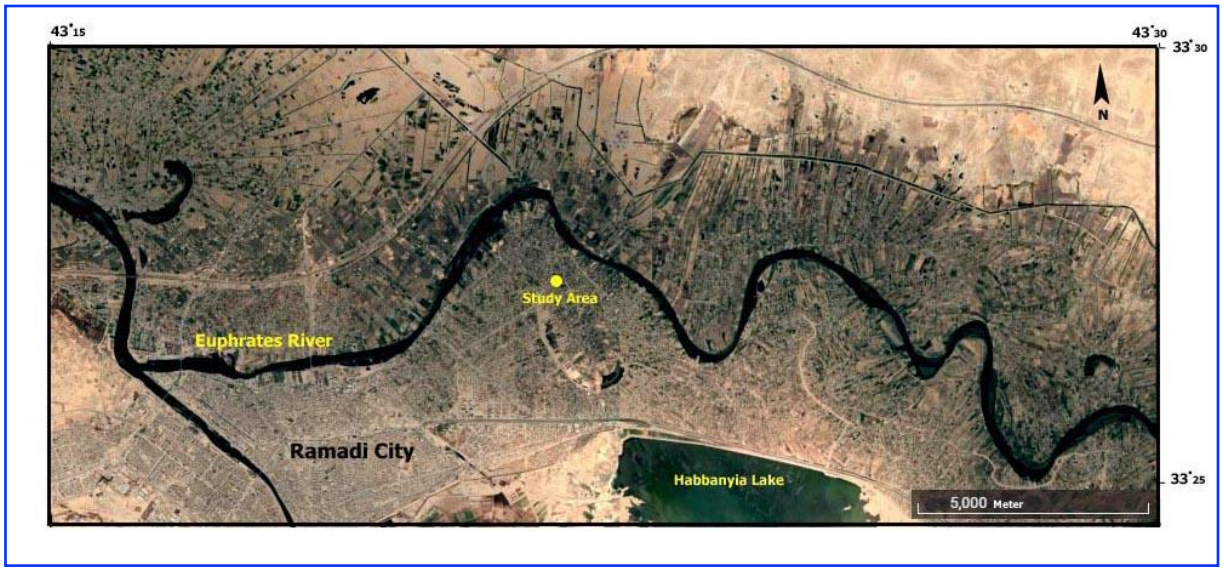


Fig.1. Location map to study area

2. Materials and Methods

We selected leaf of pear as a sample of an organic spectral changing at 9/20/2021 the leaves were buried at different depths, 40cm, 100cm, putting them in nylon net case to be in touch with natural soil effect no isolation from surrounding environment (Fig.2a) ,then we buried it in the pits as shown in Fig.2b.

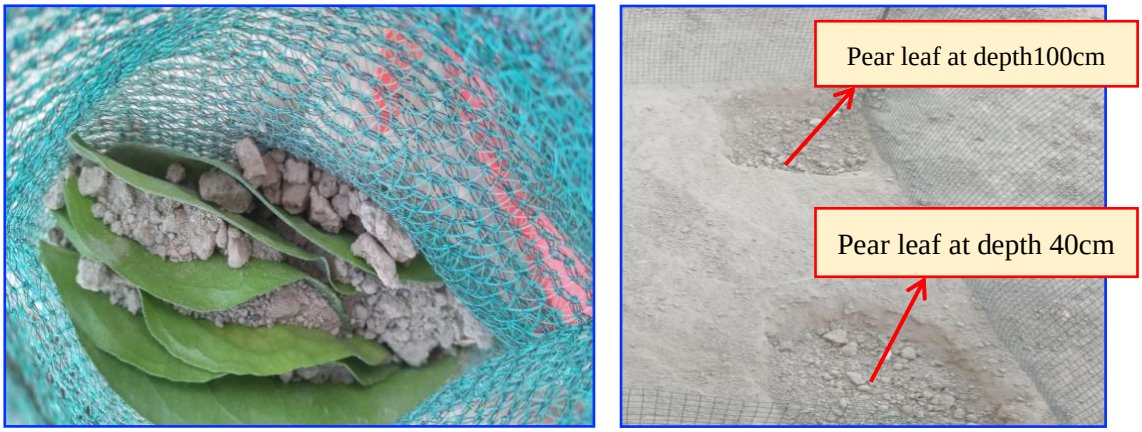


Fig. 2. A) Putting the leaves in nylon net case; B) The place of burial of the samples

2.1. Sieving Process

Two samples of soil was taken for the burial site for both depths, then the samples were burned and dried , by using a vibrating sieve (sieve shaker) to know type of soil for the burial site of the ,then we got three weights from sieving process is listed in Table 1.

Table 1. Weight of sediments of the burial site

N0	Type sediment	Weight(g)
1	Sand	430.39g
2	Silt	110.19g
3	Clay	440.54g

by using the world tables (US Department of Agriculture soil textural triangle), show that the soil type of the burial area is sandy clay is shown in Fig.3.

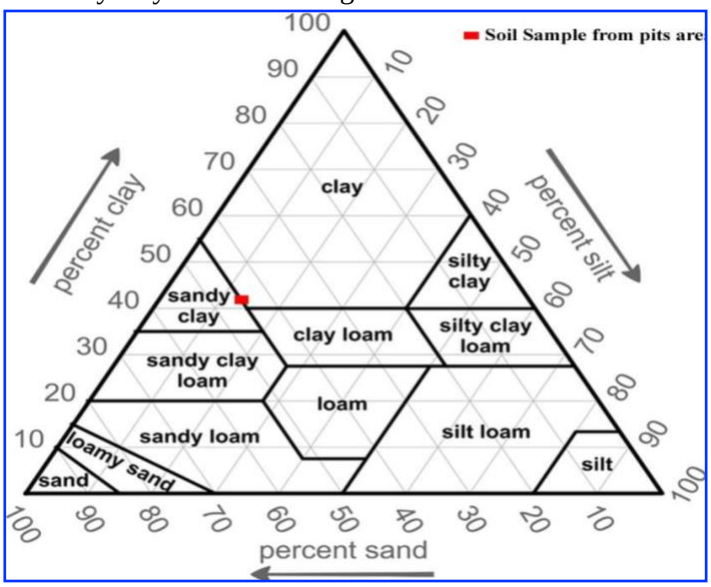


Fig.3. Type of soil with the stander triangular of soil textural (US Department of Agriculture soil textural triangle)

2.2. Measuring the Temperature and Humidity

The temperature and humidity of the samples were measured to get information at other factor may be effect on the reflectance, using the device (Temp.& Humidity Meter HTC-2),this information is listed in Table 2.

Table.2. The temperature and humidity of the pits

NO	Date	Temperature(C°)		Humidity%		Notes
1	20/09/2021	40cm	28C°	40cm	22%	Before the burial leaf
		100cm	25C°	100cm	22%	
2	29/11/2021	40cm	23C°	40cm	31%	After(70)day
		100cm	22C°	100cm	29%	
3	20/01/2022	40cm	13C°	40cm	34%	After(122)day
		100cm	18C°	100cm	35%	
4	29/03/2022	40cm	21C°	40cm	18%	After(190)day
		100cm	23C°	100cm	19%	

2.3. Reflectivity Measurements

The reflectivity of pear leaves and soil was measured before the samples were buried on 2021/9/20, using spectroradiometer-fieldspec®3 reflecting device (Fig.5.a), This devise has been calibrated to avoid measurement errors and wrong results is shown in Fig.5. b.



Fig. 5. A) Measuring the reflectivity of plant before burial; B) Calibrated the device

2.4. Chemical Analyses of Total Organic Carbon

In each day of measurement we made a TOC analysis by using the hydrogen peroxide (H_2O_2)) , the organic matter in soil sample at both depth 40cm and 100cm (Table 3).

Table 3. The values of total organic carbon in soil for depths 40cm and 100cm

Type	Depths	20/09/2021	29/11/2021	20/01/2022	29/03/2022
Soil (before burial)	40cm	3.36%	___	___	___
	100cm	3.33%			
Soil (Pear)	40cm	___	4.33%	4.65%	6.56%
Soil (pear)	100cm	___	3.32%	4.45%	5.07%

3. Results and Discussion

After a set of measurements, we have results in reflectivity, organic material, and conditions such as temperature and humidity :

3.1. Reflectivity Measurements

The results showed that reflectivity values decreased as the amount of organic matter increased after decomposition of the leaves in soil as shown in Figs. 6 and 7. And this is consistent with the openion of one researcher,who pointed out that increasing organic matter in the soil reduce its reflectivity, and vice versa (Rossel et al., 2016).

3.2. Temperature and Humidity measurements

Results showed temperature and humidity of the samples were measured with samples pits varied depending on the season, difference between 40 cm and 100 cm **(**Table.2).

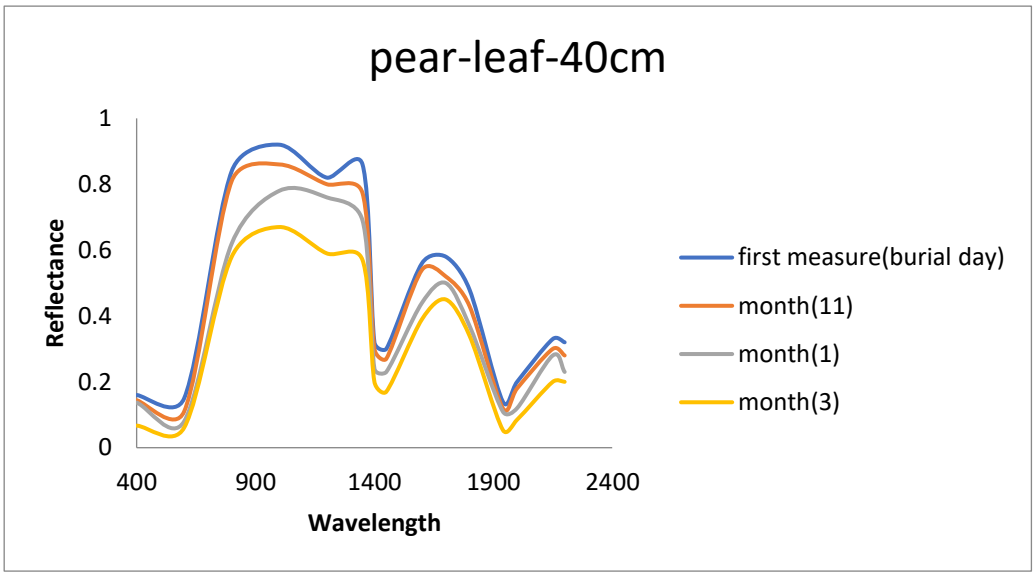


Fig.6. The reflectivity of the pear leaf at a depth of 40cm, for the specified time periods

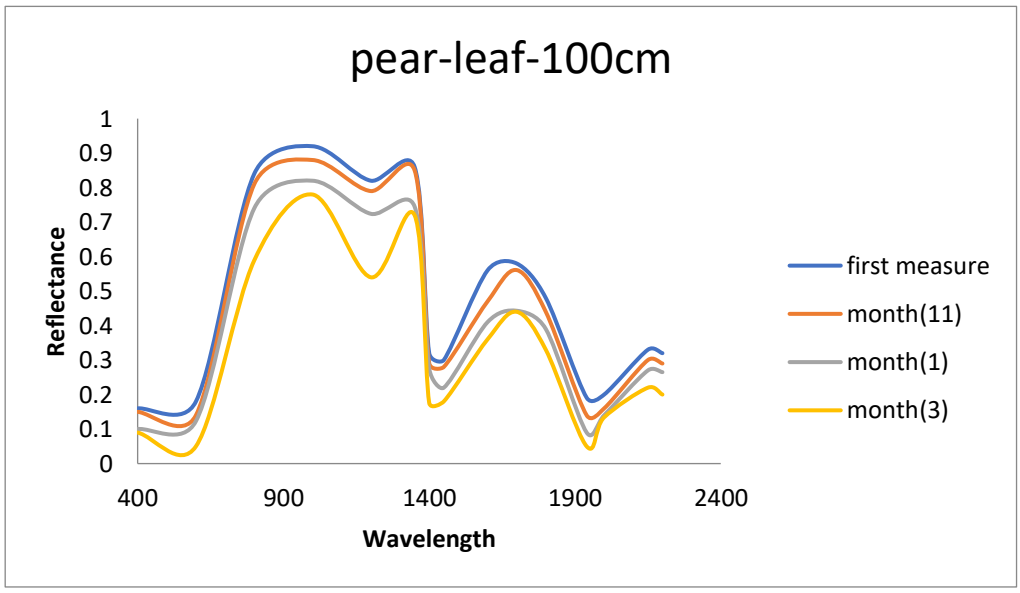


Fig.7. The reflectivity pear leaves at a depth of 100cm, for the specified time periods

3.3. TOC Analysis

We found that organic matter is more concentrated at the shallow depths than at the more depths, At shallow depths, humidity is greater, so the decomposition of organic matter will increased (Table.3) (Schumacher, 2002).

4. Conclusions

Soil, being the most important part in the natural formations and the environment in which humans and the rest of the plant and animal living organisms live, is greatly affected by the influences that surround it and thus reflects a large difference in the spectral reflection depending on the circumstance, time or influence, so no standard scheme for soil reflection can be considered It is the prevailing one,

which can be applied in remote sensing studies of reflectivity, and accordingly it is necessary to produce soil reflectivity charts according to the circumstance and place for later adoption in any specialized studies of reflectivity .to design a new standard reflectivity curves for our area we buried the samples and re-measuring their reflectivity at fixed intervals, it was noted that during the decomposition of the leaves of the plant and the increase of the organic matter by 3.2%, the percentage of the soil samples reflectivity decreased by 26% at depth 40cm, 13% at depth 100cm, this decrease resulted from the entry of the decomposing organic matter from the leaves of the plant into the soil and thus changing all the standard schemes of the soil samples before burial, as well as the reflectivity of the leaves.

The buried done with 2 different depths from the surface to get know about effect of depth on rate of decomposing , in general with all time of measurements showed at depth 40 cm. the organic matter percent more that depth 100 cm that because of most of primitive creatures live at depth 40 cm. or less to be near sun light and oxygen from soil surface , all that give the degrease of reflectivity which be more at depth 40 cm.13% percent of different between depth 40 and 100 in same time.

Time of buried and measurements starting from autumn to winter to spring (the end of measurements in the third semester) This gives an indication that the organic decomposition did not show a clear relationship with the temperature of the soil and the air, especially since the measurement year was a completely dry year where the total rainfall during the measurement period was7.33 cm Only which eliminates the possibility that the reflective difference of the soil was affected by moisture, also the soil temperature not showed wide range of all of these results gave us an idea of the necessity of designing reflection schemes for each region and according to its own conditions, since there is no single standard scheme that can be applied to all types of soils in order to show the effect of organic matter on the general reflection of the soil.

Recommendations

The experiment is recommended for different soil types(soil texture),and at three different depths of 30cm,50cm,100cm, since the decomposing microorganisms of plants have different activity from one soil texture to another.

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