Study the effect of the depth on soil reflectivity through the decomposition of orange leaves at Ramadi city – Sofia.

EilafHameed Abbas/ela20s4001@uoanbar.edu.iq
Dr.Omar Al-Jarrah/ Department of Applied Geology, College of Science, University of Anbar, Anbar, Iraq.

Abstract

One of the most crucial phenomena to examine is soil, as distant sensing is crucial to human sustenance and agriculture. The features of soil vary in response to particular stimuli, which alters their reflectivity and causes them to lose their distinctive qualities. This study will serve as the starting point for developing these diagrams since it focuses on determining the impact of soil depth on reflectivity, especially given the dearth of uniform soil reflectivity samples in the study region. A chosen orange leaf was collected, buried at two different depths (40 cm and 100 cm), and the reflectivity of the buried leaf and the soil around it were monitored during a six-month period.The results showed that the rate of reflectivity decreased by 13% during this wavelength (900nm), with an increase in organic matter on depth 40cm, and reflectivity decreased by 8% during this wavelength (900nm), with an increase in organic carbon in the depth 100cm. No discernible relationship between the rate of reflectivity decrease and changes in organic matter was seen during this time period. In order to avoid errors in future research, these findings should be applied to any subsequent research in the field, and the reflectivity difference should be determined.

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Introduction

The reflectance of the composite land surface is influenced by the soils, which make up a sizeable portion of the Earth's land surface. The electromagnetic spectrum's visible (VIS), near-infrared (NIR), and middle infrared (MIR) bands are used for remote sensing of the ground surface. The percentage of sand, silt, and clay in the soil, soil moisture (dry, wet, saturated), the amount of organic matter, the concentration of iron oxide, and the roughness of the surface are all elements that affect soil reflectance (Streck et al., 2003).Quantitative spectral study of soil using VIs and NIR reflectance spectroscopy requires advanced statistical methods to ascertain the response of soil properties from spectral characteristics. Several strategies have been used to relate soil spectra to soil characteristics (Gholizadeh et al., 2014).In the case of vegetation, green light reflects due to the presence of the chlorophyll pigment in plant leaves. It is possible to distinguish vegetation from other types of land cover (non-living) features in an optical/near-infrared image thanks to the presence of the chlorophyll pigment. Vegetation has a low reflectivity in both the blue and red portions of the EM spectrum because chlorophyll absorbs blue and red wavelengths for photosynthesis (Awad et al., 2019).

Numerous studies shown that,No absorption peak related to soil organic matter was found in the visible and infrared regions of the spectrum that were examined (Krishnan et al., 1980). examined how moisture affects soil

SOM models (R2 > 0.692; RMSE 6.018)(Wang et al., 2016). The study estimates the amount of soil organic matter using remote sensing technologies and discovers a strong correlation between each band and the amount of soil organic matter(Xie & Xiao, 2018). The purpose to this study to know the effect of the depth of leaf burial on the amount of decomposition and thus changing the amount of reflectivity of the model.

Location of study Area. 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).

reflectivity, The results of this investigation help quantify the significant impact of moisture on spectral reflectance and absorption qualities (Lobell & Asner, 2002).With two different soil particle sizes (sieved soil and nonsieved soil), multivariate statistical analysis was used to build a SOM model with absorption peak parameters obtained from the continuum-removed (CR) method, and the study's objectives were to estimate soil organic matter (SOM) and evaluate the performance of a SOM prediction model. The findings showed that nonsieved soil-based SOM models performed better than sieved soil-based

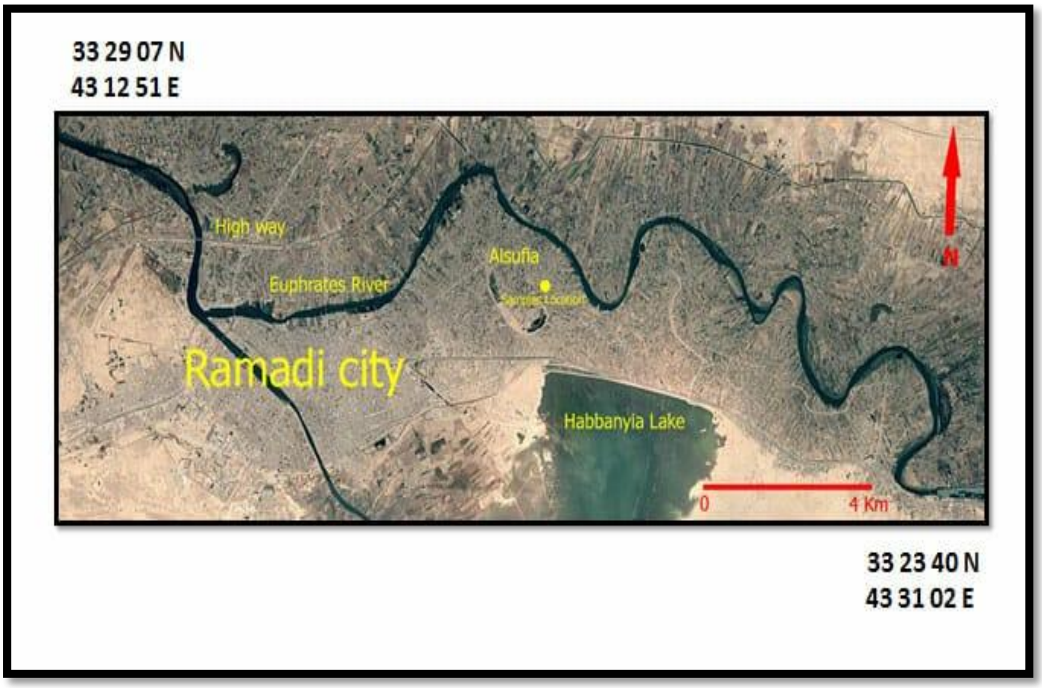

Fig.1. Location map to study area

enclosed in nylon net to be in contact with the soil's natural effects and not isolated from their surroundings.then we buried it in the pits as shown in (fig.2),(fig.3).

Materials and Methods

We chose an orange leaf as a representative example of an organic spectral altering on September 20/9/2021. The leaves were buried at varying depths 40 cm and 100 cm,while

Fig.2.Plant leaves with soil inside the net case(nylon) before burial.

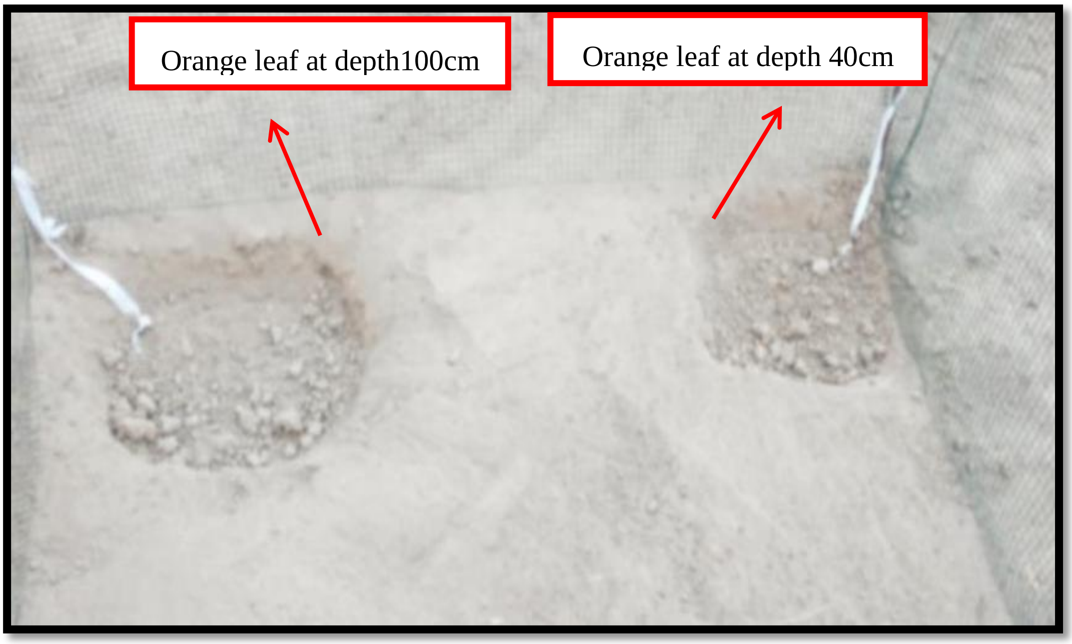

Fig.3.Place of burial of the samples.

1. Measuring The Temperature And Humidity

Using the instrument (Temp.&Humidity Meter HTC-2), the samples' temperature and humidity were monitored to get data on additional factors that might have an impact on the reflectance at various depths. This data is shown in Table 1.

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Table.1. The temperature and humidity for all pits with all Dates of measurements.

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NO	Date	Temperature(C°)		Humidity%		Notes
1	20/09/2021	40cm	26C°	40cm	20%	Before the burial leaf
		100cm	23C°	100cm	20%	
2	29/11/2021	40cm	23C°	40cm	30%	After(70)day
		100cm	21C°	100cm	28%	
3	20/01/2022	40cm	11C°	40cm	33%	After(122)day
		100cm	15C°	100cm	34%	
4	29/03/2022	40cm	19C°	40cm	17%	After(190)day
		100cm	22C°	100cm	18%	

The result indicate that the soil temperature and humidity vary from depth to other, with temperature difference of about(2-3C)º, and relative humidity difference of about (1-2%).

2. Reflectivity Measurements

Before the samples were buried on 2021/9/20, the reflectivity of orange leaves and soil was assessed using a (spectroradiometer-fieldspec®3) reflecting device. To prevent measurement mistakes and inaccurate findings, the tool has been calibrated, fig(4).

Fig.4.Measuring the reflectivity of plant before burial(20/9/2021).

3.Chemical analyses of total organic carbon

The organic matter in the soil sample at both depths of 40 cm and 100 cm was analyzed for TOC on each measurement day using the hydrogen peroxide (H2O2) technique, as indicated in Table 2.

Table.2. The values of total organic carbon in soil for depths 40cm and 100cm.

NO	Type measure	Depths	20/09/2021	29/11/2021	20/01/2022	29/03/2022
1	Soil (before burial)	40cm	3.36%	___	___	___
		100cm	3.33%			
2	Soil (orange)	40cm	___	4.30%	4.59%	4.91%
3	Soil (orange)	100cm	___	3.32%	4.45%	4.67%

Results and Discussion

Results in reflectance, organic material, and environmental factors including temperature and humidity are obtained after a series of observations:

1.Temperature and Humidity measurements

The result indicate that the soil temperature and humidity vary from depth to other, and its varied depending on the season, with temperature difference of about(2-3C)º, and relative humidity difference of about (1-2%) as Table.1.

2-Reflectivity measurements

The results showed that reflectivity values at the depth 40cm was less than at depth 100cm because of the difference in organic matter at depth 40 cm more than at depth 100cm.as shown in (fig.5) ,(fig.6).

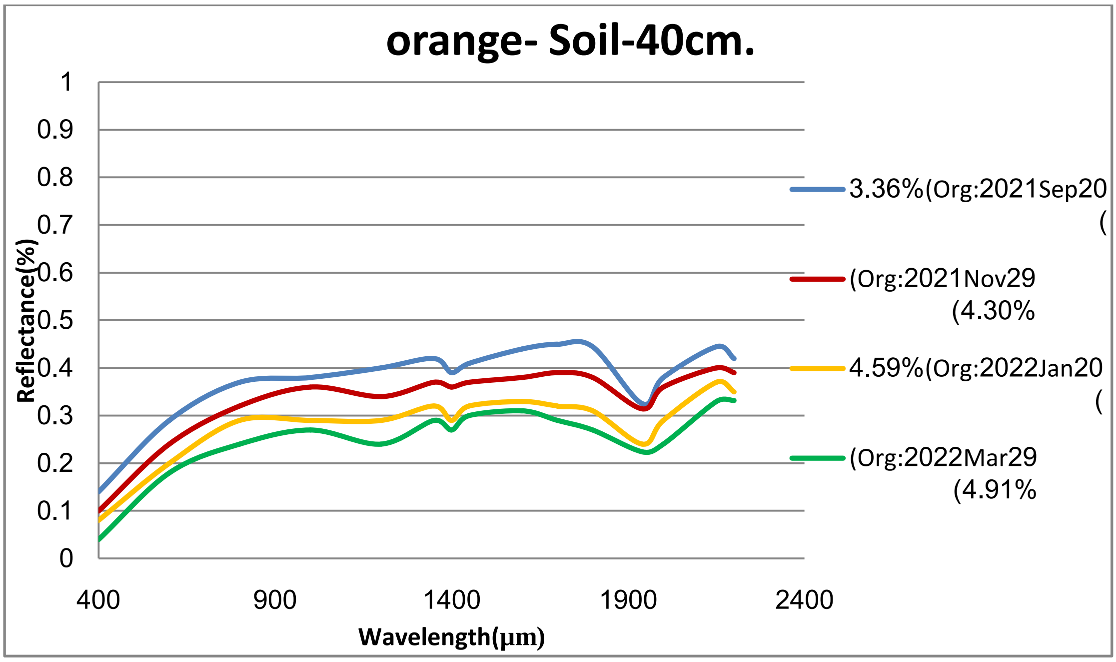

Fig.5.The reflectivity of the soil in which the pear leaves were buried on a depth of 40cm,for all periods of measurements.

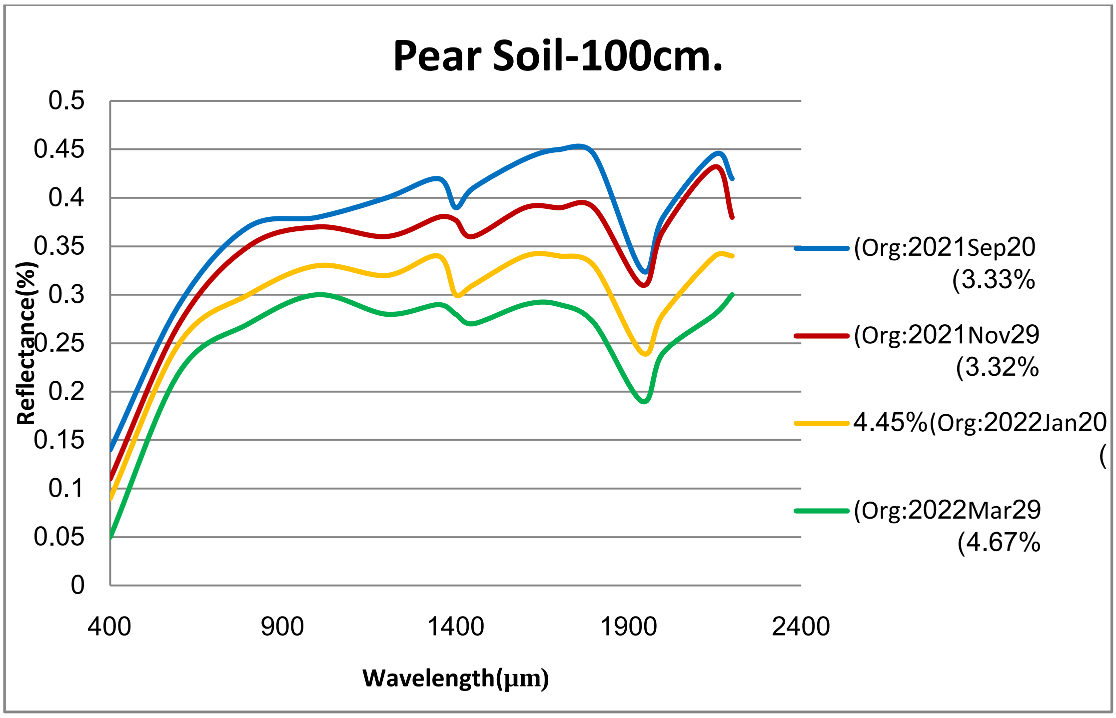

Fig.6.The reflectivity of the soil in which the pear leaves were buried on a depth of 100cm,for all periods of measurements.

required to create soil reflectivity charts according to the situation and location for later adoption in any specialized studies of reflectivity since it is the one that is now in use and may be used in remote sensing studies of reflectivity.

We buried the samples and measured their reflectivity again at predetermined intervals to create new standard reflectivity curves for our region. It was discovered that while organic matter increased during the decomposition of the plant's leaves, the percentage of the soil samples' reflectivity decreased by (13%) at depths of 40 cm and (8%) at depths of 100 cm at the wavelength (900nm). This decrease was caused by the entry of the plant's decomposing organic matter into the soil. The burial was carried out at two different depths below the surface to determine the impact of depth on the pace of decomposition. in general with all time of measurements showed at depth 40 cm. the organic matter percent more than depth 100 cm that because most primitive creatures live at depth 40 And this supports a researcher's hypothesis that increasing the amount of organic matter in the soil reduces its reflectivity and vice versa (Rossel et al., 2016).

3-Total Organic Carbon Analysis

According to our research, organic matter is more concentrated at shallow depths than at greater depths. Table 2. Because humidity is higher at shallow depths, the breakdown of organic materials will accelerate(Schumacher, 2002).

Conclusions

Since soil is the most significant component of natural formations and the environment in which people and other living things exist, it is significantly influenced by the forces around it and as a result, reflects a wide range of spectral reflections depending on the situation, time, or influence. As a result, no standard scheme for soil reflection can be taken into consideration. As a result, it is

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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. (5% of different between depth 40 and 100 in same time.

measures commencing in the autumn and going through the winter and spring (the end of measurements in the third semester) This suggests that the organic decomposition did not exhibit a clear link with soil and air temperatures, especially given that the measurement year was an exceptionally dry year. All of these results gave us an idea of the necessity of designing reflection schemes for each region and according to its own conditions, but only which eliminates the possibility that the reflective difference of the soil was affected by moisture, and also the soil temperature not showed wide range.as there isn't an one universal methodology that can be used to demonstrate how organic matter affects a soil's overall reflection across all soil types.

Recommendations

The experiment is advised for various soil types (soil texture) and at three different depths of 40 cm, 70 cm, and 100 cm because the decomposing microorganisms of plants have varying levels of activity depending on the soil texture.

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