IRAQI Academic Scientific Journals
ISSN:1813-1646 (Print); 2664-0597 (Online)
Tikrit Journal for Agricultural Sciences
Journal Homepage: http://tujas.tu.edu.iq
E-mail: tjas@tu.edu.iq
TJAS Tikrit Journal for Agricultural Sciences

Effect of Vegetation Cover for Olive Trees Orchards in Optical Characteristics of Fadhlia Region Soils in Nineveh Province/ Northern Iraq

Radhwan A.M.Saeed Al-Kiki * ;
Jassim Khalaf Shallal Al-Rawi

Dept. of Soil Sc. and Water Resources/ College of Agriculture and Forestry/ University of Mosul/ Iraq

KEY WORDS:
vegetation cover, olive trees, optical characteristics, spectroradiometer, Fadhlia

ARTICLE HISTORY:
Received: 28/06/2020
Accepted: 22/07/2020
Available online: 15/12/2020

ABSTRACT

This study was held in Fadhlia region, 22 km northeast of Mosul city, province center, and aims at knowing the effect of olive trees in soil optical properties, three sites of olive orchards were chosen with different ages and agricultural processes, the age of trees in first site is 200 years old, second site is 10 years old and third is 25 years old, three soil pedons were drilled under olive trees, and three others in uncultivated land, and several photographs for soil sites were taken using a digital camera to calculate RGB values, the color of the soil was then measured in field and laboratory using Munsell soil color charts, and use the Spectroradiometer in laboratory to draw the spectral reflectance curves of soil, the results obtained that RGB values were high in dry soils and decrease in moist state, and the percentage of spectral reflectance was lower than that of (47.3%) in the surface horizon soil of p5 under olive trees, hue, value and chroma were different between the layers of study sites in the field and laboratory for dry and moist state, and low values of the spectral reflectance were observed in surface horizons of most soil pedons at the wavelength (1750) nm .

INTRODUCTION

The vegetation cover of olive trees have a clear influence in soil optical properties as well as other soil characteristics, a soil color is one of the most obvious and intersable characteristics with other soil properties, (Liles et al ,2013) suggested that knowledge of soil optical properties and soil colors was important and useful in the soil survey and different classification systems , Tofigh and Vida (2010) in their study on forest soils (northern Iran) confirmed that the color of surface horizons soils ranged from 10YR3/3-10YR5/4 because of the high content of organic material (3.45%-6.6%) resulting from the degradation of leaves falling from trees and humus formation, Jubair and Jabbar (2017) they remarked to knowledge and recognition of soil color allows the detection of many morphological and pedogenic characteristics directly in the field, and the dark color of some horizons indicates that there are concentrations of clay or organic matter presence, and that knowledge of the properties of the soil spectral reflectance is considered to be Important technologies in the area of assessment of properties, soil variations accurately with rapid results, can be performed in laboratories or fields and that knowledge it from air and space by aircraft and satellites (Ben Dor et al., 2015), The aim of this study was to find out the effect of olive trees with different ages and agricultural processes in optical characteristics of Fadhlia region soils , as well as the possibility of calculating the basic soil color (RGB) values by taking advantage of digital camera, Munsell color chard and some remote sensing techniques such as to use of spectroradiometer .

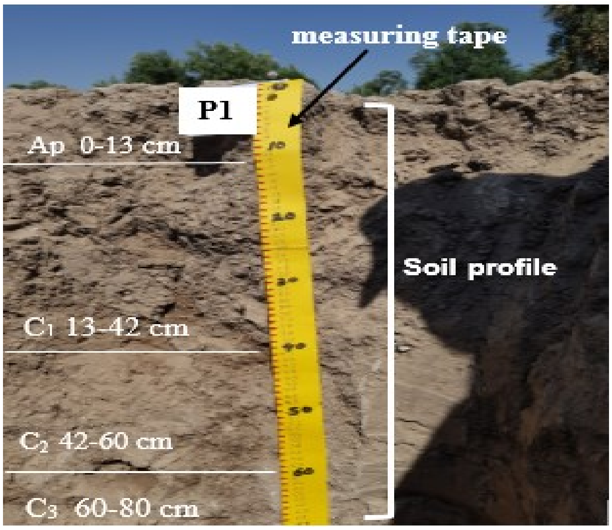
* *Corresponding author: E-mail*: radhwanalkiki@yahoo.com

MATERIALS AND METHODS

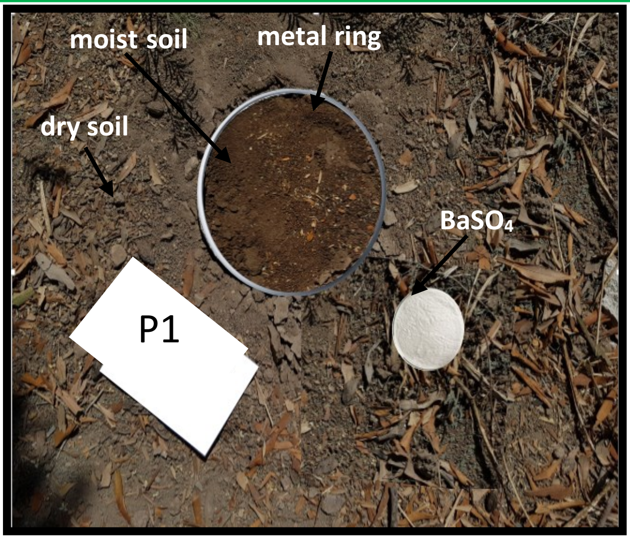
Study area :

The Study Site was selected for it agricultural importance, with the oldest olive trees of hundreds of years (figure 1), Fadhlia region located in the coordinates (36°30'48") north and (43°16'09.1") east, its soil was classified under Inceptisols and the Calcixerpts according to USDA System (Muhaimeed et al.,2014). , a semi dry climate with a rain depth rate of 300-550 mm/year, three different olive trees have been chosen at their age (200,25,10) years as well as different agricultural processes, and six soil pedons have been drilled face to direct sunlight (Figure 2), morphology pathophysics were described in the American Soil Survey Staff(1999), and several images of specific profiles were acquired using a digital camera to calculate the basic soil colors (RGB), Red, Green, and Blue and spectral reflectance by the soil color analysis programs and using a computer, a special metal ring for the soil to be moist was used to compare the RGB soil color values of both dry and moist state in a single image, and $BaSO_4$ was placed beside the ring as a standard reference (Figure 3), and then the amount of water (about 50 ml) was distributed, homogeneity on the soil, the camera is set 1 meter above the selected site, and many pictures were taken under the direct sunlight of all the sites according to globally standards, then measure the color field using Soil colors chard, after several soil models have acquired the Surface and subsurface horizons, these samples have dried air and then it underwent a very fine grinding and passed through a sieve diameter of its holes(500 μm) because the soil smooth surface effect on the spectral reflectivity values, and the photo process was done as in the figure (4), after that was done the calculate RGB values using a computer and the Color Grab program for calculating basic soil values and the Color of soil sample is measured represented in the laboratory based on soil colors chard, and the spectral reflectance curves for soil samples were calculated of surface and subsurface layers in the soil dry state then the data has beenprocessed and recorded in the computer and reflectivity values have been calculated in laboratory through RGB values .

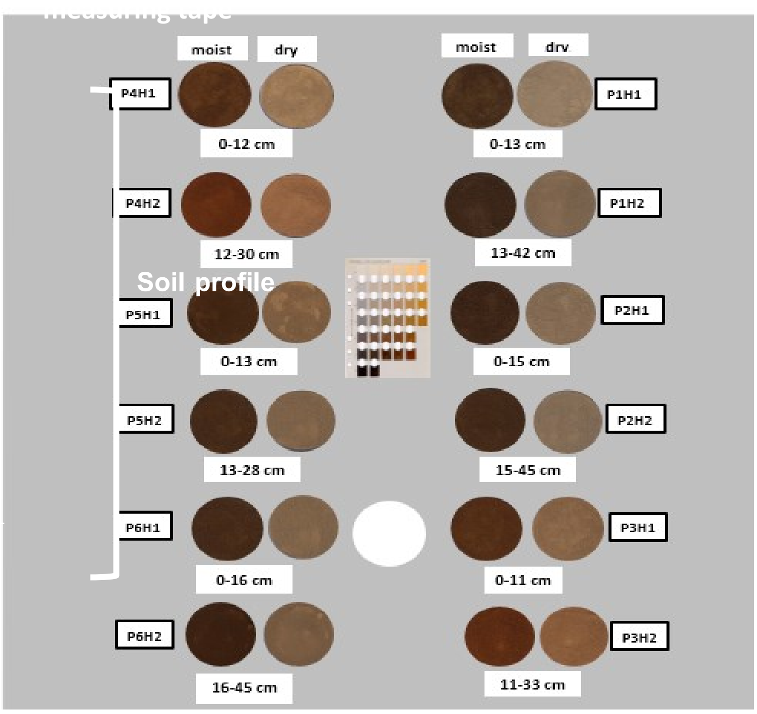
Figure (1) A map showing the locations the study area



Figure(2) The photos taken technique for soil pedon Interface



Figure(3) Use the metal ring for both dry and moist state of soil and calculated RGB values for all studied



P : soil pedons H1 : surface layer H2 : subsurface layer

Figure (4) Shows how to take a photo and measuring soil color in the laboratory

RESULTS AND DISCUSSION

The results of chemical and physical analysis and measurements of the soil samples for surface and subsurface layers of studied pedons are observed in table (1) .

Table (1) Some chemical and physical characteristics of surface and subsurface layers of studied pedons**.**

Pedons	Horizon	Dep. cm	pH	EC ds. m^{-1}	$CaCO_3$	O.M.	Bulk density $Mg.m^{-3}$	size distribution $g.kg^{-1}$			texture
					$g.kg^{-1}$			sand	Silt	clay	
P1	Ap	13-0	6.80	6.35	355.0	27.45	326	412	262	326	Loam
	C_1	42-13	7.00	5.72	430.0	18.90	374	454	172	374	Loam
P2	Ap	15-0	7.70	1.2	320.0	12.73	341	354	305	341	Loam
	C_1	45-15	7.50	1.0	400.0	10.60	352	381	267	352	Loam
P3	Ap	11-0	7.12	2.23	425.4	23.05	252	405	343	252	Clay loam
	C_1	33-11	7.29	2.42	400.5	11.50	260	438	302	260	Loam
P4	Ap	12-0	7.75	1.26	418.4	17.68	252	395	353	252	Clay loam
	C_1	30-12	7.70	1.33	445.5	8.14	226	380	394	226	Clay loam
P5	Ap	13-0	7.00	1.1	200.2	25.70	137	523	340	137	Silty clay loam
	C_1	28-13	7.12	1.4	251.0	18.55	135	500	365	135	Clay loam
P6	Ap	16-0	7.60	1.26	265.7	10.32	175	411	414	175	Clay loam
	C_1	45-16	7.50	1.27	215.0	11.75	170	421	409	170	Clay loam

The optical characteristics of Study soils :

Table 2 results show that the optical properties of camera results computed in laboratory for surface and subsurface horizons were mixed with clear differences between colors (RGB) with variations in spectral reflectance values (R%) and presence Differences between Hue (H), value (V), and Chroma (S) values, and that the RGB soil color values and spectral reflectance values were high when the soil dried in contrast to moist and for all layers to studied horizons, This shows the effect of the explicit moist content on soil color values and their reflectance, as indicated by person (2005) as well as Karavanova and others (2000) who stressed that moisture makes soil color more topical, and red values when soil dried ranged from 144 to 196. In humidity between 72 and 125, the green values of dry color are among 119 to 172, a moist conditions is about 40 to 64, and the color of blue ranged from 93 to 147, and for the moist was between 19 and 41, and these values are related to organic content, texture, minerals, and soil salts, which was ALaskary(2019) and Attiyah(2017) found, hue and value It were high in dry state and showed a clear reduction in moist state, but the chroma were high in moist conditions compared to a dry, which indicates the effect of water present Especially in soft soil texture on a dark color and increased values of Chroma (Shields et al, 1968) , Figure 5 refers to the reflex ratio of dry surface horizons that showed a disparity between the studied soil pedons, which was 47.3% lower in the soil of the surface horizon of the P5 where the pedon is located under 25-year-old olive trees. The reason for the decrease in reflectivity for this site is due to the high organic content due to the accumulation of plant residues over time, which is consistent with Stoner and Bumgardner (1982), and the pedons P1, P3, P5, refer to the soil under trees and the P6, P4 to the sites of the waste lands, and the spectral reflectance value for drought is 67% In the surface horizon soil of the pedon P1 despite the high organic content of the horizon soil, which represents a very old olive orchard, can be caused by the salt water , CaCO3 quantity and the loam texture of the site, which is the soil spectral reflectance, and the "organic" matter, as indicated by Muhaimeed and Za'in (2013), the spectral reflectance values of the near subsurface horizons when the soil is dry were different among the pedons. and Surface and subsurface of the moist state sites has been characterized by a decrease compared to the dry condition as in figures 7&8 , due to the moist content of the soil which increases darkness color, (Lobell and Asner, 2002), the lowest value of the soil spectral reflectance for moist soil was the surface horizon of the P5 under the 25 year old olive trees, which reached 19.1%, and the highest proportion was the sub-surface soil of the P3 under 10 year old olive trees, which reached 32.3%.

Table (2): Basic soil color values RGB and chromatic evidence (value, Hue, Chroma) and spectroscopic reflex ratios for surface horizons and laboratory surface subsurface.

Sample	Dry state							Moist state						
	Basic color			R%	H	S	V	Basic color			R%	H	S	V
	R	G	B					R	G	B				
P1H1	191	172	147	67	34	23	75	92	64	41	27	27	55	36
P1H2	169	145	119	57	31	30	67	82	55	36	24	25	56	32
P2H1	171	147	121	58	31	29	67	80	52	33	23	24	59	31
P2H2	176	155	131	60	32	26	69	83	54	32	24	26	61	33
P3H1	152	130	97	50	27	33	65	78	51	26	22	21	65	35
P3H2	176	134	101	55	26	43	69	125	64	26	32	23	79	49
P4H1	196	165	126	65	33	36	77	107	63	32	29	25	70	42
P4H2	193	148	109	60	28	44	76	120	57	22	31	21	82	47
P5H1	144	119	93	47	26	35	63	72	40	19	19	24	74	28
P5H2	161	130	103	52	28	36	63	80	47	26	22	20	66	34
P6H1	166	139	113	55	29	32	65	80	50	29	22	25	64	31
P6H2	170	137	104	55	30	39	67	83	47	23	22	24	72	33

P : soil pedons H1 : surface layer H2 : subsurface layer

Table 3 results refer to RGB and (Chroma,Hue,Value) and R% spectral reflectance that are field-calculated for the soil surface at each study pedons, It was noted that these values showed a slight decrease compared to laboratory and the same studied practice sites because the surface of the soil within the field is characterized by its roughness compared to the very smooth (500 µm) in laboratory conditions, thus increasing the soil's spectral reflectance values. As noted by Herodowicz and Piekarczyk (2018), spectrodiometer spectral reflectance properties that measured by Spectroradiometer: Shows the shape(9) of the spectral reflectance curves of the surface horizons of the studied pedonse of the dry condition dry state measured by Spectroradiometer, The path taken by the curves was consistent with the results of the spectral reflectance of R% shown in figure (5) and the curves indicate differences in the hydrological population packets at wavelength (1940) of the m, for the spectral reflectance values at this range, The surface horizon soil of P5 below the olive trees it has contains O.M. (Table1), which increases soil capacity for water retention, as well as the high content of silt in this horizon (523) g.kg-1, which helps to reduce color values, (Mohamed et al., 2018) and (Al-Dullaimi,2007) The first surface horizon was 0.75% more reflective in 2000 - 2250 nm , because of the salt in the soil of this pedon, especially dry surface horizons, and the least reflectance ratio of 0.56% in the soil of the P5 surface horizon for the same wavelengths due to the organic content of the surface layer that affects the soil's spectral reflectance values, Figure (10) refers to the spectra reflectance curves of the surface and subsurface soil of the studied site pedons calculated using the Spectroradiometer, surface layer reflectance of P5 located under the 25-year-old olive trees, was 0.57% in wavelength (1750) nm, because the content of organic matter in subsurface layer for this soil pedon (Table1), which led to the decrease in the reflectance values ,Researchers Cierniewski and Kuśnierek (2010) have indicated that the effect of organic matter on the reflectance of spectral soil by its degree of degradation and the percentage of plant residues in a soil sector as well as the activity of its decomposed organisms. The highest reflectance ratio is 0.68% for the sub-surface soils of the Pedon P2 during the wavelength (1750) of the Pedon, which may be caused by high $CaCO_3$ that affect the soil spectral reflectance values (Clark, 1999) .

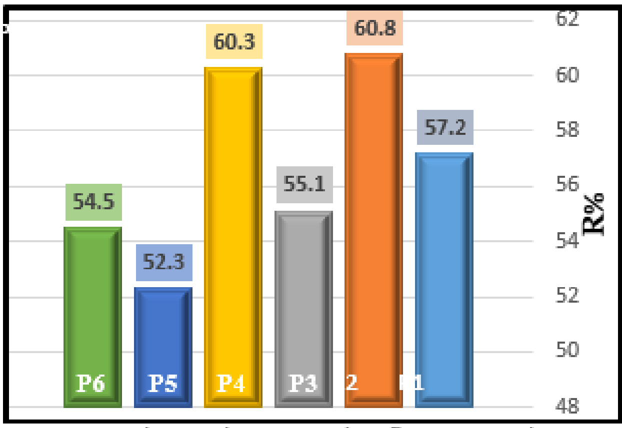


Figure (6) Shows the spectral reflectance values for study pedons subsurface layers in dry condition

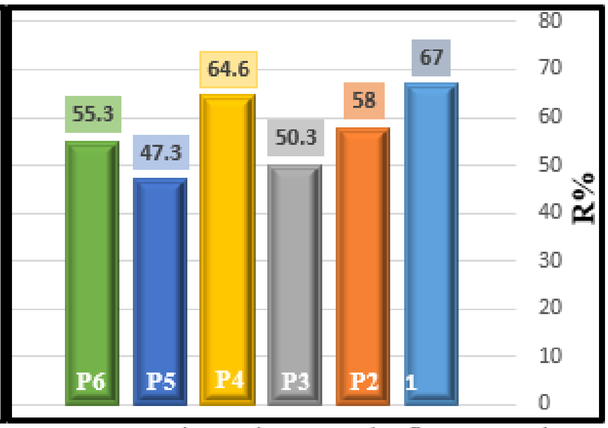


Figure (5) Shows the spectral reflectance values for study pedons surface layers in dry condition

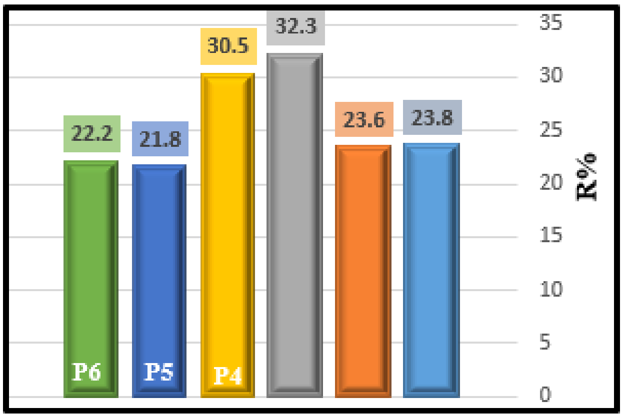


Figure (8) Shows the spectral reflectance values for study pedons subsurface layers in moist condition

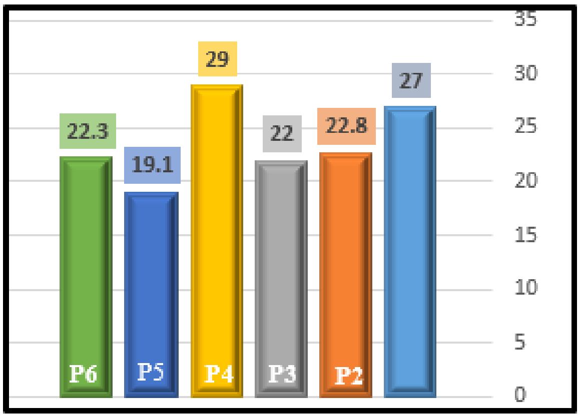


Figure (7) Shows the spectral reflectance values for study pedons surface layers in moist condition

Table: (3) the basic colors of soil (RGB) and (Hue,Value ,Chroma) values

pedon	Dry state							Moist state						
	Basic color			R%	H	S	V	Basic color			R%	H	S	V
	R	G	B					R	G	B				
P1	165	144	121	57	32	33	60	85	55	36	24	25	58	35
P2	147	128	119	52	29	23	47	70	47	33	21	22	55	23
P3	135	118	96	46	33	29	49	89	69	53	28	24	41	27
P4	167	133	89	52	34	44	68	118	84	47	35	31	48	47
P5	135	111	86	44	31	36	53	79	50	52	24	25	57	34
P6	161	131	95	52	34	42	65	87	57	36	25	33	45	67

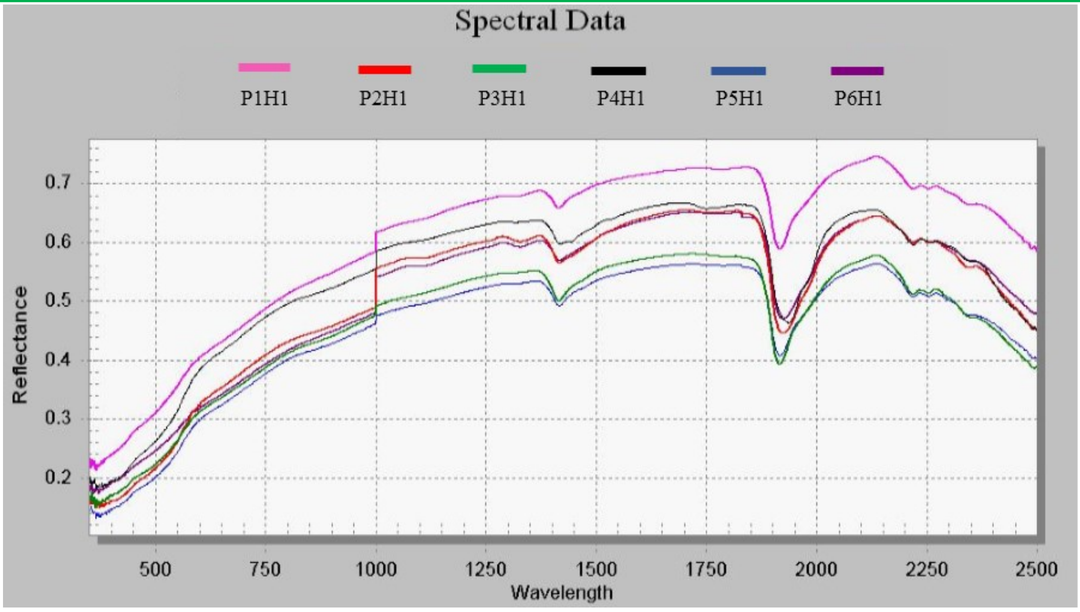


Figure (9) the spectral reflectance curves of soil surface layer in dry state

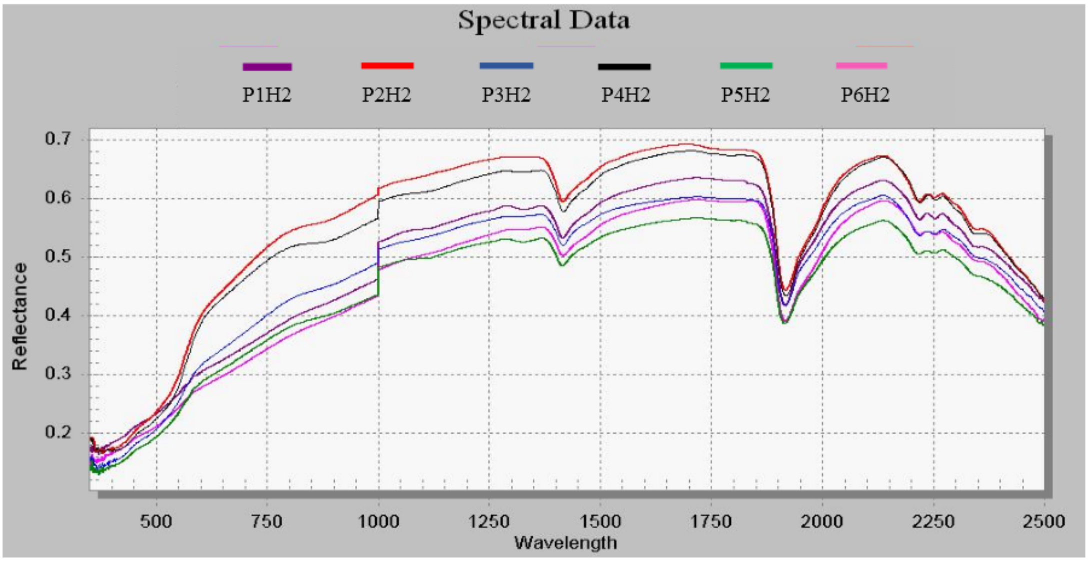


Figure (10) the spectral reflectance curves of soil subsurface layer in dry state

REFERENCES

AL-Askary, W.A. A., (2019) . Optical and Morphological Properties for Soils Under Different Agricultural Land Uses at Kirkuk Provinance. M.Sc., College of Agriculture and Forestry, University of Mosul.

Al-Dullaimi, Aiad A. Kh.H., (2007). color and reflectance of the soil and their relationship with some physical and chemical soil properties . M.Sc., College of Agriculture and Forestry, University of Mosul .

Atiyah, Omar Saad., (2017) Effect of Biosequence on optical and pedological properties of AL- Dibis Forest soils in Kirkuk Province, M.Sc. , College of Agriculture, University of Tikrit.

Ben Dor, Eyal., Ong, Cindy., and Lua, Ian. C. (2015). Reflectance Measurements of Soils in the Laboratory: Standard and Protocols. Geoderma,112-124.

Cierniewski, j. & Kuśnierek K.(2010). Influence of several soil properties on soil surface reflectance. Quaestiones Geographicae 29(1), pp. :13-25 .

Clark, R.N., (1999). Spectroscopy of Rocks and Minerals and Principles of Spectroscopy. In: Rencz, A.N. (Ed.), Remote Sensing for the Earth Sciences , Manual of Remote Rensing, vol. 3. John Wiley and Sons , New York, pp. 3–58 .

Herodowicz, k. And piekarczyk, j . (2018) . Effects of soil surface roughness on soil processes and remote sensing data interpretation and its measuring techniques – a review. Journal of soil science ,vol. Li/2.

Jubair, A. R. and Jabbar, R. H. (2017). Characterization and diagnosis of accurate construction in some of the layers of the Middle Euphrates. Euphrates Journal of Agricultural Sciences, 9 (4): 699-709 .

Karavanova, E. I. Shrestha, D. P. and D. S. Orlov, (2000). Application of remote sensing techniques for the study of soil salinity in semi-arid Usbekistan. Division of soil science, ITC. Ensched.The Netherland.

Liles, G. C., Beaudette, D. E., OGeen, A. T., & Horwath, W. R. (2013). Developing predictive soil 537 C models for soils using quantitative color measurements. *Soil Science Society of America* 538 *Journal*, 77(2173) .

Lobell, David B. and Gregory P. Asner . (2002) . Moisture Effects on Soil Reflectance . Soil Science Society of America Journal , 66(3) : 722-727 .

Mohamed, E.S. , A.M. Saleh, A.B. Belal and Abd_Allah Gad . (2018) . Application of near-infrared reflectance for quantitative assessment of soil properties . The Egyptian Journal of Remote Sensing and Space Sciences , 21 : 1–14 .

Muhaimeed, A. S. and Za'in, A. A., (2013). Examine the spectroscopic reflectance and factors affecting the prevailing earth covers using remote sensing technology in the Abu Ghraib project. Baghdad Science Journal, 10 (1).

Muhaimeed, Ahmad S., A. J. Saloom and K. A. Salem . (2014) . Classification and Distribution of Iraqi Soils . International Journal of Agriculture Innovations and Research , 2 (6) , (Online) 2319-1473 .

Person, M. (2005). Estimation of surface soil moisture from soil color using image analysis. Pub. Vadoszone J. 4: 1119-1122 .

Shields, j. A., e. A. Paul, r. J. Sr. Arnaud and w' k' head . (1968) . Spectrophotometric measurement of soil color and its relationship to moisture and organic matter . Canadian journal of soil science, vol. 48 : 271-280 .

Soil Survey Staff. (1999). Soil taxonomy : A basic system of soil classification for making and interpreting soil surveys. 2nd ed. Agric. Handb. No. 436. USDA-NRCS. U.S. Govt. Print. Office,Washington, DC .

Stoner, E. R. and M. F. Baumgardner , (1982). Characteristic Variations in Reflectance of Surface Soils . Soil Sci. Soc. AM. J. , V. 45 .

Tofigh, A., and Vida S. (2010) . Physical, chemical, and morphological characteristics of forest soils in the Keroudkenar regions of northern Iran. World Congress of Soil Sci. 13-14.

تأثير الغطاء النباتي لبساتين أشجار الزيتون في الخواص البصرية لترب منطقة الفاضلية في محافظة نينوى/شمالي العراق

رضوان عبدالله محمد الكيكي وجاسم خلف شلال الراوي

جامعة الموصل/كلية الزراعة والغابات/قسم علوم التربة والموارد المائية

المستخلص

أُجري هذا البحث في منطقة الفاضلية (22 كم شمالي شرقي الموصل مركز محافظة نينوى) ويهدف إلى معرفة تأثير أشجار الزيتون في صفات التربة البصرية ، اختيرت ثلاثة مواقع لبساتين أشجار الزيتون بأعمار وعمليات خدمة مختلفة ، الأول عمر أشجاره 200 عاماً والثاني 10 أعوام ، والثالث 25 عاماً، وتم حفر ثلاث بيدونات للتربة (soil pedons) تحت أشجار الزيتون ، وثلاث أخرى في الأراضي الجرداء (الغير مزروعة) ، وتم إلتقاط عدة الصور لواجهة البيدونات وإطار مساحة الترطيب لمواقع الترب باستعمال آلة التصوير الرقمية وذلك لحساب قيم RGB ، بعدها أُجري قياس لون التربة حقليا ومختبريا باستعمال أطلس مونسل (Munsell Soil Color charts) ،فضلاً عن إستعمال جهاز قياس الانعكاسية الطيفية (Spectroradiometer) لرسم منحنيات انعكاسية التربة الطيفية ، وتوصلت النتائج إلى أن قيم RGB كانت مرتفعة في حالة التربة الجافة ، وأبدت انخفاضاً في الحالة الرطبة، وبلغت نسبة الإنعكاسية أقل ما يكون (47.3%) في تربة الأفق السطحي للبيدونP5 الواقع تحت أشجار الزيتون، وكانت قيم الهيو والفاليو والكروما متباينة بين ترب مواقع الدراسة المحسوبة حقليا ومختبريا وبين الحالتين الجافة والرطبة للتربة ، ولوحظ إنخفاض في قيم الانعكاسية الطيفية لترب الآفاق السطحية لمعظم البيدونات عند الطول الموجي (ηm1750) .

الكلمات المفتاحية: الغطاء النباتي،أشجار الزيتون،الخواص البصرية،الراديوميتر ،الفاضلية.