SPATIAL VARIABILITY OF THE HEAT EMITTED FROM THE LAND SURFACE IN DETERMINING THE CHARACTERISTICS OF DESERT SOILS IN AL-SAMAWAH DESERT USING "GIS"

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ABSTRACT

This study was aimed to reveal the variation land surface temperature "LST" with some characteristics of desert soils in the Samawa desert at Al-Muthanna province, and to adopt solutions and treatments by identifying factors and indicators that have a direct impact to desertification, by using geographic information systems mapping for spatial distribution Some physical and chemical properties were selected. . the result showed that there was a statistical relationship between LST and the physical characteristics, as it was revealed that the comparison of sand and silt content with the land surface temperature "LST" . There is a significant relationship with the determination coefficient of R^2=0.6. The chemical properties, the results showed that there was a significant connection between the electrical conductivity with the land surface temperature with a coefficient of determination R^2=0.5 and an It was also observed that there is a significant relationship between the land surface temperature and the temperature measured in the field with a determination coefficient R^2=0.6.

Keywords:. Thermal band, Emissivity, soil temperature , soil moisture
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التغاير المكاني للحرارة المنبعثة من سطح الارض في تحديد صفات الترب الصحراوية في بادية السماوة باستعمال نظم المعلومات الجغرافية

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المستخلص:

تهدف الدراسة الي معرفة التغاير في درجة حرارة السطح الارض مع بعض صفات الترب الصحراوية في بادية السماوة محافظة المثنى ووضع الحلول والمعالجات من خلال تحديد العوامل والمؤشرات التي لها علاقه مباشرة بالتصحر بالاعتماد على استعمال نظم المعلومات الجغرافية لرسم خرائط التوزيع المكاني. وبناء على ذلك اختيار بعض الخصائص الفيزيائية والكيميائية. وقد لوحظ وجود علاقة احصائية بين LST وبين الصفات الفيزيائية حيث تبين مقارنة محتوى الرمل ومحتوى الغرين مع درجة حرارة سطح الارض LST تبين وجود علاقة معنوية بمعامل تحديد R^2=0.6. بالنسبة للصفات الكيميائية بينت النتائج وجود علاقة معنوية بين الايصالية الكهربائية مع حرارة سطح الارض بمعامل تحديد R^2=0.5 كما لوحظ وجود علاقة معنوية بين حرارة سطح الارض وبين الحرارة المقاسة بالحقل بمعامل تحديد R^2=0.6.

الكلمات المفتاحية: الحزم الحرارية، الانبعاثية، حرارة التربة ،رطوبة التربة
جزء من رسالة ماجستير للباحث الاول

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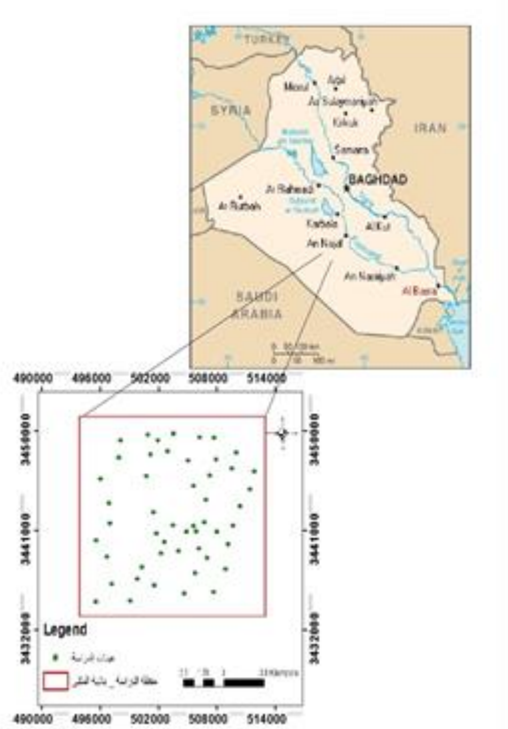
INTRODUCTION

The arable lands are one of the main natural resources with a limited area on which agricultural production depends in the country's economy. To preserve this resource for future generations, it is necessary to apply modern scientific methods that help increase the productivity of the land unit of agricultural crops and protect it from the impact of some manifestations of desertification as a result of the use of poor management methods used by its users for various purposes indicated that desertification is a serious global environmental problem that directly affects many people in countries with semi-arid or arid climates (25). Therefore, the causes of desertification are diverse and complex, including economic activities and practices of land use. Desertification also results in a decrease in the productive capacity of the land and a decrease in biodiversity (4). The simple correlation coefficients between the estimated soil properties and the studied physical characteristics when other soil properties we fixed (3). Desertification was also defined as the degradation of land in arid, semi-arid and semi-humid areas resulting from climatic changes and human activities, (1) indicated that soil degradation occurs as a result of one or more factors that reduce the productive capacity of the soil (quantitative and qualitative), and when the vegetation cover deteriorates, which ensures soil cohesion, thus the process of sustainable agricultural development needs advanced practical methods that help combat desertification. Abdullah, indicated that Iraq is one of the dry regional countries that faces the problems of deteriorating fertile agricultural lands and preserving lands from deterioration as a result of various uses and increased agricultural production, so many researchers were interested in studying the reasons for the deterioration of agricultural land and the preparation of various studies for its reclamation Talib .(22)explained the difference between the terms desert and desertification, as the word desert differs from desertification. The term "desert" refers to the barren or desolate place, which is one of the barren lands that lack trees or areas that have no plant life in them. Our country depends mainly on oil industry, therefore alternatives should be invented to use the available sources more efficiently and study desert areas which are very important as they cover large areas of Iraq. These desert areas include abandoned lands such as Al-Samawah desert. And due to the lack of studies and research on the issue of land degradation in Al-Muthanna Governorate /Al-Samawah desert, which requires shedding light on these areas and preparing studies to reclaim them in order to invest them in an optimal way to be a financial resource for the country in these bad conditions. When conducting a field visit to Al-Samawah desert, it was noted that it suffers from the lack of exploitation of its lands for agricultural purposes, which led to a comprehensive deterioration of the soil and vegetation cover, and water sources, the absence of a system for its reclamation and its exposure to difficult climatic conditions such as high temperatures and lack of rain. Therefore, the need has become necessary to prepare an assessment of different cases of desertification and degradation in Al-Samawah desert by using spectral indices to diagnose the causes of the deterioration and develop appropriate solutions to reclaim and use these lands and measuring their important indicators, namely, the land surface temperature (LST) and a guide to know the relationship between the land surface temperature great importance as an important means in following up on the state of deterioration:The study aims to know and monitor the desert soils in the Samawah desert through maps using geographic information systems.The relationship between LST and some properties of desert soils, and a comparison between the measurement soil temperature measuring the field with LST.

MATERIALS AND METHODS

Study Area: The study area was at the Muthanna Governorate, specifically in a part of the Samawah desert located in the northern section, with an area of (42042.72) hectares, bordered by Al-Rumaitha district, from the north-east by Al-Warka district, from the west by Al-Majd district, from the south-west by Al-Salman district, and from the south-east by Al-Khader district, located between the two circles Latitude 29° 03' 45"- 31° 03' 30"N and longitudes 44° 52' 30"- '46 59" 33° E as show in Figure (1)



Map No 1. The Study Area and the Locations of the Samples

Soil of the study area and natural vegetation: The quality of the soil in Al-Muthanna desert is a reflection of the natural conditions prevailing in arca, especially the climatic conditions that are characterized by low rainfall and high temperatures, which led to the soil not retaining a permanent vegetation cover as it has high permeability in its upper layers, while its lower layers has semi-high porosity, being gypsum or limestone layers, so the texture of the soil is not firm, as well as the lack of organic matter in it, which led to the disintegration of soil particles and lack of consolidation. as well as, surface was covered with sand and gravel of different sizes and rocks fragments, (6). There is a few count of plants in the study area, in a limited spread throughout the region, due to their relative importance, it is necessary to identify their types Monotropa, Colocynth, Schanginia, and Salmas. The area is characterized by the cultivation of some field crops such as wheat and barley in the winter season corn, and sorghum alfalfa and some vegetable crops such as spring potatoes. onions and sophistication in the summer season, and the cultivation of these crops is concentrated in flooded depressions to provide the appropriate environment due to its growth, especially the soil. The cultivated areas have reached 194,600 dunums in 2019. irrigating these areas depends on mechanical methods such as axial and fixed sprinklers and drip irrigation systems as well as through the prevailing surface irrigation. Most of the areas in the region are used for grazing purposes and constitute about 90% of the total area (5).

Satellite imagery: The satellite image of Landsat 8 satellite was downloaded from the official website of the USGS on 20/10/2021. The satellite imagery of the satellite provides eleven spectral bands with different spatial discrimination capabilities, as the spectral range was (1,2,3,4,5,6,7,9) with resolution (30*30)m and the 8thbund with a spectral resolution of (15*15)m and “10.11” range with resolution accuracy (100*100)m band 10 and 11 were used in calculating the spectral index of LST and belonging to Landsat 8 (10,11).the visual interpretation was carried out by the Arc GIS V 10.3.

Field work: Field visits were made to the area for the study, where a survey was conducted for the selected team through the gird soil survey method through 50 auger holes and soil samples were taken on 10/20/2021, and by Auger 50 samples were taken superficially and in the form of three location. The field temperature of the soil was measured using a mercurial thermometer due to. Soil survey division staff, (21). soil samples were obtained representing each horizon, and they were numbered and placed in plastic bags, then dried and transferred to the laboratory for the purpose of determining some chemical and physical properties.

Land Surface Temperature (LST)Was Measure Due To:

TOA (L) = ML * Qcal + AL

BT = (K2 / (ln (K1 / L) + 1)) − 273.15

NDVI=(Band5–Band4)/(Band5+Band 4)

Pv = Square ((NDVI – NDVI min) / (NDVI max – NDVI min))

LSE = 0.004 * Pv + 0.986

LST = (BT / (1 + (0.00115 * BT / 1.4388)*Ln(LSE)))

TOA= Spectral radiation from the atmosphere

ML = A factor that you count the range multiplier from the metadata

QCAL=A value dependent on the tenth temperature range in the OLI . sensor data
AL = Incremental rescaling factor for range from metadata
BT=Conversion of spectral radiation from atmosphere to temperature due to brightness
NDVI=the normalized difference vegetation indix
LSE= Earth's surface emission
BT= radiation temperature
W =Wavelength reflectivity(11.5 µm)
LST= land surface temperature

RESULTS AND DISCUSSION

Characteristics of some physical characteristic: Particle size distribution: The results of the mechanical analysis of surface soil samples, which are shown in Table Abdullah ,(1), indicated that the textures of the soils were coarse-and medium generally. It is noted that the sand content is high throughout the study area compared to the content of clay and silt, and the sand content ranged between 426-876 gkg^{-1}, while the silt content ranged between 44-344 gkg^{-1}, clay content between 12-290 gkg^{-1}. The reason for the high content of sand compared to the content of clay and silt is due to the nature of sedimentation taking place in the desert study area. These soils are desert that originated from ancient marine sediments of the bottoms of the ancient Tethys Sea, which covered most of the study area, as well as the wind deposits in which (20, 9,5). Figure (2) shows the spatial variation in the content of soil texture. It is noted from it that the clay content showed the least spatial variation compared to the content of sand and silt, the sandy loam texture was dominant compared to the other textures by 51.49% with an area of 21650.23 hectares. This category represents the locations of the samples that are located within the areas of the general slope of the region, during which the separates are transmitted by rain and torrential water, as well as the winds that atomize them to other areas. The reason for the predominance of the sandy loam is attributed to the nature of sedimentation in the study area and that most of the soil textures in the study area were coarse and medium textures, where the content of the sandy loam increases compared to the fine separated, which is clay, which is reflected in the heterogeneity in the content of both, on the spatial distribution map due to the capacity of the sand and silt content range compared to the clay content. The results shown in Table (1) show that there are five types of soil textures prevalent in the study area, which included, Sandy Clay Loam, Silt Loam, loam, Loamy sand, and Sandy loam. Figure (2) shows a map of soil textures in the study area.

Table1. Classes and areas of tissues and percentage

N	Soil Texture	Area H	%
1	Silt loam	2311.04	5.49
2	Sandy loam	21650.23	51.49
3	Sandy clay loam	1040.78	2.47
4	Loamy sand	8632.89	20.53
5	loam	8407.81	19.99

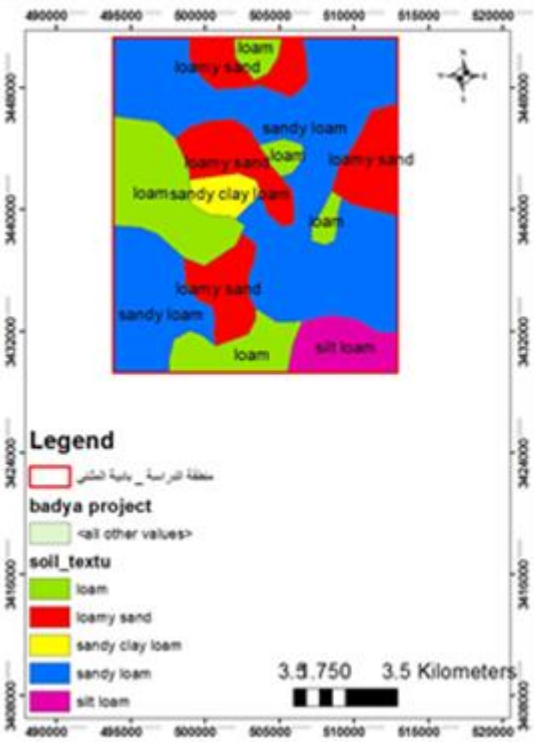


Fig2. Spatial distribution of soil texture

The bulk density: Table (2) shows the values of the bulk density of the study area in general, which ranged between 1.33-1.62 Mgm^{-3}. Although all the samples of the study area were generally of coarse texture, the decrease in the value of the bulk density was due to the nature of the land use for that site. A significant decrease in the value of the bulk density in the study area is due to the high percentage of gypsum, that was positively reflected on the values of the bulk density. It was found here that the variety from 1.45-1.51 Mgm^{-3} is the most dominant variety by 45% and with an area of 19227.15 hectares. The reason for the high percentage of gypsum is the predominance of coarse-grained, which led to a decrease in these values, while an increase in the values of bulk density is observed in the areas of lands that have not been cultivated and reclaimed so far, and because of the predominance of coarse-grained in them led to a rise in the values of bulk density Stolf (29,12). Figure (3) shows the spatial variation of bulk density values for the soils of the study area.

Table2.Classes and areas of bulk density and percentage

N	Pb (Mgm^{-3})	Area H	%
1	1.33-1.4	2262.02	5.38
2	1.4-1.45	16479.63	39.19
3	1.45-1.51	19227.15	45.73
4	1.51-1.56	3798.72	9.03
5	1.56-1.62	275.23	0.6

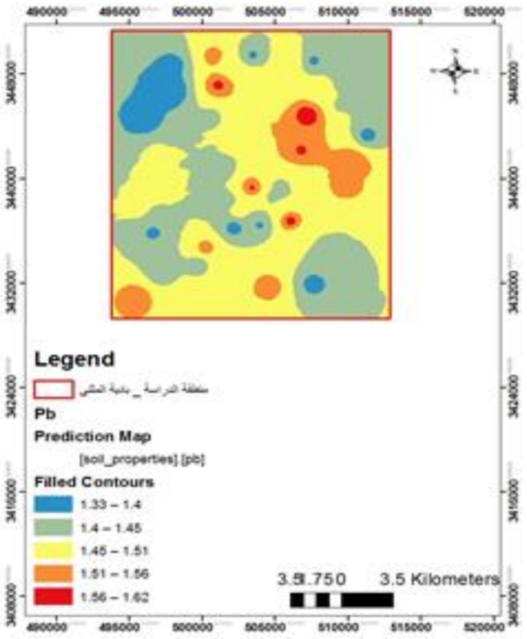


Fig3. Spatial distribution of bulk density

Soil Chemical Properties

Soil salinity in terms of the electrical conductivity: Table (3) shows the values of the chemical properties of the soil, as the electrical conductivity values of the saturated paste extract ranged between 1.30 - 21.5 $dsi.m^{-1}$, where the highest value was in the unexploited agricultural soils that were left in the lands within the low areas, consequently, the water collected in it and evaporated due to the high temperatures in the summer, which leads to the formation of white salt layers on the surface of the soil as a result of the accumulation of salt in it throughout the wet and dry climatic cycles And flood seasons, which helped greatly to accumulate additional quantities of salt. Soil salinity was classified according to the values proposed by the American Salinity Laboratory. The class of salinity ranged from 8-16 $dsi.m^{-1}$ was the most prevalent, followed by the slightly saline soil with values ranging by between 4-8 $dsi.m^{-1}$, while there was very little appearance of the two types of salinity highly effected and unaffected soils. In general, the soils of desert areas have a weak effect on salt due to the weakness of this process in contributing to the salinization process due to the absence of the main factor in its accumulation, which is water, and the soils of desert areas have a high potential for exploitation when water is available and this was confirmed by (16, 13, 19).

Table3. Classes and areas of electrical conductivity and percentage

N	Class	EC ($dsi.m^{-1}$)	Area H	%
1	Very Slightly	1.3-4	16362.6	38.91
2	Slightly	4-8	21084.2	14.50
3	Moderately	8.16	4107.5	9.7
4	Strongly	16-21.5	488.3	1.16

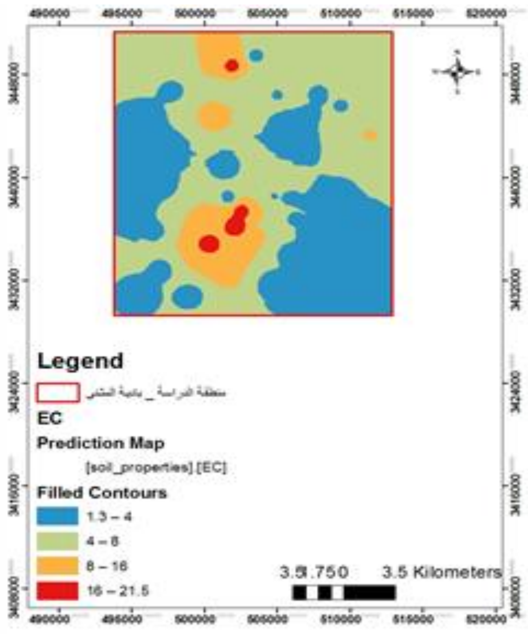


Fig4. Spatial distribution of electrical conductivity

The Soil of reaction pH: Soil reaction values ranged between 7.02-7.77 in the soils of the study area the result Table (4). that the low values were because it can be said that most of the soil reaction values ranged between the ranges of values for limestone soils that fall within the range of soils that inclined to alkaline due to the abundance of calcium carbonate in the soil, Figure (5) shows the spatial distribution of the soil, and it is noted that the dominant variety was with the range 7.2-7.3, with a percentage of 35.24%, and an area of 14819.11 hectares. Soil organizational structure, if the latter is often associated with the fine separates and its content of active calcium, on the contrary in the coarse separates, where most of the particles are inactive and torpid due to their large size (11).

Table 4. Classes and areas of pH and percentage

N	Class	pH	Area H	%
1	PH1	7.02-7.2	5560.77	13.22
2	PH2	7.2-7.3	14819.11	35.24
3	PH3	7.3-7.4	12457.14	29.62
4	PH4	7.4-7.5	7501.02	17.84
	PH5	7.5-7.7	1704.71	4.05

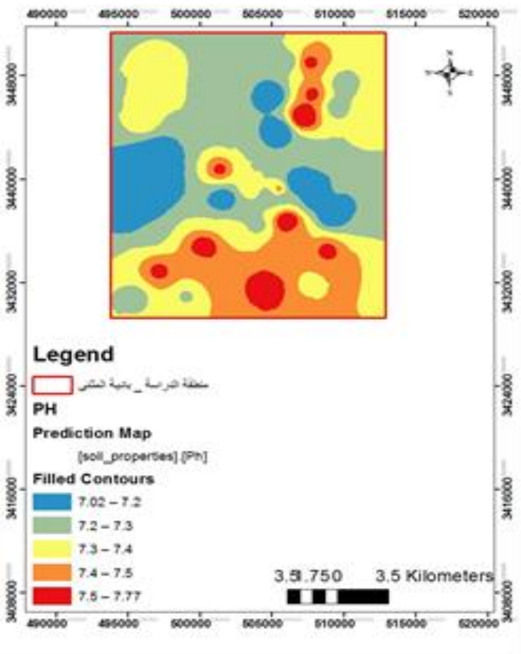


Fig5.Spatial distribution pH

Organic Matter O.M: Table (5) shows the values of soil content of organic matter, as it ranged between 2.10-8.60 g/kg^{-1} as the values were low for this trait. The reason for the decrease in soil content in this component in the study area is due to the lack of vegetation cover, the decomposition of organic matter, as well as the variation in temperature and its effect on organic matter, leads to a decrease in its content in the soil Al-jubouri and Aldayni (10,7). Figure (6) shows the spatial distribution of the types of organic matter. As most of the soils of the central and southern regions are considered poorly developed, due to the nature of the environmental factors that do not help the increase in the activity of excrement and genetic processes. The development in the soil of the region as a result of the presence of gypsum and lime horizons is mainly due to the nature of sedimentation that the region was exposed to (7). The dominant type is 4.6-6.5 with a percentage of 49.79% and an area of 20936.77 hectares, and the lowest type is 7.77-8.6 with a percentage of 0.23% with an area of 98.23 hectares. The high temperatures, which lead to the oxidation of organic matter and its rapid decomposition and its loss from the soil, and due to that there is a decrease in the percentage of organic matter in the dry and semi-arid areas, and this phenomenon is common in the soils of arid areas.

Table5. Classes and areas of organic matter and percentage

N	Class	OM g kg-1	Area H	%
1	O.M1	4.1-2.1	12507.12	29.74
2	O.M2	4.6-4.1	8025.97	19.09
3	O.M3	6.5-4.6	20936.77	949.7
4	O.M4	7.77-6.5	474.64	1.12
5	O.M5	8.6-7.77	98.23	0.23

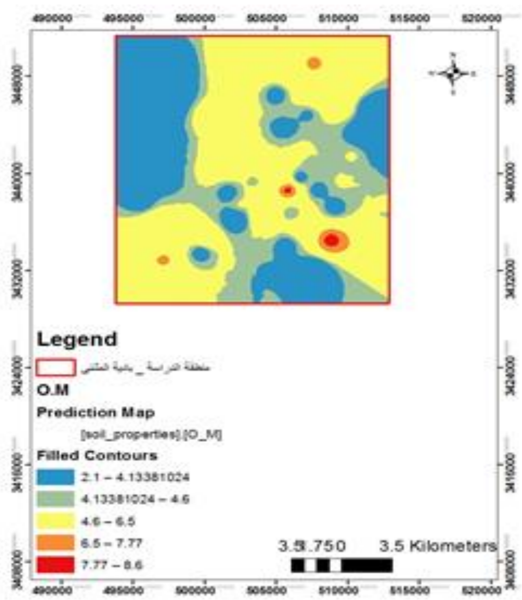


Fig.6 Spatial distribution of organic matter

Soil content of calcium carbonate CaCo3: Table (6) shows the values of soil content of carbonate minerals, as it ranged between 228.10-334.80 g/kg^{-1}. These soils have a high content of carbonate minerals due to the nature of the composition and the prevailing climate in the region, which helps to accumulate compounds Carbonate minerals in soil (10, 22, 26). Figure (7) shows the spatial distribution of the content of carbonate minerals in the soil, as it is noted that the content of 250-308- g/kg^{-1} was the most prevalent in the study area with a percentage of 81.10% and an area of 34097.83 hectares and that the content 330-334.8 is the least present with a percentage of 0.15 with an area of 63.78 hectares. The high carbonate content of the region is consistent with what the latter indicated that the Iraqi soils are high in carbonates, and calcium compounds. Calcium carbonate plays a major role in controlling the regulatory capacity of limestone soils in general and the degree of interaction in them in particular, and this is reflected. As we mentioned earlier that soil reaction values were maintained in a range that tends to alkalinity without the development of alkaline conditions in it. (10)

Table6 .Classes and areas of carbonate minerals content and percentage

N	Class	Caco3 g kg-1	Area H	%
1	Ca1	288.1-250	5165.9	12.28
2	Ca2	250-308	34097.8	81.10
3	Ca3	308-330	2715.1	6.45
4	Ca4	330-334.8	63.7	0.15

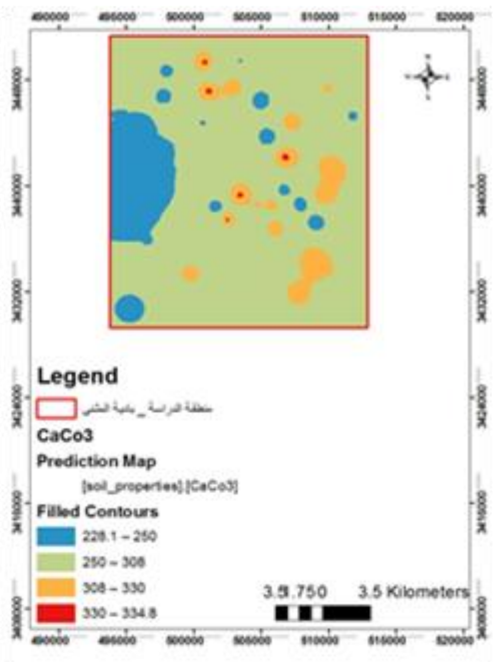


Fig7. Spatial distribution of calcium carbonate

Gypsum: Table (7) shows the values of soil content of water calcium sulphate (gypsum), as it ranged between .214 - .953 g/kg^{-1}. These values indicate that most of the soils fall within the framework of calcareous gypsum soils. The reason is due to the nature of the original materials in the soil of the study area, which consists of gypsum and calcareous rocks together, as well as the secondary deposition of gypsum from the soil solution, which occurred during ancient geological periods, and this was indicated by, (15,9,17). Figure (8) shows the spatial distribution of gypsum content in the soils of the study area, as it is noted that the type with a range of 330-460 g/kg^{-1} was the most prevalent in the surface horizons of the soil by 36.39% with an area of 15299.57 hectares. The content of gypsum in the soil affects the nature of land uses, especially in the application of soil administrative procedures when planting crops, as irrigation and water use lead to a redistribution of this compound in the soil due to the high solubility of gypsum compared to carbonate minerals compounds, so gypsum areas need special management.

Table 7. Classes and areas of gypsum content and percentage

N	Class	Gypsum g kg-1	Area H	%
1	G1	214-245	318.58	0.7
2	G2	245-265	1058.48	2.5
3	G3	265-290	2732.26	6.4
4	G4	290-330	5882.97	13.9
5	G5	330-460	15299.5	36.3
6	G6	460-570	10197.2	24.2
7	G7	570-730	5212.68	12.3
8	G8	730-952	1340.90	3.1

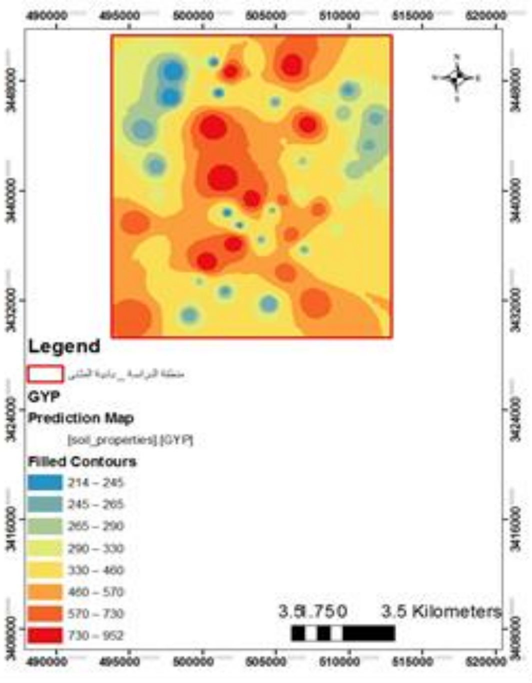


Fig8. Spatial distribution of gypsum content characteristic

Exchangeable Sodium Percentage "ESP": Table (8) shows the values of soil content of the percentage of exchanged sodium in the soil of the study area It is noticeable from the results that range from 2.82-11.58, where the two values recorded a rise in the percentage of sodium and the reason is due to the variation in the values of soil salinity in the main degree and the accompanying accumulation of sodium in the soil (14). The dominance was for the class 4-5.4 by a percentage of 46.22% and an area of 19434.42 hectares. The lowest percentage was for class 7.4-11 with a percentage of 4.98% and an area of 2093.97 hectares. Figure (9) represents the distribution of the balanced average of the exchange rate of sodium in the soil of the region. It is clear that these percentages are high due to the existence of a positive and highly significant correlation between soil salinity and the percentage of exchanged sodium. Most soils are gypsum and saline because their salt content is higher than 50 dsi and the percentage of exchanged sodium did not exceed 15% according to the classification of the American Salinity Laboratory. As a result of the high content of bivalent components (calcium and magnesium) while sodium is lower by the percentage values of exchanged sodium. As for the high values of this characteristic, they indicate a high sodium content in those soils, although it is not considered alkaline, since the reaction degree values are less than 8.5, in addition to the high content of calcium carbonate in the soil, which prevents the salinization from moving towards the alkaline direction. These results agreed with the results of researchers, namely Al-aqidi and Al-bayati (4,6).

Table 8. Classes and areas of exchanged sodium and percentage

N	Class	ESP %	Area H	%
1	ESP1	2.8-3.6	5919.50	14.07
2	ESP2	3.6-4	7783.32	18.5
3	ESP3	4-5.4	19434.42	46.22
4	ESP4	5.4-7.4	6811.52	16.2
5	ESP5	7.4-11.5	2093.97	4.98

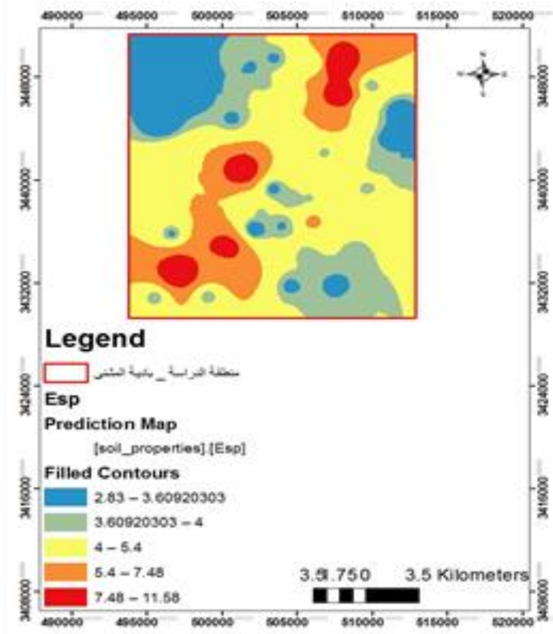


Fig9.Spatial distribution of the characteristic of the proportion of exchanged sodium

Land Surface Temperature (LST): To show the difference in Land Surface Temperature within the study area, the LST index was used and calculated according to equations (1,2,3,4,5) and the method described by (22). Location ally or chronologically, the temperature in the tenth month of 2021 ranged from 28.9-38.4 degrees. A grid of points was made within the ArcGIS 10.8 program in order to study the correlation between physical and chemical characteristics in order to know the relationship between them and the rest of the spectral evidence. It was found that the prevailing temperature is high to medium, because the study area is a desert area and exposed to the sun's rays, so it is high in the summer compared to the winter.=

Table 9. Classes and Areas of heat and percentage

N	Class	LST	Area H	%
1	LST 1	28.9-30	29.29	0.06
2	LST 2	30-33	1518.32	3.6
3	LST 3	33-35	4751.58	11.3
4	LST 4	35-38.84	35743.55	85.01

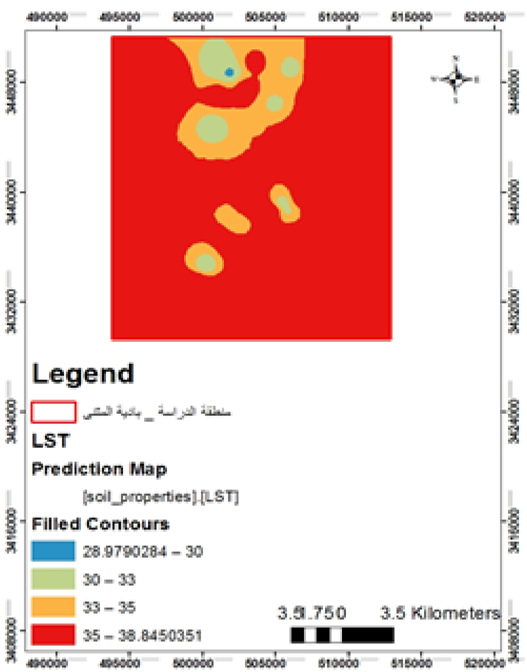


Fig10. Spatial Distribution of Earth's Surface Temperature (LST)

Relationship between LST and Humidity: The correlation between LST and NDVI is strongly negative, which indicates vegetation can relieve the effects of LST to some extent(22,17). Figure (11) shows the relationship between the land surface temperature "LST" calculated from the satellite images and the soil moisture measured in the field. The results showed that there is a significant inverse relationship with a polynomial of the third degree with a determination coefficient of 0.4. The increase in the and surface temperature led to a decrease in soil moisture due to the increase in evaporation processes, especially in the soils of dry and semi-arid areas and the absence of vegetative cover in them, as confirmed by (2).

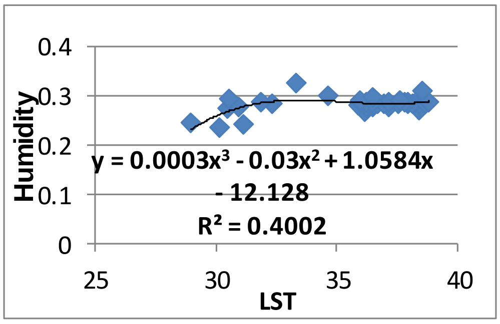


Fig11. The linear relationship of the spatial distribution (LST) and field humidity

The relationship between Land Surface Temperature "LST" and temperature: Figure (12) shows the relationship between the land surface temperature "LST" calculated from the satellite images and soil temperature as in Appendix, (2). The figure is that the relationship was a polynomial of the second degree with a correlation coefficient of 0.67. In fact, the increase in the air temperature and thus the surface temperature increases the degree of soil tenacity in general as a result of the influence of the surrounding climate on the microclimate of the soil itself, and this is in accordance with what was found by (21).

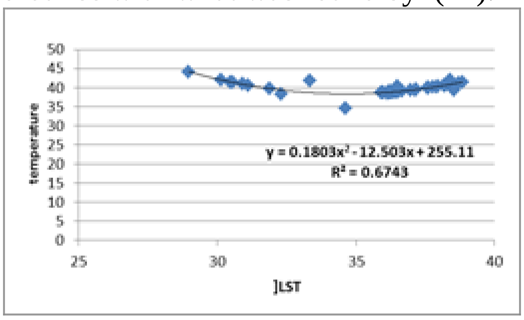


Fig12.The linear relationship of the spatial distribution (LST) field temperature

The relationship between the land surface temperature and the organic matter: Figure (13) shows the relationship between the land surface temperature calculated from satellite visualizations and organic matter. The results showed that there is an insignificant,logarithmicrelationship with a determination coefficient of 0.1. The decrease in the percentage of organic matter in the dry and semi-arid areas is due to high temperatures and oxidation of organic matter, this phenomenon is common in the soils of arid regions.

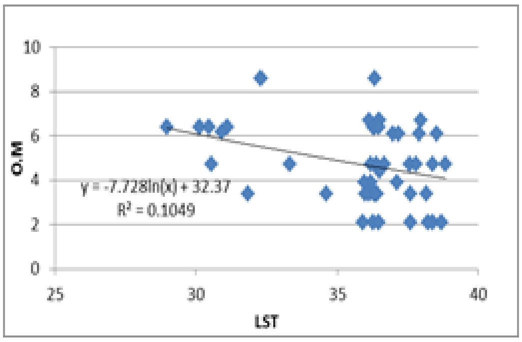


Fig13. The linear relationship of the spatial distribution (LST) organic matter

The relationship between the land surface temperature and the degree of interaction: Figure (14) shows the relationship between the land surface temperature calculated from satellite visualizations (LST) and the degree of interaction. The results showed that there is an insignificant relationship of the second degree with a determination coefficient of 0.02 where it was found that the higher the land surface temperature, the lower the degree of reaction due to the increase in salts, which affects the degree of reaction as he found.

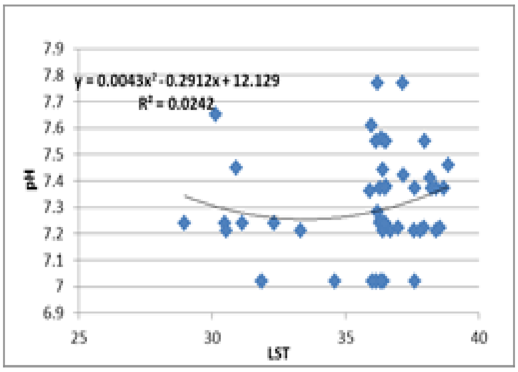


Fig14. The linear relationship of the, spatial ,distribution(LST)the degree, of interaction

The relationship between the land surface temperature and calcium carbonate: Figure (15) shows the relationship between the land surface temperature calculated from satellite images and calcium carbonate. The results showed that there is an insignificant relationship of the second degree with a coefficient of determination of 0.01 because all the study area has a high calcium carbonate content.

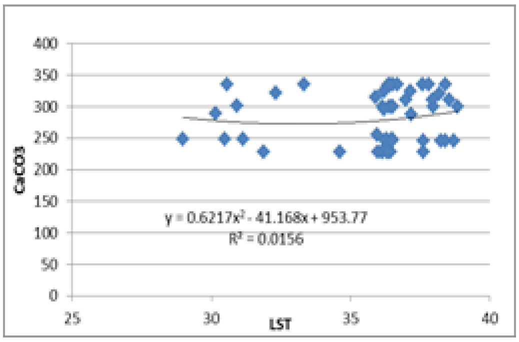


Fig15. The linear relationship of the spatial distribution (LST) calcium carbonate

The relationship between the land surface temperature and gypsum: Figure (16) shows the relationship between the land surface temperature calculated from satellite visualizations and gypsum. The results showed that there is an insignificant logarithmic weak relationship with determination coefficient of 0.1, because the higher the temperature, the greater the sedimentation processes, including gypsum.

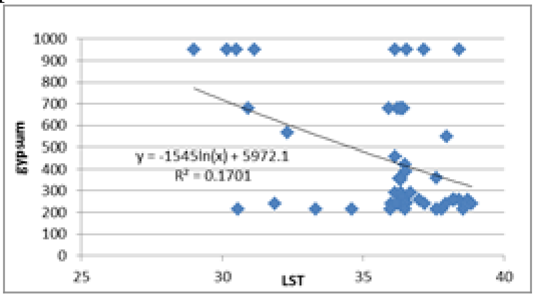


Fig16. The linear relationship of the spatial distribution (LST) gypsum

The relationship between the land surface temperature and the exchanged sodium: Figure (17) shows the relationship between the land surface temperature calculated from satellite visualizations and the proportion of exchanged sodium. The results showed that there is an insignificant relationship of the second degree with determination coefficient of 0.002, because of the increase in temperature, the salts in the soil increase and thus increase on the exchanged sodium.

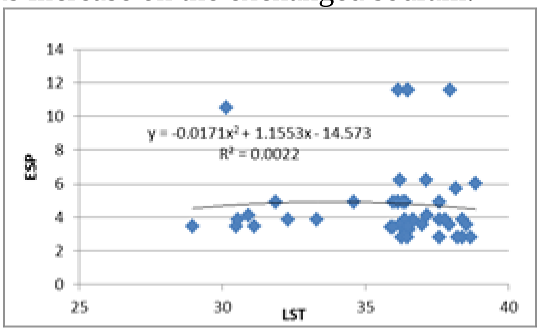


Fig17.The linear relationship of the spatial distribution (LST) exchanged sodium

The relationship between the land surface temperature and the proportion of sand: Figure (18) shows the relationship between the land surface temperature calculated from satellite visualizations and the proportion of sand in the soil. The results showed that there is a significant relationship of the second degree with determination coefficient of 0.6, because the high sand content indicates an increase in quartz minerals and other minerals that reflect the falling ray to the air surrounding the soil and thus raise its temperature.

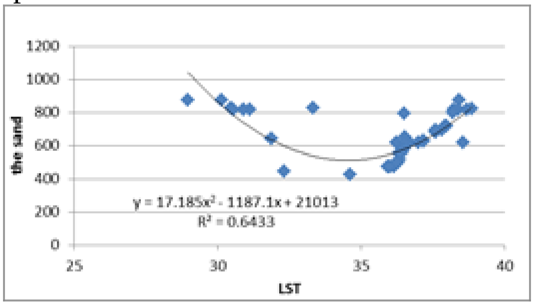


Fig18. The linear relationship of the spatial distribution (LST) the proportion of sand

The relationship between the land surface temperature and the proportion of silt: Figure (19) shows the relationship between the land surface temperature calculated from satellite visualizations and the proportion of silt in the soil. The results showed that there is a significant relationship of the second degree with a determination coefficient of 0.6. Thus, the amount of reflected radiation from the incident to the air surrounding the soil decreases aljuraysi.(39)

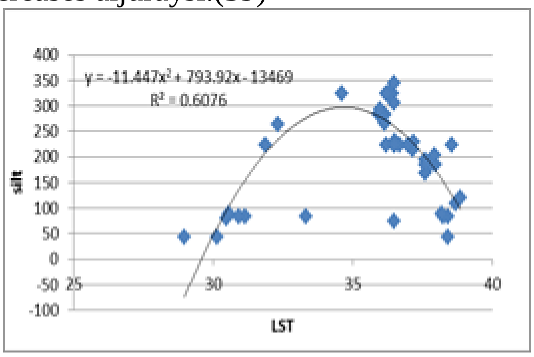


Fig19. The linear relationship of the spatial distribution(LST) the proportion of silt

The relationship between the land surface temperature and the proportion of clay: Figure (20) shows the relationship between the land surface temperature calculated from satellite visualizations and the proportion of clay in the soil. The results showed that there is an insignificant relationship of the second degree with a determination coefficient of 0.2, because the clay content is low and the common soil is coarse texture .

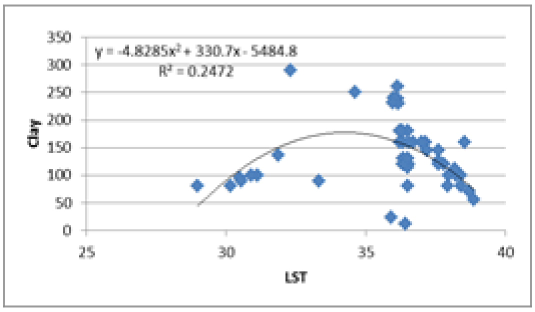


Fig20. The linear relationship of the spatial distribution(LST) the proportion of clay

The relationship between Land Surface Temperature "LST" and soil salinity: Figure(21) shows, the, relationship between Land Surface Temperature "LST" calculated from satellite visualizations and the electrical conductivity of the saturated paste extract. The results showed that there is a significant polynomial relationship of the second degree with a determination coefficient of 0.53. The increasing the surface temperature leads to an increase in evaporation processes and thus an increase in the salt concentration. Although some salts lead to an increase in moisture that is not available to the plant by the accumulated saline compounds .

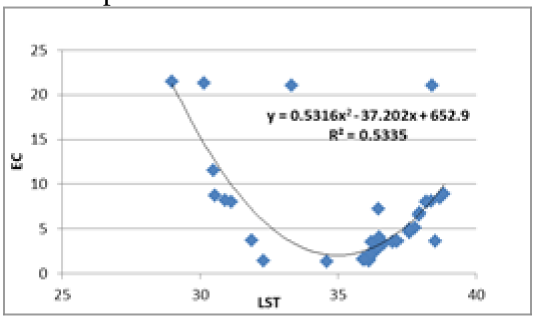


Fig21. The linear relationship of the spatial distribution(LST) soil salinity

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