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## The Spatial Analysis for *Bassia eriophora* (Schrud.) Asch. Plant Distributed in all IRAQ by Using RS & GIS Techniques

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### Abstract:

Most vegetation's are Land cover (LC) for the globe, and there is an increased attention to plants since they represent an element of balance to natural ecology and maintain the natural balance of rapid changes due to systematic and random human uses, including the subject of the current study (*Bassia eriophora*) Which represent an essential part of the United Nations system for land cover classification (LCCS), developed by the World Food Organization (FAO) and the world Organization for environmental program (UNEP), to observe basic environmental elements with modern techniques. Although this plant is distributed all over Iraq, we found that this plant exists primarily in the middle and southern parts of Iraq in wet areas and near rivers or catchment area or water basins. The main idea is how to use this techniques to monitor the distribution of the plants (*Bassia eriophora*), in order to utilize and take provisions of plant growth and diffusion, Moreover, know and control the breadth of these areas in Iraq and prepare for them, and understanding climates and the variable plantation habitats and mapping patterns, may lead to a successful environmental protection and dominance plan. In this study, monitoring the distribution of *Bassia eriophora* in Iraq by apply remote sensing (RS) and geographic information systems (GIS) techniques. The data was obtained from (BAG) National Herbarium of Iraq, Ministry of Agriculture. (BUNH) Iraq Natural History Research Centre and Museum, University of Baghdad the University Herbarium (BUH) in College of Science at University of Baghdad. This data contains only the address (place of germination), this information (addresses) was detected, identified and covered for all areas sampled by the techniques of satellite imagery and images taken from the air and some data records where the main features of these areas.

**Key words:** *Bassia eriophora* plant, HotSpot Techniques, Plant Distributions, RS & GIS Techniques, Spatial Analysis.

### Introduction:

The spatial data acquired at variable times help us analyses and manage grass and plant resource s for land cover changes consequently the flora distribution, (1). The multi spectral data using temporal periodic data are used effectively to monitor natural resources of plantations. GIS have sufficient power and assessment of data and Land-cover analysis interpretation for spatial data mapping. Land Cover portray the physical features in term of natural environment of earth's surface such as (plants, grass, flora, soils type, and groundwater).

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The planning plays an important role in Land cover to monitor and detect the changes, Remote Sensing (RS) and geographic information system (GIS) allow spatial analysis with statistical methods approach related to conservation and sustainable management of ecosystems. Aerial photography has been used to determine the spatial location of plants.. Recently, applications of remote sensing have been primarily in plant sciences for example vegetation classification, crop monitoring, land range, mapping patterns of different forests, agricultural lands and disease detection in any crop. GIS helps in remote sensing database, monitoring and assessing the natural resources of both tempo-spatial scales.

There has been a worldwide concern due to present state of local and global environmental conditions. A key to elucidating the mechanisms through which biological diversity generates services to humans is the concept of ecosystem functions, (2).

The primarily key to global conservation is the mapping of biodiversity to pinpoint the hotspots effort, such as trees, plant species, bird habitats, butterfly fields and higher mammal regions are easy to monitor and also represent biodiversity (3). They offer knowledge to ecosystem function, which includes monitoring, inventory and ecology. Most of the plants have direct or indirect relationship with their habitat, depending on several factors they acquire for place, water, wet, climate and soil availability. Their preference of habitat due to the criteria of factors were investigated by sampling *Bassia eriophora* in diverse habitats along with mapping the flora by using remote sensing and GIS to supply a detailed idea of the distribution of *Bassia eriophora* plant and offer changes in patterns with habitat.

through spatial analysis and using advanced techniques in data collection such as geometric distribution presence and intensity of plant areas and locate this plant in accordance with the latest precision devices of GPS related Earth satellites, to determine the best areas of distribution and preserve green spaces of land cover and direct impact on environmental conservation.

### Study Area Description

Iraq is situated between latitudes 29° and 38° N, and longitudes 38° and 49° E (the top and bottom photomapping geocoordinates are 37°22'17'' N, 38°48'33''E, and right at 38°06'10''N, 48°36'15''E). The surface area of Iraq is 438,317 km<sup>2</sup>, it is status in the world 58th largest country, show Fig 1.

The aim of the research is to determine the distribution of *Bassia eriophora* plant in Iraq

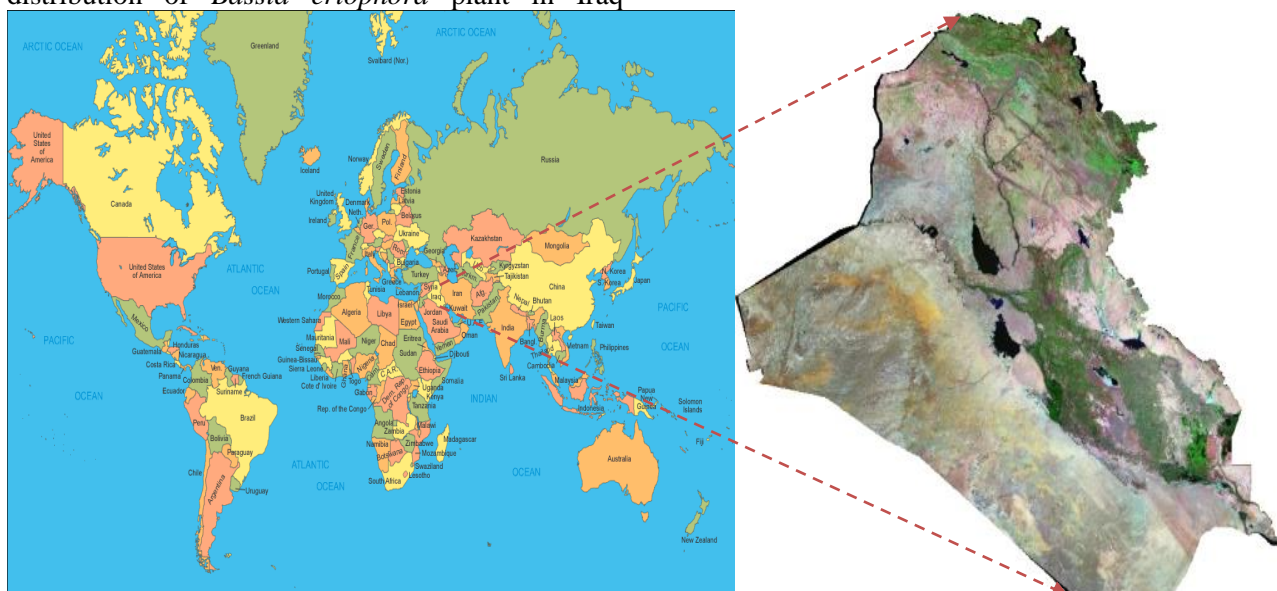


Figure 1. Illustration, the Study Area of Iraq.

Generally, Iraq's climate is variable being hot and dry through summer season and cool and wet through winter season. Iraqi climate is actually affected by its location between tropical drought of the Arabian Desert regions and the tropical humidity of Basra Gulf.

In January the weather is coldest and the temperature fluctuate from 4°C to 20°C in the day, and during night sometime reaches below zero. August is the hottest month with temperatures rising up to 40°C and more, show Fig 2, in most of the areas, summers season, (4).

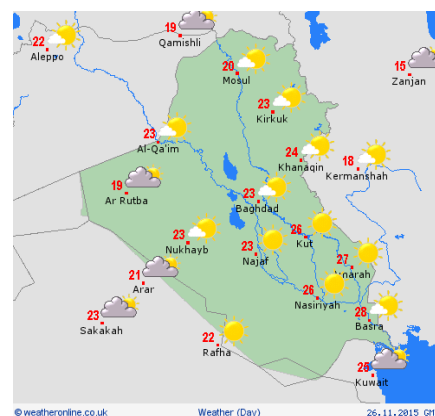


Figure 2. Illustrating, the climate state at Iraq are the temperature degree and weather pictorial.

In Iraq, summer season is middle hot and change to high hot rapidly, the days are sunny, the humidity is very high in the southern region beside coastal bar region of Basra Gulf, the temperatures is very hot; most days temperatures may reach above 40°C or

more. The desert area is very hot in day and cool at night which causes a danger due to heat exhaustion sand. Sometimes, the winds can be very strong associated with Hot and dry, it can cause violent sandstorms, show Fig 3.

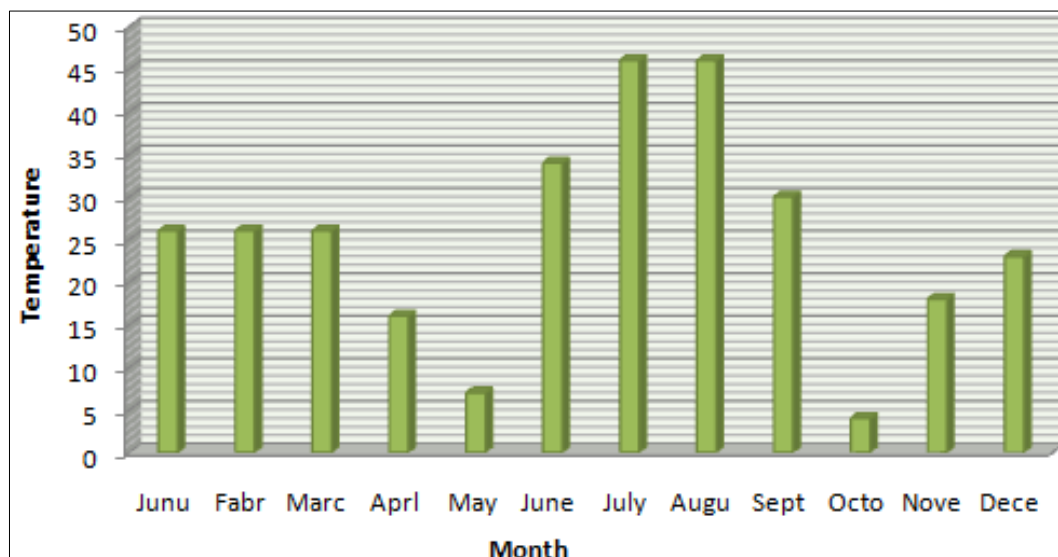


Figure 3. Temperatur level of Iraq, periodically is 25 years.

Most of the average rainfall in Iraq is between November and April, with no rainfall between, June to August. The average Rainfall quantity varies from season to season, also from year to year. And huge rainfalls in winter or spring season causes flood, stream flow precipitation causes sometime shift of river shoulders in winter because of erosion in the Bank Rivers and creeks.

#### Classification of Koeppen- Geiger

Iraq is located in three different climatology zones. The first one is the western and south-western regions categorized as BWH Climate; it is a hot, dry desert climate with annual average temperatures above 20°C. Second small part (continental shelf) between the Basra Gulf extended to the Turkish Border in the north east of Iraq can be categorized as BSh climate; it is moderately humid climate with an average annual Temperatures above 16 C°. The third part, the mountain regions are in northern of Iraq, It can be categorized as DSA Climate, it is a cold and snowy climate with moderate summers, and wet through winters with the warmest month over 16 C° and the temperatures decline to below 0°C.

#### Bassia eriophora Plant Description

The plant information of Bassia eriophora mentioned specifications according to Annual herb, fleecy-villose ,erect ascending about 5-25 cm, and branches from base, stem and branches generally

enveloped with soft hairs, the axils of flowering region contains the dense cotton ball-like growth from the perianth, Leaves are small, flat, and sessile or very short petiole. It is linear-oblong to lanceolate-ovate or elliptic, ± fleshy, entire, 5-20 x 2-4 mm and abruptly narrowed towards base. Acute to obtuse, pubescent especially beneath and on the margins. Bracts soon deciduous and smaller than leaves circa. Flowering glomerulus like cotton balls, hidden in thick white fleece and densely spicate. Perianth is perfect flowers with broad lobes, one-fourth the length of tube, that of pistillate flowers shorter and subtruncate, enveloped especially at base with very long dense hairs. Fruiting perianth adherent to the fruit, rounded-oval, 1-2 mm long, like cotton-balls, with or without short protuberances at the back; seed c. 1-2 mm across, discoid, brown. Fl.Per.: March-June, (1, 5), The plant has industrial benefits created by IT NANOFIBRILS, which is friendly to low molecular decomposition environment, (6), The plant has been used for many medical purposes and has been used as a bactericidal and anti-oxidant, (7), Plant leaves were used to treat wounds in laboratory experiments conducted on albino rats, Pharmacogenetic and Wound Healing Studies of the Leaves of Bassia eriophora, (8).

The arial parts of the plant have been proven to be effective as antipyretic, antioxidant, antiallergic and renal diseases, (9).

**Bassia eriophora** shows fig 4.



Figure 4. *Bassia eriophora* Plant Family; Familia: Chenopodiaceae Subfamilia: Camphorosmoideae Genus: *Bassia* Species: *eriophora*.

## Material and Method:

### Remote Sensing and GIS Analysis

Remote sensing is important for data processing in the new exposure sciences. It is an acquisition of the data/information with some properties (mathematic or describe logic) for objects (features), phenomenon (annual) and material such as soil type, geological and plants by a computerized recording measurement device contact directly or not with the features by organized attribute file (tabulate) according to scientific discipline, (10). The field have comprehensive database files which can be manipulated, retrieved, processed, analyzed and visualized, the data collection were achieved by using satellite, aircraft, aerial photography and radiometry or optical properties detection sense energies and illumination of light technology designs.

The methodology for this study was directed toward producing a map of spectrally distinct topography according to Landsat Thematic Mapper (TM) data (Imagery) used for soil, water and vegetation mapping in the majority of state land cover only use mapping project for Iraq. The Thematic Mapper records reflected energy in three spectral bands BRG (Blue, Green, and Red), with a spatial resolution of 28 m. TM data of the study area produced for March 2002. The satellite data were georeferenced to The World Geodetic System (GCS-WGS-1984) which is a standard for use in cartography and coordinate system to match it with topographic maps of the region, (11).

The Microsoft Excel programming used for the grass laboratory samples with their coordinates

(Latitude and Longitude) field recording, and that is imported into GIS application in order to manipulate and analyses the spatial distribution of the (*Bassia eriophora*) parameters selected in the area, see Table 1.

In geographic information system (GIS) the data above were converted to layer (feature) mapping and determining wedge of point which represent *Bassia eriophora*, show Fig 5.

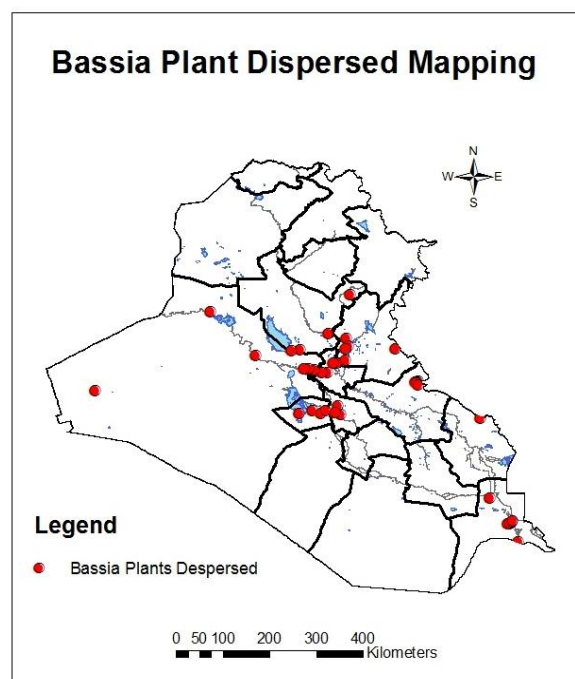


Figure 5. Illustration create feature layer in GIS applications and wedged samples.



**Table 1. Illustration, the example of location simulated Long.-Lat and (x-y axis) coordinates system and address for each spatial points.**

Plant Location Number	Plant Location Name	Long. (λ) Degree,	Lat. (φ) Degree,	UTM/X-Axis	UTM/Y-Axis
1	BAdra1	45.9556	33.1353	510484.97	5089123.27
2	BAdra2	45.9464	33.1076	508339.76	5088097.82
3	BAdra3	45.9118	33.1087	508430.26	5084253.69
4	BAdra4	45.9316	33.0859	506659.63	5086451.42
5	BAdra5	45.9628	33.0617	504780.77	5089916.18
6	HElla	44.4688	32.483	458877.74	4924073.54
7	MAhawell	44.4128	32.6639	473241.01	4917778.22
8	RaZaza	43.6671	32.5052	460108.69	4835018.39
9	EGHather	43.9312	32.5594	464634	4864330
10	KARballa1	44.0825	32.5181	461418	4881150
11	KARballa2	44.1853	32.5623	465017	4892550
12	KARballa3	44.3622	32.5323	462731	4912210
13	BAGHdad EAst1	44.2129	33.2894	523119	4895560
14	BAGHdad EAst2	44.1042	33.2894	523162	4883490
15	BAGHdad NORth1	44.3913	33.4817	538365	4915450
16	BAGHdad NORth2	44.3216	33.4817	538411	4907710
17	BAGHdad FALoja1	43.9537	33.3507	538139	4866790
18	BAGHdad FALoja2	43.8533	33.3591	528861	4855640
19	FALoja	43.7557	33.373	530027	4844810
20	THerthar1	43.6832	33.7298	558822	4836950
21	THerthar2	43.516	33.7187	558088	4818370
22	ANna	41.9587	34.4478	619982	4646200
23	AH3	39.7412	32.951	495801.62	4399034.74
24	Hiet	42.8259	33.628	551331.6	4741672.81
25	DYalla1	44.5863	33.9534	575681.32	4937437.28
26	DYalla2	44.6147	33.8004	563505.15	4940461.44
27	DYalla3	44.5624	33.743	559004	4934610
28	MAndly	45.5339	33.7445	558130	5042530
29	GHan BAni SAad	44.5601	33.5345	542448	4934220
30	DHloyiaa	44.2319	34.0443	583399	4898160
31	SLeman Beak	44.655	34.7912	642019	4946190
32	SAfwan	47.8973	30.0564	279995	5309080
33	SAVwaan1	47.6898	30.4006	341334	5245340
34	SAVwaan2	47.735	30.404	341334	5245340
35	SAVwaan3	47.7596	47.7596	306358	5292820
36	SAVwaan4	47.7585	30.4424	308331.89	5292627.08
37	SAVwaan5	47.7845	30.4571	309528.46	5295480.16
38	ALTeeb	47.1563	32.4247	456390.25	5222693.93
39	BAsra NAserea	47.3423	30.8995	341333.89	5245343.15

In this research, we review the work by using Geographic Information Systems (GIS) and spatial analysis techniques and methods in environmental field plants distribution. Spatial (geographers) biological and using geographic methods or statistical theory have a significant part in understanding the possibility of displaying course in spatial and time (spatio-temporal).

**Bassia eriophora Habitat and Distribution**

Distribution: Iraq, Egypt, Sinai, Palestine, Syria, Pakistan (Baluchistan), Iran and C.Asia. Distribution in Iraq: FPF (Persian Foothills territory), DLJ (Lower Jazeera territory), DWD (Western Desert territory), DSD (Southern Desert territory), LEA (Eastern Alluvial Plain territory) & LCA (Alluvial Central of Plain territory), (12). Habitat: Sandy and waste places, (13).

**Geostatistical Analysis**

Geostatistics designate to the compilation of statistical theory or methods in which geographic or location data (discrete area) or dataset (continuous area) plays an important role in the study area designed or data of spatial analysis, (14). Geostatistical analysis in Flora Distribution in relation to exploratory spatial data analysis and distributed mapping emergence. Exploratory spatial data analysis indicates the distribution of a propagation using geographic location data. HotSpot technique is one of the statistical methods used for Distribution layer mapping. Which individual or group of Geostatistical techniques to generate the variable value at none represented sample locations but based on the observations at known locations new portrait.

### HotSpot Mapping Techniques

One of the most common and innovative uses of flora mapping is to aggregate numerous into hotspot maps.

Hotspots represent special kind of clustered fashion. In hotspot mode, the objects have high similarity preference to point distance inside correlation in comparison to another, and they are quite dissimilar to all the objects outside the location.

The objects in the hotspot region are interesting compared with another points as densities. Hotspot detection is determining spatial data regions where existent points are present or more objects are appearing in comparison to other areas. Two types of Hotspots, point Hotspots called individual and second area Hotspots called global. The specific Hotspot maps will be aiding biologists in individualized situating plants resources investigation, (15), applying sensitive hotspot analysis discovered that the influence of these facilities on the plant distribution depends on the local level of plant, (16).

### Intensity (Inverse Distance Weighted (IDW))

The use of intensity value analysis (IVA) estimates the intensity of *Bassia eriophora* around, for example zones, Area, region, etc. The IVA often uses an inverse distance weighting performance to analyses the plants surrounding a location (i.e., IDW and kriging interpolation). This technique is similar to a buffer analysis. This technique requires an analyst to construct a buffer that extends a beforehand determined distance from the location under examination according to a distance termed a bandwidth and count the number of point events (*Bassia eriophora*) falling within that bandwidth, (17).

Different thematic maps (layers) can be generated for each parameters using Inverse Distance Weighted (IDW) interpolation technique in the Arc GIS application for instance (18).

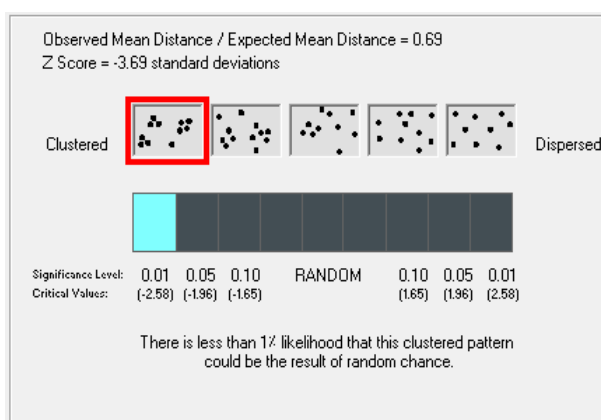
The interpretation (IDW) process is on spatial autocorrelation in an accurate manner.

A surface created with IDW in this process will not exceed the known value range or pass through any of the sample points. IDW is processing a good interpolator for environmental or phenomena, whose distribution is strength correlated with distance. One potential advantage of IDW procedure, that helps explicit control over the influence of distance, each parameter could be reclassified and converted into raster format by layer maps, (19) and (20).

### Results and Discussion:

#### Data Analysis

The target of Individual distribution maps can be developed for *Bassia eriophora* species to hold maintenance. In order to perform, the analyses process using ArcGIS 9.3 techniques and tool of Hot Spot Analysis ((Getis-Ord  $G_i^*$ ) method), can be compared with two cluster category dispersal identify local to global averages, generally the local pattern point (*Bassia eriophora*) is different, observed over the entire study area. The  $G_i^*$  statistic can applied to a continuous area of grid cell output from any local average compared to the global average. That can be tested, if a clusters dispersed, that is showing statistically significant and the value investigating confirm, show Fig 6.



**Figure 6. Illustration, distribution was cluster variety, Method of testing the type of distribution of study samples to select the optimal technique for the study and determine the presence of these samples or plant.**

In these tools, for testing if these are hot spots of point (*Bassia eriophora*) surrounding high rates instead of low rates, show Fig 7 and see Table 2.

Then, construction analysis depict, the layer containing the species of *Bassia eriophora* distribution on the map (Feature Class), in the field ( $G_i^*$ ) column contained to weight number of species in each points which Input Field register, and the new layer may be recording the results of the analysis that Output Feature Class registering, points spatial relationships, that can be based in harmony with the layer dataset for area analyzed taking into account the interaction existing points.

The weight value which can be used to analyses the point distance of the spatial analysis scale, that the results would have a substantial influence, this distance determined by the existing interrelation that can be estimated by threshold distance (bandwidth or sigma), here determined five kilometers, see Table 3.

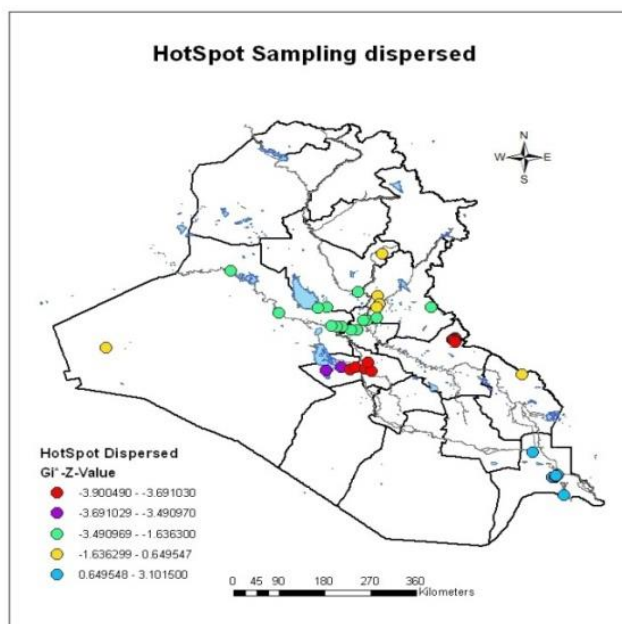


Figure 7. Illustration, HotSpot sampling dispersed and classified the field weight (GiZInvDst) from attribute file, and Inverse Distance Weight (IDW) with 5km for distance.

Table 2. Illustration, HotSpot Attribute contained Gi\*-Z score field, which Values are represented distribution clusters and randomly in portion.

Location Index. N	Long. (λ) Degree,	Lat. (φ) Degree,	UTM/X-Axis	UTM/Y-Axis	Gi*-Z score
1	45.9556	33.1353	510484.97	5089123.27	-3.7386
2	45.9464	33.1076	508339.76	5088097.82	-3.74912
3	45.9118	33.1087	508430.26	5084253.69	-3.77254
4	45.9316	33.0859	506659.63	5086451.42	-3.75826
5	45.9628	33.0617	504780.77	5089916.18	-3.72781
6	44.4688	32.483	458877.74	4924073.54	-3.90049
7	44.4128	32.6639	473241.01	4917778.22	-3.86273
8	43.6671	32.5052	460108.69	4835018.39	-3.49097
.....	.....	.....	.....	.....	.....
36	47.7585	30.4424	308331.89	5292627.08	3.1015
37	47.7845	30.4571	309528.46	5295480.16	3.09898
38	47.1563	32.4247	456390.25	5222693.93	0.649547
39	47.3423	30.8995	341333.89	5245343.15	3.08993

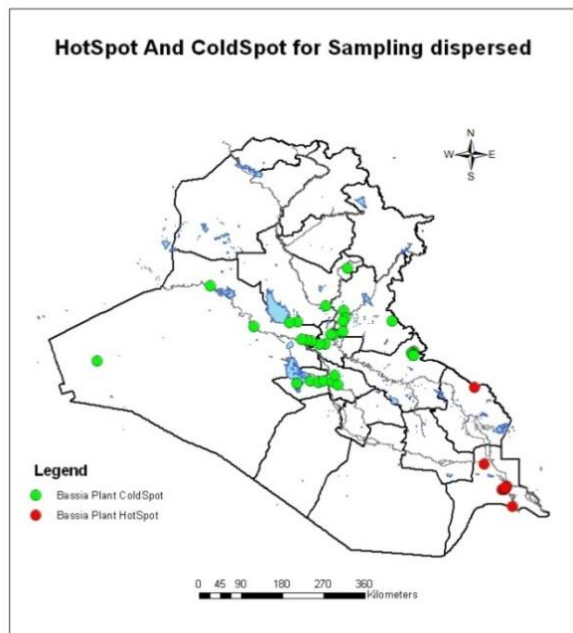
Table 3. Illustration, the procedures of Inverse Distance Weighted (IDW) will be using the distance from the spatial point to each sample, which represents the weight average.

Location Index. N	Long. (λ) Degree,	Lat. (φ) Degree,	UTM/X-Axis	UTM/Y-Axis	GiZInvDst
1	45.9556	33.1353	510484.97	5089123.27	-3.73860
2	45.9464	33.1076	508339.76	5088097.82	-3.74912
3	45.9118	33.1087	508430.26	5084253.69	-3.77254
4	45.9316	33.0859	506659.63	5086451.42	-3.75826
5	45.9628	33.0617	504780.77	5089916.18	-3.72781
6	44.4688	32.483	458877.74	4924073.54	-3.90049
7	44.4128	32.6639	473241.01	4917778.22	3.86273
8	43.6671	32.5052	460108.69	4835018.39	-3.49097
.....	.....	.....	.....	.....	.....
36	47.7585	30.4424	308331.89	5292627.08	3.101500
37	47.7845	30.4571	309528.46	5295480.16	3.089930
38	47.1563	32.4247	456390.25	5222693.93	0.649547
39	47.3423	30.8995	341333.89	5245343.15	3.089930

After applying the analysis, output have many column (fields) in attribute file tabulate (table or data base file). The P-Values represent the probability, which is called the Hot spot (height value density) or Cold spot (low value density).

The score of (Gi\*-Z technique) is used in especially trust thresholds and to evaluate statistical significance, HotSpots technique statistically represent crucial clusters of high score values equal high positive (Z-value score) and ColdSpots

technique statistically represent crucial clusters of low score values equal high negative (Z-value score), show Fig 8.



**Figure 8. Illustration, HotSpot and ColdSpot for Sampling Dispersed. Which the red point represented HotSpot, and the green point represented ColdSpot.**

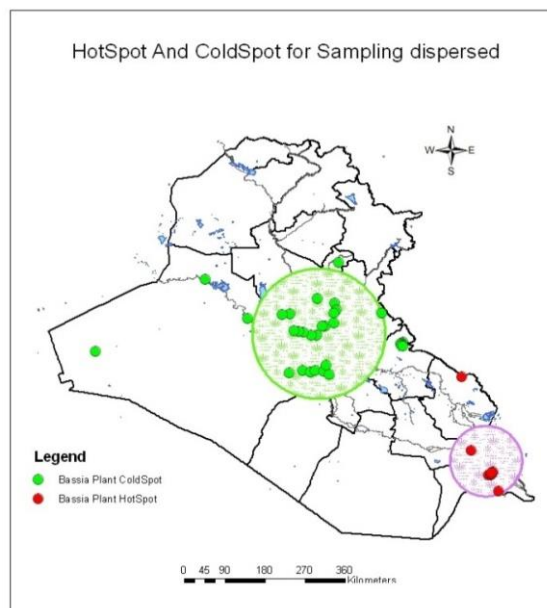
This process is to be completed by isolating positive and negative values, see Table 4, 5 and apply standard deviation method for determined spatial concentration values outer and inner circle to see how point entities in circle of HotSpot and ColdSpot, show Fig 9.

**Table 4. Represented, the hotspot techniques can isolate major values in Gi\*ZInvDst field.**

FID	Shape *	Id	NameE	NameA	XXX	YYY	GiZInvDst
23	Point	32	SAfwan		47.89730	30.0564	2.74873
24	Point	33	SAWwaan1	1	47.6898	30.4006	3.06822
25	Point	34	SAWwaan2	2	47.73500	30.40399	3.08989
26	Point	35	SAWwaan3	3	47.75960	30.416	3.09882
35	Point	37	SAWwaan5	5	47.7845	30.4571	3.09898
36	Point	38	ALTeeb		47.1563	32.42470	0.649547
37	Point	39	BAAsra NAsereaa		47.3423	30.8995	3.08993
38	Point	36	SAWwaan4	4	47.75849	30.4424	3.1015

**Table 5. Represented, the hotspot techniques can isolate minor values in Gi\*ZInvDst field.**

FID	Shape *	Id	NameE	NameA	XXX	YYY	GiZInvDst
0	Point	9	EGHather		43.93119	32.55939	-3.630
1	Point	10	KARballa1	1	44.0825	32.51810	-3.691
2	Point	11	KARballa2	2	44.18529	32.56230	-3.731
3	Point	12	KARballa3	3	44.36220	32.53229	-3.806
4	Point	13	BAGHdad EAst1	1	44.21289	33.28939	-2.56
5	Point	14	BAGHdad EAst2	2	44.10419	33.28939	-2.527
6	Point	15	BAGHdad NORth1	1	44.3913	33.48170	-1.993



**Figure 9. Illustration, the standard deviation statistical method and density distribution for point's location.**

From this figure, you can notice account outer and inner points for both circles. The green circle, nine points outer the circle unlike inner twenty-one points entities'. In this way, the red circle too, two points outer circle and seven points inner circle. Hence, in this study applied standard deviation to utilize from methods such as ellips, buffer, etc. That may involve point area distribution for this field.

**Conclusion:**

This recent techniques have indicated the impact of *Bassia eriophora* with other participating factors on Iraq ecology and climatic Area. These can open wide range entries in this field level by using this site and diffusion in Iraq.

The present investigation to stabilize the results obtained in this search can be summarized below; In herbarium can be automated digital recording of hundreds of plant samples, determining the spatial location by recent technique that have Global Positioning Systems (GPS) to obtain accuracy in the data collection simultaneously with satellite imagery field level maps can be created scientific field discipline, this work has created recent field techniques mapping libraries for extensive range of society as health care and climatic mitigate control, and exploiting the database for finding plant (*Bassia eriophora*) habitat accumulation recent study nature with variable spectral signature of electromagnetic algorithms corresponding, this plan is monitoring surveillance and detection propagation spot. That open field Improve work survey of Iraq by aerial photo of 1:100000 scale with satellite imagery for



accurate and useful plantation surveillance. In this search obtained region spot of plant (*Bassia eriophora*) focuses in middle of Iraq and low quantity in south of Iraq, that prediction the plant (*Bassia eriophora*) life and diffusion between humidity, high hot and sunny weather.

**Conflicts of Interest: None.**

### References:

1. Ramachandra TV, Ajay N. Ants Habitat Mapping Using Remote Sensing And Gis. *Wetlands*. 2001;23600985:1-7.
2. Duncan C, Thompson JR, Pettorelli N. The quest for a mechanistic understanding of biodiversity–ecosystem services relationships. *Proceedings of the Royal Society B: Biological Sciences*. 2015 Oct 22;282(1817):20151348.
3. James B C, Randolph H W. Introduction to remote sensing. 5<sup>th</sup> editor, The Guilford Press. 2011 June 21.
4. Thorsten W, Kirk A M. Handbook of Spatial Point-Pattern Analysis in Ecology. *Spatial-Point-Pattern-Analysis-in-Ecology/Wiegand-Moloney*. 2013; p. 538.
5. Somayeh S, Seyed M, Mahdi H, Marius N G. Micromorphology and leaf ecological anatomy of *Bassia halophyte* species (*Amaranthaceae*) From Iran. *Sezeged abs/article*. 2017; 61(1): 85-93.
6. Jegan A, Vaiyapuri SP, Periasamy VS, Alshatwi AA. Fabrication and cytotoxicity assessment of cellulose nanofibrils using *Bassia eriophora* biomass. *Int J Biol Macromol*. 2018; 117 (1): 911-918.
7. Khalil HE, Aljeshi YM, Saleh FA, Mohamed TS. Assessment of Chemical Composition and the Antimicrobial and Antioxidant Activities of *Bassia eriophora* growing in Eastern Province of Saudi Arabia. *JOCPR*. 2017;9(2):210-5.
8. Hasan SY. Pharmacognostic and Wound Healing Studies of the Leaves of *Bassia eriophora* (Family: *Chenopodiaceae*) on Albino Rats. *Arrib*, 2015; 5 (5): 400-408.
9. Hasan SY. Analgesic, antipyretic, nephritic and antioxidant effects of the aerial parts of *Bassia eriophora* Family. *Chenopodiaceae* plant on rats, *Asian Pac J Trop Med*. 2015; 5 (7): pp: 559-563.
10. Michael J, Sara G, Caitlin K. Spatial Modeling in Environmental and Public Health Research. *Int. J. Environ. Res. Public Health*. 2010; 7(4): 1302–1329.
11. Israa JM, Fouad KM, Rafid JT. Monitoring the Vegetation and Water Content of Al-Hammar Marsh Using Remote Sensing Techniques. *Baghdad Sci. J*. 2011; 8 (2): 646-651.
12. Al Rawi A. Wild Plant of Iraq with their distribution. State Board for Agricultural & water resources Research. Ministry of Agriculture & Irrigation, 1964, 2<sup>ed</sup> edition. 2013: pp:163.
13. Pavol E, Daniel D, Zuzana D, Mariana E. Distribution and ecology of the genus *Bassia* in Slovakia 2: *Bassia laniflora* (S. G. Gmel) A. J. Scott. *Thaiszia - J. Bot*. 2016; 26 (2): 125-138.
14. Rekha S, BN Nagpal, Aruna S, SK Gupta, AP Dash. Application of spatial technology in malaria research & control: some new insights. *ICMR, New Delhi, India*. 2008.
15. Shashi S, Michael RE, James MK, Pradeep M. Identifying patterns in spatial information: a survey of methods. *John Wiley & Sons, Inc*. 2011; 1: p 203-205.
16. Patricia LB, Paul JB. Principal of Geographical Offender Profiling. In: C.R. Block, M. Dabdoub, and S. Fregly, eds, Washington, DC: Police Executive Research Forum. 2017: 129- 149).
17. Natalia SD, Michael L. Land Use Influencing the Spatial Distribution of Urban Crime: A Case Study of Szczecin, Poland. Article, *ISPRS Int. J. Geo-Inf*. 2017; 6(3): 74.
18. M Ahmed, DN Jeb, AK Usman, GK Adamu, MU Mohammed. Spatial Distribution and Assessment of Selected Physiochemical Parameters of Soils Using GIS Techniques in Bunkure Kano State, Nigeria. *I J P S S*. 2015; 5(3): 143-154.
19. Mustafa AA, Man S, RN Sahoo, Nayan A, Manoj K, A Sarangi, et al. Land suitability analysis for different crops: A multi criteria decision making approach using remote sensing and GIS. *Researcher*. 2011; 3(12).
20. Fouad KM, Gheidaa SH. Study the Wet Region in Anbar Province by Use Remote Sensing (RS) and Geographic Information System (GIS) Techniques. *Iraqi j. sci.*, 2017; 58(3A): 1333-1344.

## التحليل المكاني لتوزيع نبات *Bassia eriophora* في كل العراق باستخدام تقنيات الاستشعار عن بعد ونظم المعلومات الجغرافي

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### الخلاصة:

تشكل المزروعات النسبة الاعظم من الغطاء الارضي للكورة الارضية، وازداد الاهتمام بالمزروعات لأنها تمثل عنصر التوازن للطبيعة البيولوجية والحفاظ على التوازن الطبيعي للمتغيرات المتسارعة نتيجة الاستخدامات البشرية المنتظمة والعشوائية، ومنها موضوع دراستنا الحالية الباسيا ايروفورا (*Bassia eriophora*) والتي تمثل جزء اساسي من ضمن نظام الامم المتحدة لتصنيف الغطاء الارضي (LCCS) والذي طور من قبل منظمة الغذاء العالمي (FAO) و المنظمة العالمية للبرامج البيئية (UNEP)، وذلك لمراقبة العناصر البيئية الاساسية بواسطة التقنيات الحديثة. وعلى الرغم من وجود هذا النبات في كل انحاء العراق، وجدنا ان اكثر هذا النبات يتواجد بصورة اساسية في الوسط وقسم منه في جنوب العراق وفي المناطق الرطبة وقرب الانهار والمسطحات المائية. الفكرة الاساسية هي كيفية استخدام تلك التقنيات لمراقبة نبات الباسيا وتوزيعها، وذلك لاختذ التدابير لنمو هذا النبات وانتشاره والاستفادة منه، علاوة على ذلك، معرفة والسيطرة على اتساع هذه المناطق في العراق والاستعداد لها. وفهم المعلومات عن المناخ وتنوع مواطن المستعمرات النباتية وتغطيتها بنماذج الخرائط، هذه الطريقة بمقدورها ان ترشدنا الى التخطيط بنجاح والحماية والسيطرة على بيئة الحياة النباتية. في هذه الدراسة تم تطبيق تقنيات الاستشعار عن بعد ونظم المعلومات الجغرافي بمراقبة وتوزيع نبات *Bassia eriophora* في العراق، حصلنا على البيانات من (BUH) ، (BUNH) ، (BAG). هذه البيانات تحتوي فقط على العنوان (مكان الانبات)، تم الكشف عن هذه المعلومات (العناوين) وتحديدها وتغطيتها لكل المناطق التي اخذت العينات منها بواسطة تقنيات صور التتابع الارضية و الصور الماخوذة من الجو وبعض سجلات البيانات التي توجد فيها المعالم الاساسية لهذه المناطق.

**الكلمات المفتاحية:** نبات *Bassia eriophora*، تقنيات الكثافة العالية، التوزيع النباتي، تقنيات التحسس النائي و نظم المعلومات الجغرافية، التحليل المكاني.