MARSH BULLETIN 18(2) September (2023) 192–204

MARSH BULLETIN

ISSN 1816-9848

Study of Morphology, Ecological and Geographical distribution of *Artemisia scoparia* Waldst. et Kit. in Basrah Province

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Received: 28 June 2023 Accepted: 2 August 2023

Abstract:
This study was conducted from 2021 to October 2022 through monthly field trips to selected stations: Hammar Musharif, Al-Tuba, Artawi, and Safwan (40 km), located in the southern desert of the Basra Governorate. During these visits, the distribution of *Artemisia scoparia* was determined, and its physical and chemical environmental conditions were examined using a questionnaire. These included air and soil temperature, air and soil humidity, soil pH, soil salinity, and soil organic matter content. In addition, morphological and taxonomic studies were conducted to confirm species identification. The highest air temperature recorded was 49 °C in July at the Safwan station, whereas the lowest was 10 °C in January at most stations. The soil temperature reached a maximum of 46.2 °C in August at Al-Tuba and a minimum of 12 °C in January at Safwan. Air and soil humidity showed their highest values in January at Hammar Musharif, reaching 62% and 10.2%, respectively. The lowest air humidity was 16% in June at Safwan, whereas the lowest soil humidity was 0.1% in September at Artawi. Soil pH values varied among stations, with the highest value of 8.58 recorded at Al-Tuba in July and the lowest value of 6.01 recorded at Hammar Musharif in December. Soil salinity reached its maximum value of 8.81 mg/L at Safwan in July, whereas the minimum value of 0.01 mg/L was recorded at Hammar Musharif in November and at Al-Tuba in December. The soil organic matter content was highest (0.13 g) in January at Hammar Musharif and lowest (0.01 g) at Artawi and Al-Tuba during most months. The species was widely distributed in scattered locations across the southern desert of Basra Governorate, particularly along the forty-kilometer line toward Safwan, as well as in Hammar Musharif, Artawi, and Al-Tuba, with isolated individuals occurring between these areas.

Keywords: distribution, Artemisia, *A. scoparia*, salinity, temperature.

Introduction

Attention has been given to biological diversity in general and plant diversity in particular in many countries of the world due to the deterioration of natural vegetation areas, and many plant species are threatened with extinction. The areas of vegetation began to shrink and gradually disappear due to climate change and the harsh and inappropriate environment that the world is exposed to, and the vast areas that man exploited for various purposes at the expense of biodiversity and its destruction in those areas. The damage that results from these pressures is not limited to the extinction of dominant species only, but the harm of this may exceed the significant impact on all associated forms of biodiversity in that specific environment. Therefore, surveys have increased to monitor plant abundance because of the need to determine the rate of biodiversity loss (Buckland et al., 2007).

The Asteraceae family is known by a second name, which is the sunflower family, as mentioned by Langenheim and Thimann (1982) with the name of the Composite family as a result of the arrangement of the flowers in the

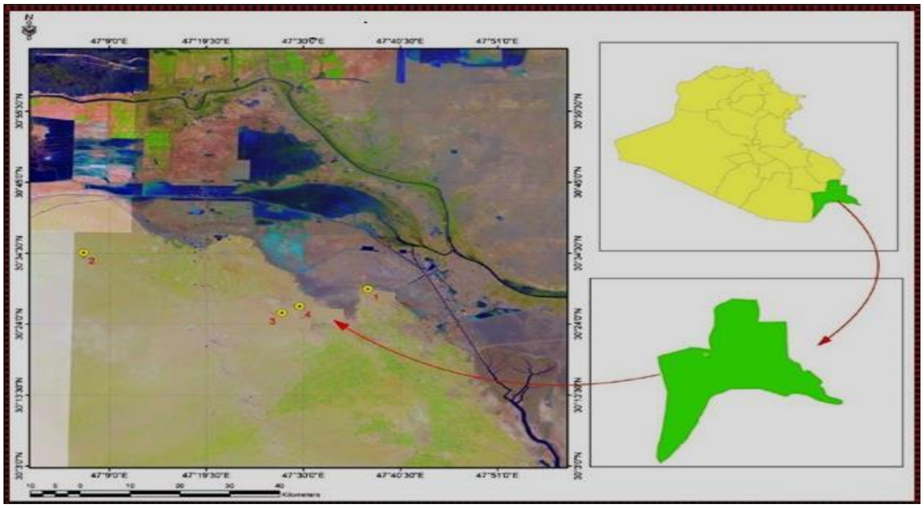
in the form of a compound head. Muschler (1912) stated that the Asteraceae family is one of the largest flowering families, and researchers have varied in the number of species in the Asteraceae family. Novak (1966) stated that this family includes 900–14,000 species and is widely spread, being found from mountaintops to seashores. Heywood (1978) indicated that this family contains 1100 genera and approximately 25,000 species. Al-Rawi (1987) mentioned that the complex family consists of 950 genera distributed over 20,000 species. with two species, A. scoparia and A. herba-alba, and Bayer and Star (1998) indicated that the classification of the composite family is difficult because it is one of the largest groups of dicotyledonous plants, as it includes 23,000 species, and Al-Mayah (2001) mentioned that the family Asteraceae is the largest Flora, as it includes 950 genera and 20,000 species, and Dillion and Alva (2002) indicated that it includes 1,500 genera distributed over 20,000 species, and it is one of the largest plant families in Iran, as mentioned by Maleh (2014) in his study of the biodiversity in the southern desert of Basra Governorate, in which he recorded 16 species, and no species of Artemisia was recorded. Al-Mayah et al. (2016) mentioned that the family consists of 100 genera in Iraq and Basra represented by 52 genera and 82 species, and the genus Artemisia contains one species, A. herba-alba, found in Khidr al-May and Busayyah.

The genus Artemisia is one of the largest genera in the phylum Anthemideae of the family Asteraceae (Martin et al., 2001, 2003; Watson et al., 2002). It consists of approximately 500 species widely distributed in the northern

regions of the world (Marco and Barbera, 1990). It is one of the most promising species for restoring arid and degraded pastoral ecosystems worldwide (El-Aich, 1992)), and this species is also a natural means of countering soil erosion (Benjilali and Richard, 1980; Cerda, 1997). high protein content (Boufennara et al., 2012). It is a small herb and shrub found in northern and southern Iraq. Most species of this genus are perennial, with only 10 species being annual or semiannual (Valles et al., 2003).

Study area

The study was conducted for a full year, from October 2021 to September 2022, in the areas where the study plant spread. Four stations were chosen: the Hammar Musharraf station, which is located on the Zubair-Al-Barjisiya road, approximately 23.6 km from the center of the city of Basrah, and the Artawi gas isolation station in the part It is bordered by the north-west by Al-Zubayr district in Basrah Governorate. It is bordered to the south by the Al-Nakhila district within the center of Al-Zubayr district. It is bordered to the west by the Safwan District. It is bordered by the extension of the old Nasiriyah line from the north. It is approximately 54 km from the first station. The third station, the Al-Tuba gas isolation station, is located approximately 43 km west of the center of Basrah Governorate, and the fourth is the Safwan station (the forty-kilometer line). The brick is 20 km. These stations are characterized by light dune soils and desert plants, especially *Astragalus spinosus*, which is present at all stations along with Artemisia plants. (Map 1 and Panel 1).



Map (1): Study stations

Plate (1): Study Stations 1: Hammar Musharraf 2: Artawy 3: Al-Tuba 4: Safwan Station (Forty-kilometer line)

Materials and methods

Collection and diagnosis of plant samples:

Plant samples were collected for each of the selected stations, with 12 field trips, which were conducted regularly during a full year period starting from October 2021 to September 2022, as plant samples (for Artemisia and its accompanying plants) were collected, and soil samples were collected from each station. The samples were sent to the laboratories of the College of Science - Department of Environment. The following was done on them:

Diagnosis of samples: After transferring the plant samples preserved in plastic bags to the laboratory, they were cleaned of dust and cut off dead plant parts. They were diagnosed based on the diagnostic taxonomic keys available in the Encyclopedia of Iraqi Plants, the Encyclopedia of Plants of Kuwait and Palestine, and the Encyclopedia of Lowland Plants in Iraq. Comparison with the herbal samples preserved in the herbarium of the College of Science - University of Basra, as well as the samples in the National Herbarium. Soil samples were also collected from the same stations and cleaned of plant residues and dried to estimate some of their physical parameters.

Air and soil temperature:

The temperature of both air and soil was measured monthly and at all study stations using a mercury thermometer in degrees (0-100) ◦C, as the temperature was measured in shaded areas, and the soil temperature was measured by placing the thermometer inside the soil at a depth of 10 cm for 5 minutes and then recorded. Thermometer reading and the results were expressed in degrees Celsius (◦C).

Air and soil humidity:

The percentage of air humidity was measured at all stations in the field using a digital humidity meter, and all readings were recorded for all stations and each month.

Taken were 5gm of clean and sifted soil were taken from each of the four study stations to measure the soil moisture. The samples were placed in a glass dish of known weight and placed in an electric oven, and the temperature was regulated to 105 ◦C for 24 h, and continued drying until the weight was proven (Taj al-Din and Yaqoub, 1988). The soil moisture percentage was estimated using the following equation:

The amount of moisture = the weight of the soil before drying – its weight after drying
Moisture percentage = moisture content (g) / soil dry weight (g) x 100%

Organic matter:

One gram of soil was collected per month for each of the study stations, placed in a ceramic cauldron of known weight, and placed in an incineration oven (Furnus) at a very high temperature of 550 °C for 48 h, after which it was weighed until its weight stabilized to calculate the difference. This indicates the amount of organic matter present in the soil (Weaver and Clement, 1973). The amount of organic matter was calculated using the equation below and expressed in grams:

Organic matter = weight of soil before burning - the weight of soil after burning.

pH and Salinity:

The pH and salinity of the soil solution prepared from 25 g of clean soil and 75 ml of water were estimated. After filtration, the pH of each soil sample was estimated for all months using a pH meter. Then, the soil salinity was estimated for the same leachate in terms of electrical conductivity by multiplying the values by a coefficient. 0.64 and expressed in mg/l. The amount of soil salinity was calculated as the electrical conductivity value × 0.64.

Results

Phenotypic study of *A. scoparia*

Table (2) and panel (1) show the morphological characteristics of the Artemisia plant, *A. scoparia*, which is a shrub up to (100) cm high with many branches up to (12) branches that are reddish-brown in color when the plant dries up. The root is a woody peg that reaches Its length is approximately (65) cm. The basal leaves are larger than the upper or stem leaves, and their length ranges between (16-6.9) cm. The basal leaves have dense hairs that fall and decrease as the plant grows. Their arrangement on the leg is semicircular. The inflorescence is a highly branched spikelet consisting of two types of radial flowers, the number of which is outward (5-6), tubular in shape, and the male always has a length of (1.3) cm and contains five sharp teeth and is glandular, while the female flowers are small in size, their number is (6-8) It contain two sharp, tubular teeth of 1.6 cm in length.

Table 2: Measurements of the parts of the Artemisia plant, *A. scoparia*

parts of the plant	Measurement (cm)
plant height	(100-7) 65
root length	(65-10) 22
root thickness	(4-1) 3
long sheet	(16-0.8) 6.9
inflorescence length	(130-6.9) 18.5
the number of branches	1-5) 12
long male flower	(1.4-0.8) 1.3
long female flower	(1.7-1.1) 1.6

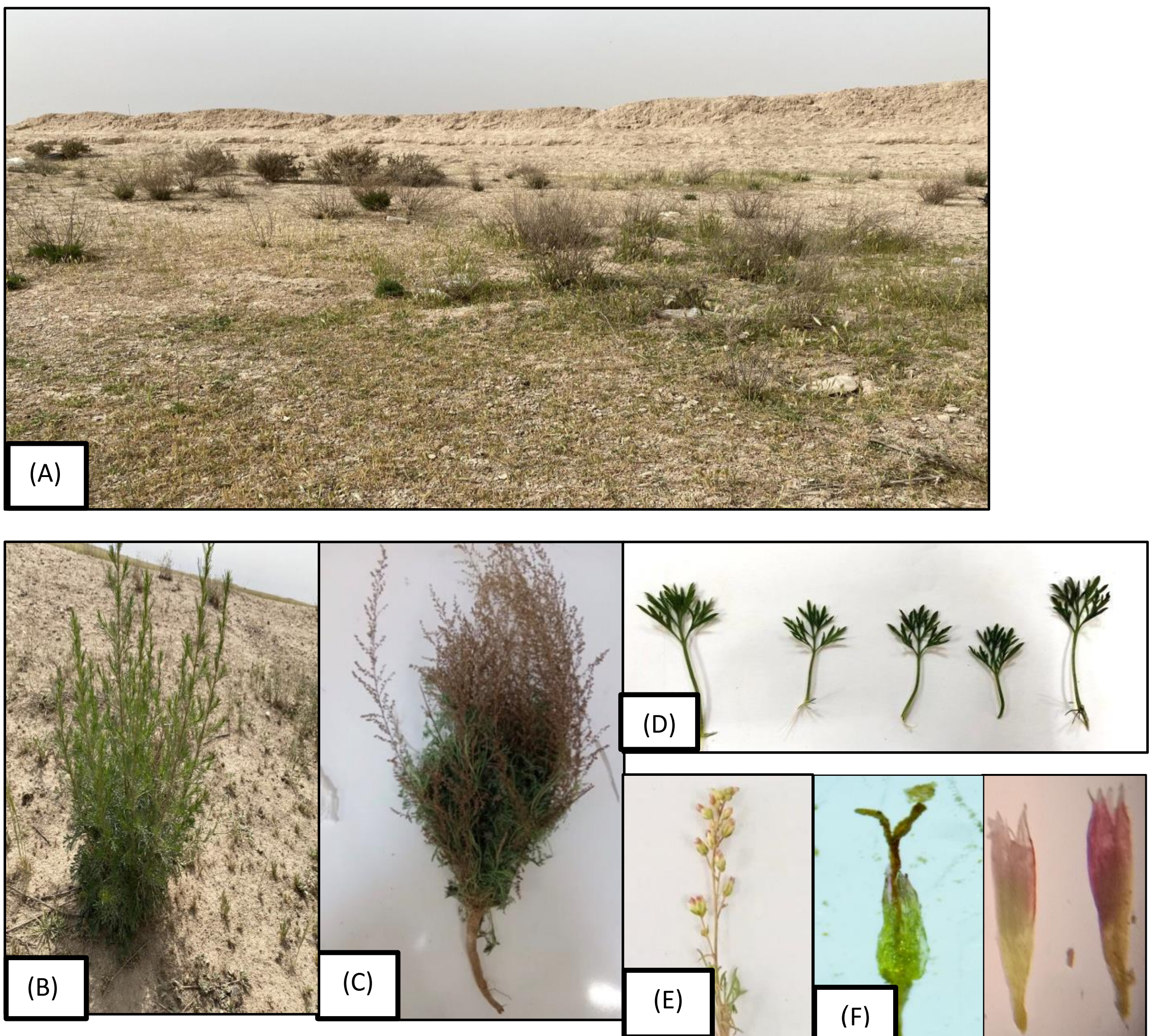


Plate (1): Appearance of the Artemisia plant A.scoparia
A: *A.scoparia* Artemisia plant community in one of the stations B: A.scoparia Artemisia plant green C: *A.scoparia* dry D: leaves E: inflorescence F: male and female radial flower

Air Temperature

Figure (1) shows the monthly rates of air temperature for the study stations, as it was noted that the highest temperature was 49° C in July in Safwan station, while the lowest air temperature was recorded, which ranged between 10-20° C for the months of December and December The second in a row in most of the study stations, and this difference may be due to the time of recording the temperature, and the results of the current study showed a clear variation in the air temperature rates during the study period as a result of the difference in climatic conditions such as the length of the day, the angle of the sun's rays and the intensity of solar radiation, in addition to the movement The phenomenon of the sun, which is of the highest intensity in the summer and tilted in the winter, Moghaddam (2006) stated that the temperature is one of the environmental factors that play a direct role in influencing the distribution of vegetation cover, and the results of the statistical analysis showed that there is a significant difference between the months as well as between the study stations at the level of P<0.05 probability.

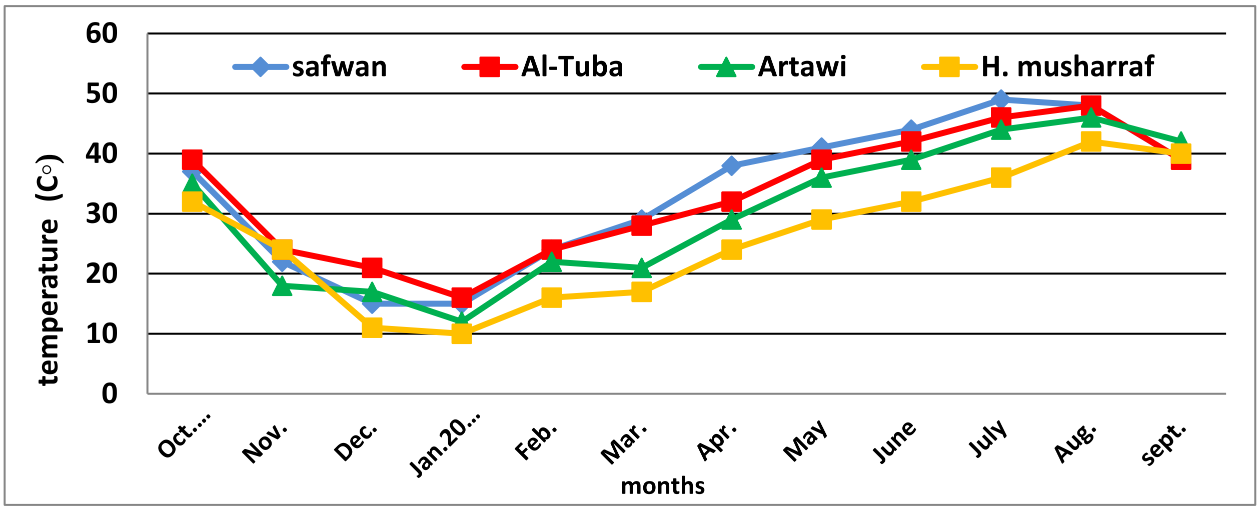


Figure (1): Air temperature in the study stations during the months of the year

Soil Temperature

Figure (2) shows the rates of change in soil temperature during the months of the year for the study stations. The highest temperature was 46.2°C in August at Al-Tuba station, and the lowest was 12°C in January at Safwan station. The variation in soil temperature may be due to the type and nature of the soil and the geographical location of the study stations. Soil temperature is a physical factor that affects the distribution and spread of plants (Abd El-Wahab et al., 2008). Soil temperature is also affected by factors such as precipitation rate, as the soil temperature decreases during the cold months due to an increase in rainfall rates. The results of the statistical analysis showed that there were significant differences between the months and between the study stations at the probability level P<0.05

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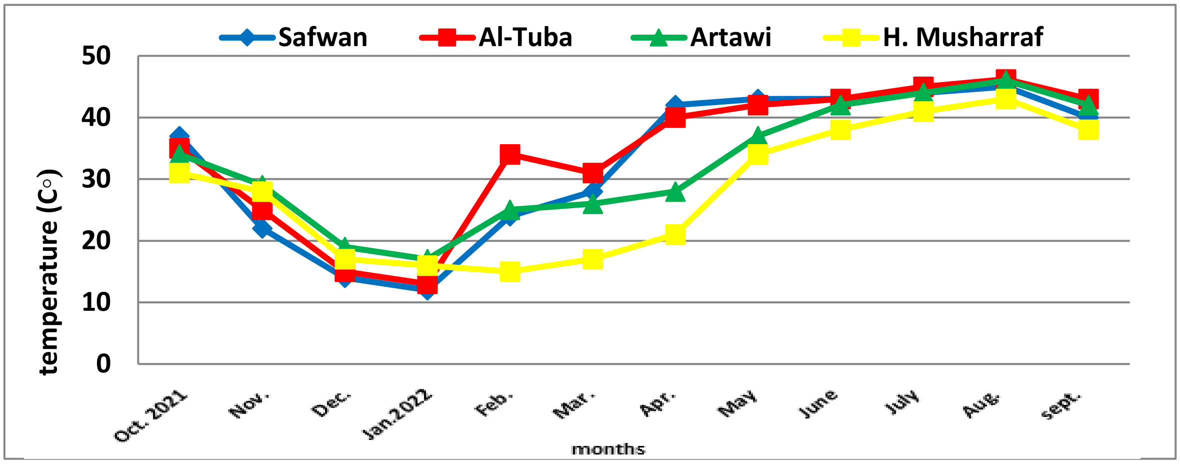


Figure (2): soil temperature in the study stations during the months of the year

Air Humidity

Figure (3) shows the relative humidity of air during the months of the year at the study stations. Monthly differences were recorded in the relative air humidity, with the highest average humidity of 62% in January at the Hammar Mushrif station and the lowest of 16% in June at the Safwan station. This may be because the relative humidity is affected by the air temperature, as well as the low rate of evaporation in summer, and that the study stations are located within the open desert area that is always exposed to hot, dry winds in summer, and its increase in winter due to precipitation and cold winds, which is consistent with what Al-Kanaani (2019) stated. The results of the statistical analysis of air humidity showed that there was a significant difference in the level of probability ($p < 0.05$) between the study stations and its presence between the months for the same probability.

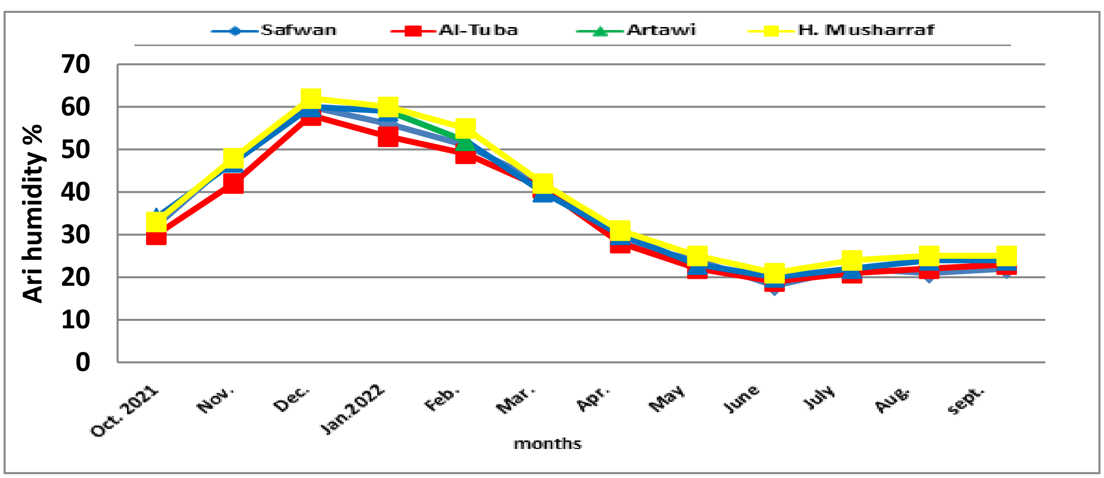


Figure (3): The relative humidity of the air in the study stations during the months of the year

Soil Humidity

Figure (4) shows the monthly changes in soil humidity, as well as a clear discrepancy between the study stations, as the highest percentage rate of 10.2 was recorded in January at the Hammar Mushrif station and the lowest rate of 0.1 in September at the Artawi station. Natural plants are the result of an interaction between climate and soil factors; therefore, natural plants in their various forms vary according to the conditions of the soil and climate. The fifth national report of the Convention on Biological Diversity in 2014 indicated that soils are affected by desertification and that 54% of them are threatened because of low soil humidity levels and a lack of vegetation cover. The amount of precipitation also affects the humidity levels of the soil; therefore, the results show an increase in humidity levels in the cold months and a decrease in the summer and dry seasons. The results of the statistical analysis of soil moisture values showed significant differences between months and between stations at a probability level of $P < 0.05$.

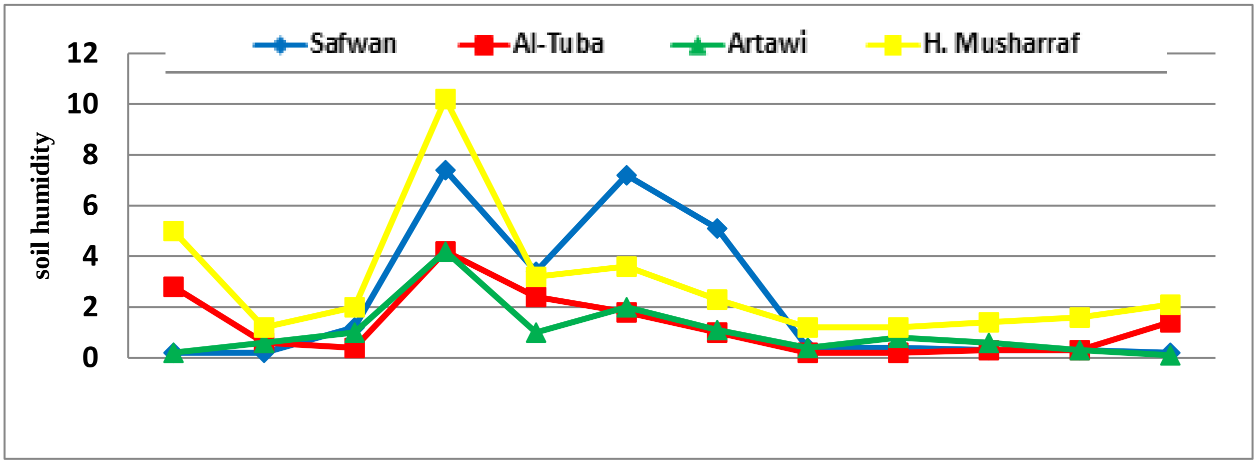


Figure (4): The relative humidity of the soil in the study stations during the months of the year

pH

Figure (5) shows the monthly changes in the pH values at the study sites, with the highest rate of 8.58 recorded at the Al-Tuba station in July, while the lowest value of 6.01 was recorded at the Hamar Mushrif station in December. pH represents the hydrogen ion concentration in the soil and thus affects plant nutrient uptake (Esna-Ashari and Gholam, 2010). The results of the statistical analysis showed significant differences between the stations and between the months at the probability level $p<0.05$.

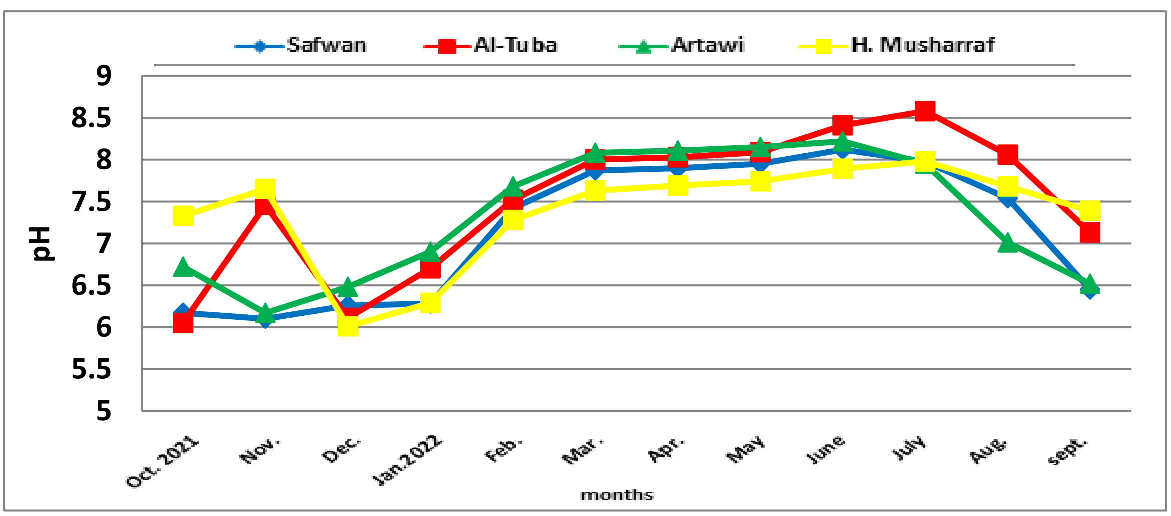


Figure (5) soil pH changes in the study stations

Salinity

Figure (6) shows the monthly changes in salinity rates in the study stations, as the highest salinity rate of 8.81 was recorded in the Safwan station in July, as it is noted that the Safwan station is one of the stations with the highest salinity values in most months of the year, while the study recorded the lowest concentration for salinity 0.01 in each of Hammar Musharif and Al-Tuba stations during some cold months, including October, November, December, February, April, May, and September. It always has a low salinity. As for the Safwan station, the reason may be due to the high soil salinity in it because the station is distinguished by the spread of its plants in low-lying areas. Depressions may be the reason for the variation in the concentration of salinity in groundwater, the capillary characteristics, and air humidity, which are among the factors affecting the different concentrations of salts in the stations, and temperatures affect the concentration of salinity in the soil. Evaporation and vice versa in the cold months due to the increase in the amount of rain, which reduces soil salinity. The results of the statistical analysis showed significant differences between months and between stations at the probability level $p<0.05$.

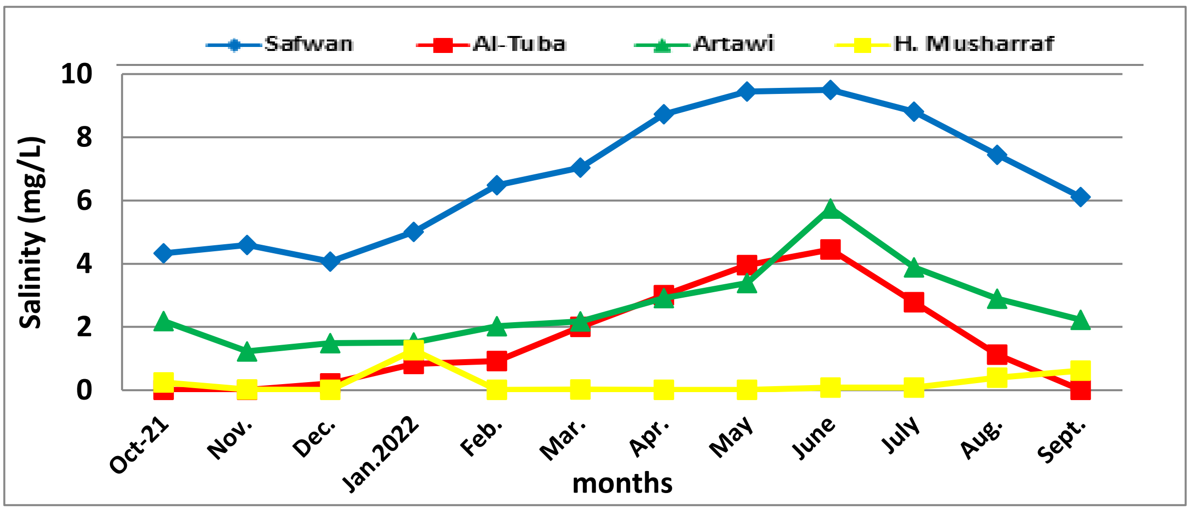


Figure (6): Seasonal changes in salinity in the station soils

Organic matter

Figure (7) shows the monthly changes in the rates of organic matter in the soils at the study stations. The highest rate of organic matter, 0.13, was recorded at the Hammar Mushrif station in January, while the lowest rate of 0.01 was recorded in January, March, April, and September at the Artawi and Al-Tuba stations. The decrease in organic matter at the Artawi and Al-Tuba stations in the cold months may be due to the lack of vegetation cover in these months and thus the lack of organic matter at those stations, as organic matter represents the remains of dead living organisms, whether plant, animal, or microorganisms, produced during transformation processes over long periods. time and therefore consist of some mineral and nutritional elements such as oxygen, phosphorus, and sulfur that are necessary to increase soil fertility, Al-Mousawi (2005), in addition to that rain, causes washing of the soil and therefore these stations are poor, and the soils of these two stations are light sandy and poor in organic matter, and the results show There is a variation in the concentration of organic matter during the months of the academic year. The results of the statistical analysis show that there is a significant difference between the months as well as between the stations as well at the probability level $P<0.05$.

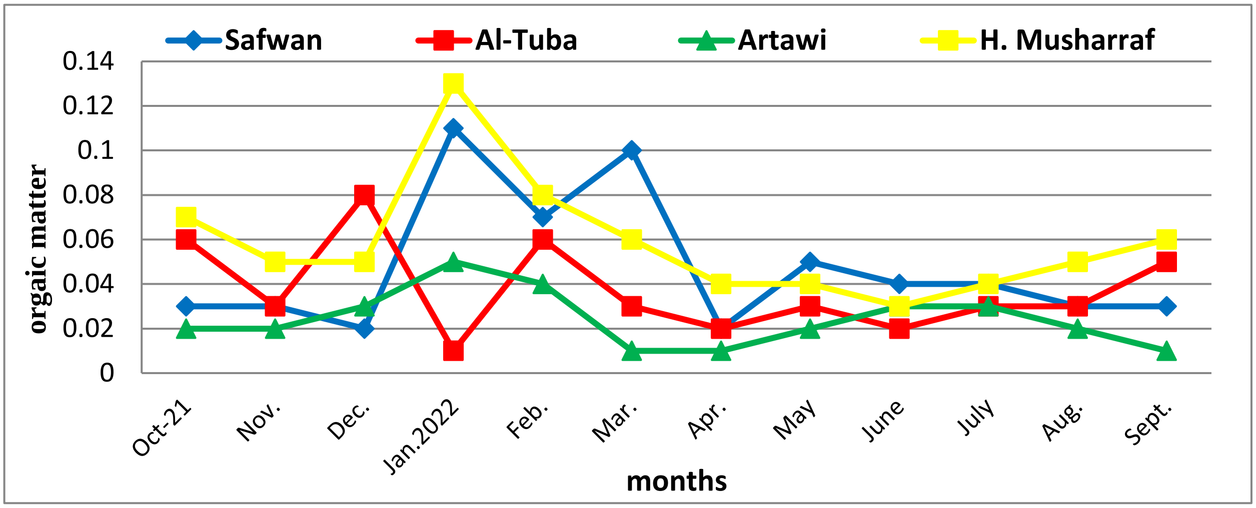
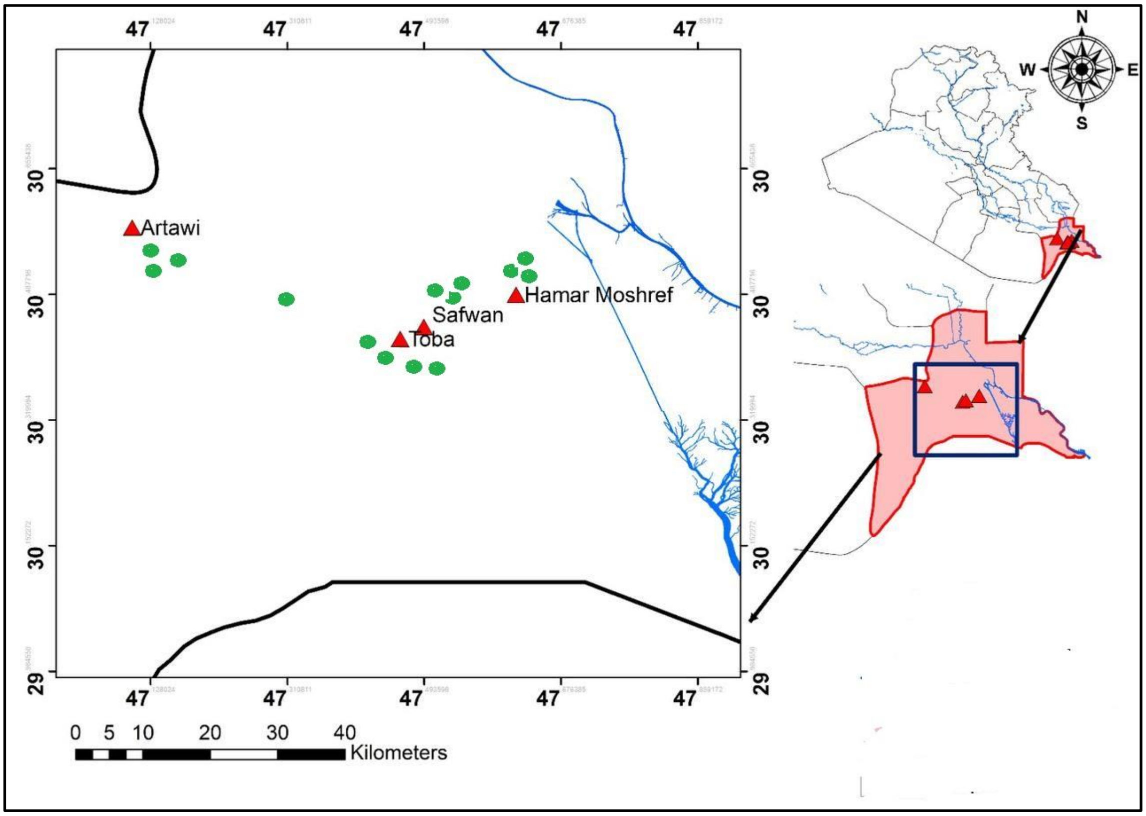


Figure (7): The organic matter in the soils of the study stations

Geographical distribution of *A. scoparia*

It was found through field trips and field follow-ups that the *A. scoparia* plant covered a number of desert areas in the southern desert ecosystems in Basra Governorate but did not cover large areas. As the spreading capacity and growth intensity of *A. scoparia* varied in the Iraqi southern desert despite the different environmental characteristics of those regions such as temperature, pH, salinity, organic matter and other characteristics of the environment, as the plant was found in a number of sites that were accessed during the study period, including An honorable donkey, as the plant was found in few clusters, approximately 4 clusters, for each group containing approximately 2-5 plants, and Artawi, as the plant was found in the form of a few plant clusters with clusters spaced apart from each other, their number was approximately 4, and some single individuals were found scattered along the line connecting to the area Artawi, but in the Al-Tuba site, it was the most prosperous site for the community of Artemisia, with very huge numbers that may reach hundreds of individuals distributed in two locations in this station, and in large numbers that may reach hundreds of individuals, especially in low areas, and I also found scattered individuals from the plant between the line separating Artawi and the station Safwan, but in the fourth site of the forty kilometer line towards Safwan, the plant was found in a very wide community in a low area towards the right of the forty line near the sand and gravel quarries, and the numbers of individuals were large, reaching hundreds of individuals, and there were individuals distributed sporadically around this depression and in small numbers. Also, trips were made to different areas in Basra Governorate, such as northern Basra (Al-Hartha_ Al-Madina_ Al-Qurna), as well as southern Basra (Abu Al-Khasib_ Al-Siba_ Al-Faw) and many desert areas such as the northern and southern Rumaila, the airport area, Al-Luhais, Jerishan, Khader Al-May, Jabal Sanam, and Khor Al-Zubair. Or record Artemisia.

The record of *A. scoparia* in this study is the first for the province of Basra, and although the spread of this species has been recorded in many provinces of Iraq, it was not recorded in the Iraqi Botanical Encyclopedia in the province of Basra. This species was not recorded by Maleh (2015) in his study of plant biodiversity in the southern desert of Basra Governorate.



Map (2): The areas of Artemisia distribution in the southern desert of Basra Governorate

Conclusion

The present study demonstrates the ecological plasticity of Artemisia scoparia in the southern desert of Basrah Province, confirming its ability to maintain scattered populations despite marked seasonal fluctuations in climatic and edaphic variables. The findings indicate that species' distribution and density are strictly governed by local environmental filters, specifically soil moisture availability, salinity gradients, and organic matter content. Most significantly, this study establishes the first confirmed record of *A. scoparia* in Basrah Province. These results fill a critical gap in regional floristic data, providing a foundational reference for future biodiversity surveys, conservation strategies, and sustainable management of desert ecosystems in southern Iraq.

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دراسة مظهرية وبيئة وتوزيع جغرافي لـ ***Artemisia scoparia*** **Waldst. et Kit.** في محافظة البصرة

حنين فيصل تويه   وداد مزبان طاهر
قسم علم البيئة – كلية العلوم – جامعة البصرة
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المستخلص

اجريت هذه الدراسة خلال الفترة من 2021 الى تشرين الاول 2022 والتي تمت باجراء سفرات حقلية شهرية الى محطات الدراسة المختارة والتي هي حمار مشرف والطوبة وارطاوي وسفوان (خط الاربعين) والواقعة في الصحراء الجنوبية لمحافظة البصرة، اذ تم خلالها تحديد توزيع نبات *Artemisia scoparia* ودراسة الخواص الفيزيائية والكيميائية المؤثرة عليه منها درجة حرارة ورطوبة كل من الهواء والتربة والمادة العضوية للتربة. اذ سجلت اعلى درجة حرارة للهواء 49ْم في شهر تموز في محطة سفوان وادناها 10ْم لشهر كانون الثاني لاغلب محطات الدراسة. اما درجة حرارة التربة فكانت اعلاها 46.2ْم في شهر اب لمحطة الطوبة وادناها 12ْم لشهر كانون الثاني في محطة سفوان. اما رطوبة الهواء والتربة فكانت اعلى نسبة مئوية لها 62% و 10.2% في شهر كانون الثاني في محطة حمار مشرف وادناها 16% و 0.1% في شهري حزيران وايلول في محطتي سفوان وارطاوي على التوالي. كما سجل اعلى قيمة للاس الهيدروجيني لترب المحطات المدروسة والتي بلغت 8.58 في محطة الطوبة خلال شهر تموز وادناها 6.01 في شهر كانون الاول لمحطة حمار مشرف. سجلت ملوحة ترب محطات الدراسة اعلى قيمة 8.81 ملغم/لتر في محطة سفوان في شهر تموز وادناها 0.01 في كل من محطتي حمار مشرف والطوبة لشهري تشرين الثاني وكانون الاول على التوالي. اما المادة العضوية للترب فكانت اعلاها 0.13غم في محطة حمار مشرف في شهر كانون الثاني وادناها 0.01غم في محطتي ارطاوي والطوبة لاغلب أشهر السنة. اما توزيع النوع فقد وجد منتشر في مناطق متفرقة من الصحراء الجنوبية لمحافظة البصرة في نهاية خط الاربعين كيلو متر باتجاه سفوان وكذلك في منطقة حمار مشرف وارطاوي والطوبة مع وجود افراد متفرقة بين الخط الواصل بينهما.

الكلمات المفتاحية: التوزيع، الشيح، *Artemisia scoparia*، الملوحة، درجة الحرارة.