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The effect of some climatic elements on the presence and spread of natural plants in Basrah province and their Interrelationships.

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Abstract

In this research, we studied the multiple correlations between climate elements (maximum and minimum temperatures, rainfall, percentage of humidity, and evaporation) for the time periods from (1984-2022) obtained from the meteorological and seismic station in Baghdad and the meteorological station in Al-Hussein neighborhood, and their relationship to the presence of natural plants through... The number of plants according to their development in the environment (mosses, ferns, gymnosperms, and angiosperms), as well as according to their presence in the environment, including desert, saline, aquatic, and parasitic plants for the time periods (1964-2022), based on the Iraqi Botanical Encyclopedia, the environment and plants of Basra, and the researcher's field trips. It was noted that the trend line for the presence of plants in the environment of Basrah province fluctuated from high to low in recent years, with the highest recorded for dicotyledonous plants, followed by monocot plants, and that desert plants are more widespread and abundant than the rest of the environments studied. It was also noted from the results of the multiple correlation that most of the plant groups were associated with the maximum temperature with a very weak positive relationship, compared with a negative inverse relationship with evapotranspiration. As for rain and humidity, only the correlation relationship was high and positive, except for the parasitic plants whose relationship with the studied climatic elements was negative.

Keyword: climatic elements, temperatures, angiosperms, multiple correlations

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Introduction

The primary cause of the natural vegetation cover's degradation is climate change, which has lengthened the elements of the climate. It is well known that the natural vegetation found in any given region of the world reflects the environmental conditions. The most significant environmental factors are those related to temperature and precipitation, which impact both the environment and the vegetation cover.

Notwithstanding the numerous threats to the natural vegetation cover, climate changes are of utmost importance because of the marked rise in temperatures, the decline in rainfall and the

relative humidity rates, the impact of other factors, such as soil salinity, and the human factor that has started to destroy the vegetation cover by using its lands for various activities. Some plant species are disappearing because of the effect, while other species that have adapted to increased temperatures are emerging.

Whether for the medicinal or pastoral plants it offers, or the plants involved in the economic aspect and other advances, the natural vegetation cover is extremely important. As a result, this chapter will address the importance of maintaining the natural vegetation cover and preventing the extinction of plant species, as highlighted by recent studies. The goal of the study is to identify the current plant species and gain knowledge of newly emerging and extinct species. The study period was divided into three years (1984–1985), (2015)–2016, and (2021–2022) to allow for the unification or classification of the vegetation cover according to scientific standards. common kinds.

One of the most significant aspects of the natural environment that influences the survival of humans, animals, and plants is the climate. Man started to notice changes in the climate and their impacts when he learned about agriculture. He started keeping an eye on these changes in the climate and their aftermath, connecting his findings to the advancements in climate studies that I then applied to the agriculture sector (Al-Moussawi, 2004).

Plants have upper limits to the required temperature, and if this temperature is exceeded, the plant will undergo changes that start with its external appearance. This upper growth temperature is referred to as the maximum growth temperature, and a minimum temperature reaches the plant has a minimum growth level that it must reach to survive; this is known as the minimum growth temperature. Al-Badiri (2008) states that there is an optimal temperature at which a plant can conduct all its essential functions and keep growing.

One of the biggest environmental problems that humanity is currently experiencing is climate change, which is predicted to have long-term repercussions on the amount of vegetation on the planet. Natural vegetation has been predicted to have decreased from levels it would have reached if the climate had remained steady due to rising temperatures and shifting rainfall patterns, and it is anticipated that more temperature increases, increasing sea levels, increased disease and pest pressure, water shortages, extreme weather events, and biodiversity loss are all expected in the ensuing decades (FAO, 2016).

Materials and Methods

The General Authority of Meteorology, Seismic Monitoring and Climate Management and Unpublished Data, 2022, the Department of Meteorology and Seismic Monitoring, Al-Hussein District in the Basrah Province, and the Directorate of Agriculture in the Basrah Province were the sources of the climate data used in this study. Department of Planning during the years 1983–1994; 1994–2005; 2005–2026; and 2016–2022. The general rates were obtained for each of the four 11-year periods, ranging from 1983 to 2022.

Along with source data on the environment and plants of Basrah for the years 2015–2016, plant information was also gathered from the Flora of Iraq for the years 1964–1984. To document the ecology and plants in Basrah Province in 2021–2022, a thorough study of the region was also conducted.

Additionally, data analysis and research into the relationship between Basrah Province's vegetation cover and climate elements-such as maximum and minimum temperatures, rainfall, humidity, and evaporation-were conducted using the multivariate statistics program Past.

Results and Desiccation

The percentage and quantity of ferns, mosses, gymnosperms, and angiosperms (monocots. and dicotyledons) that persist in the environment are depicted in Figures 1, 2, and 3. The highest number of dicotyledonous plants 492, 508, and 272 for the years 1964-1984; 2015-2016; and 2021-2022, respectively was noted for all periods. For most of the study periods, mosses and ferns constituted the lowest group, with extremely low populations. This could be because these plants are regarded as belonging to one of the lowest groups within the Plant Kingdom. Humidity, shade, and cold temperatures are what the habitat most needs. Because of the harsh weather in the Basrah Province, which may reach temperatures of 45°C

in the summer, these two groups vanish from most of the study locations.

The highest number of plants was recorded for all plant groups present in the ecosystem for the period 2015-2016, at an amount of 693 plants. (Al-Mayah *et al.*, 2016) The study areas are all considered extremely hot desert environments with little water, and this affects the plant's content of substances. This also agrees with (Qunita, 2011; Maleh, 2015) that the lack of water in the soil leads to a change in plant components. Regarding the rise in angiosperm population, dicotyledons are the largest group of plants and are found in most environments. The group of ferns and mosses had the lowest percentage-1% for most of the analyzed periods, while the largest percentage 78% of the total number of plants was recorded in the years 1964 and 2016.

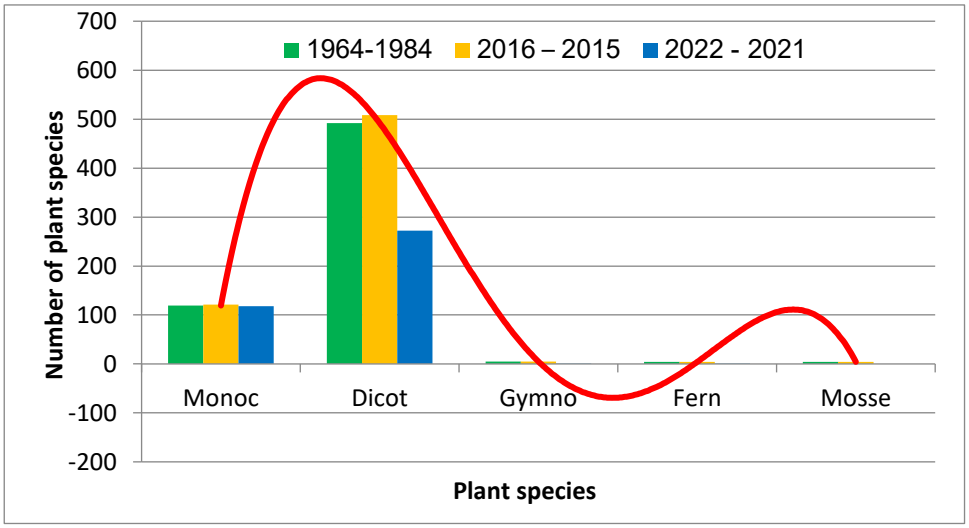

Figure (1) Number of plant species with trend line from 1964-2022

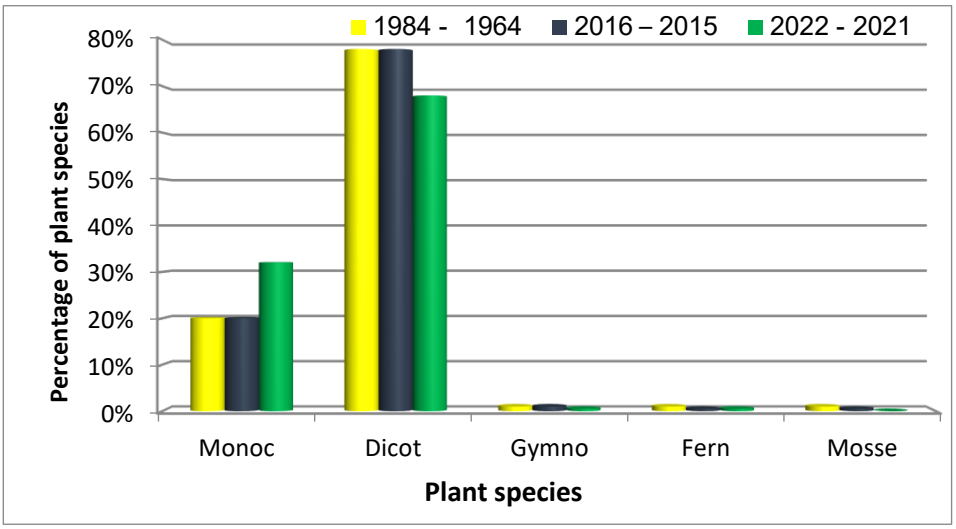

Figure (2) Percentage of plant species from 1964-2022

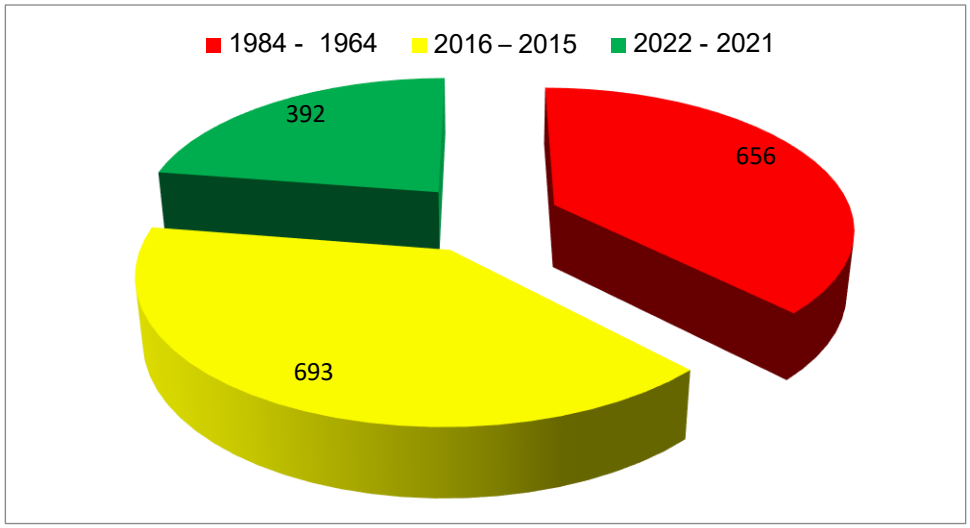

Figure (3): The total number of plant species during the study from (1964-2022)

The number of plant species according to the kind of growth in the environment is depicted in Figure (4). 283 species of desert plants were reported from 2015 to 2016, while 202 species were documented during the year 2021–2022. For the period, the greatest number of halophytes was 32 species. (20 kinds in 2020–2021) and below in (2015–2016). Regarding aquatic plants, there were 65 species during the peak era (1964–1984), and 33 species during the lowest period (2020–2021). Additionally, the number of agricultural plants was the largest (192 species) during the study's second phase and lowest (about 147 species) during its final era. Between types and periods, the trend line varied with increases and reductions. Depending on the circumstances in each habitat, there are differences in the quantity of plants. For instance, a lack of vegetation cover and high temperatures lead to the death or disappearance of many wild plants, particularly those found in arid regions, as their seeds are unable to germinate. Low water levels, increased evaporation, and high salt tides all have an impact on aquatic vegetation. Many of them were lost because there wasn't much rain. (Al-Abbawy *et al.*, 2013; Al-Knaany, 2019; Alsrifi, 2021).

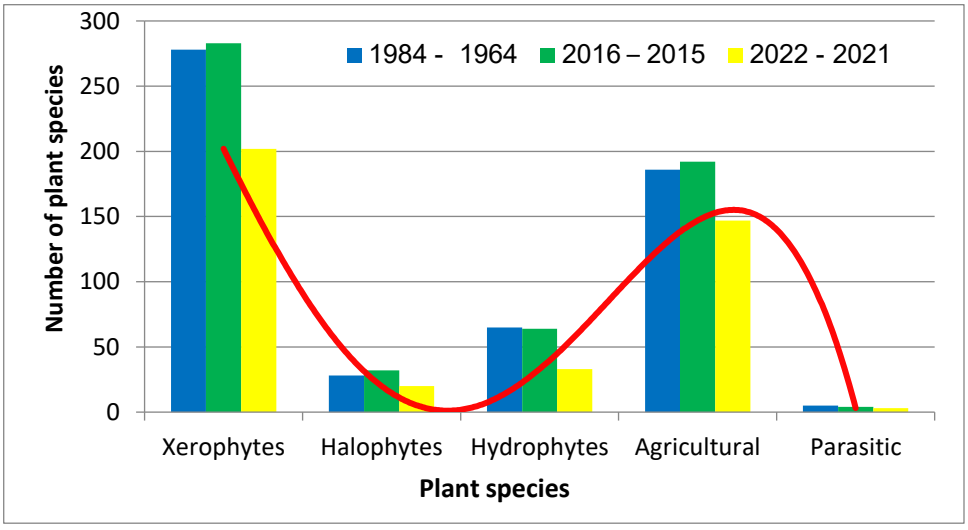

Figure (4) Number of plant species according to their presence in the environment with a trend line from 1964-2022

The presence and distribution of the majority of dicotyledon, mosses, and fern species were linked to a low inverse correlation with the maximum temperature, at a rate of (-0.63, -0.01, and -0.01), respectively. This indicates the correlation between the environmental factors studied and the nature of desert vegetation, as shown in Figure (5).

A high inverse negative correlation of -0.85 was observed between the minimum temperature and these groupings, except for dicotyledonous plants. This could be because most vegetation plants have a fixed demand for temperature for development, flowering, and fruiting, which means that high temperatures negatively impact most vegetation plants.

Regarding the relationships between the studied plant groups and the percentage of humidity and the amount of rain, these relationships were all directly positive because one of the most crucial climate elements for plant growth is the availability of water in the environment in which plants grow, whether that water comes from irrigation, precipitation, groundwater, humidity, or transpiration. This is consistent with (Al-Maleh 2015; Al-Knaany, 2019; Al-Saeedi, 2022).

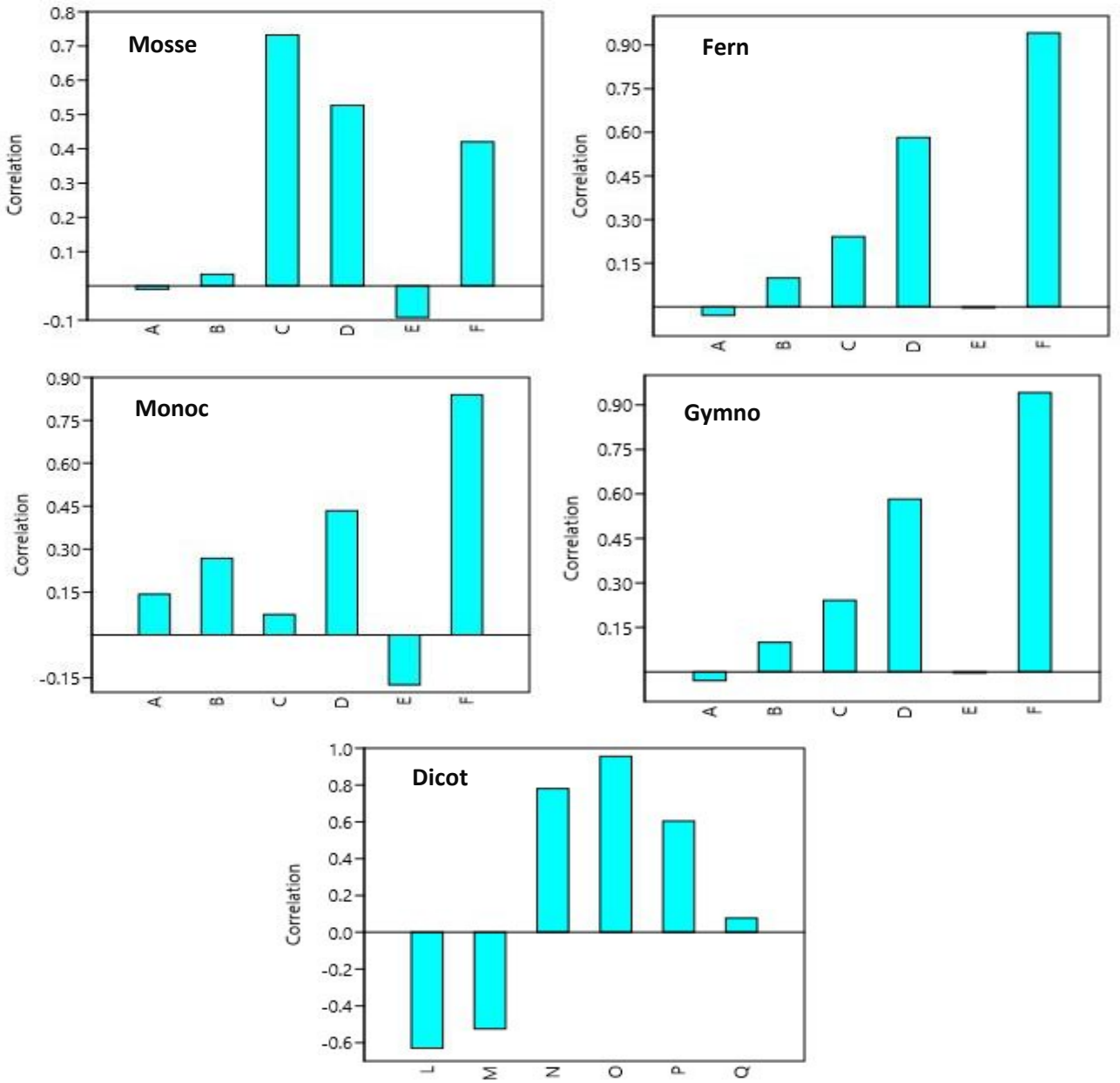

Figure (6): Correlation between climate elements and plants according to plant groups for the study period (A: Maximum temperature, B: Minimum temperature, C:Rain, D: Humidity, E:Evaporation, F:Plant group)

Regarding desert plants, there is an inverse link between the highest and lowest temperatures and the quantity of rain and relative humidity. These relationships are strong, positive, and direct. The explanation could be because desert plants are sensitive to temperature, and that dry weather inhibits the germination of seeds and the growth of perennial plants, as a result, will result in As a result of the lack of desert vegetation cover, we can observe that desert plants have adapted in a variety of ways to survive in the desert. For example, some have mutated into thorny stems or leaves to store water, while others have covered some of their parts with dense hairs or a thick layer of wax to prevent evaporation and water loss.

The impact of weather factors like heat is often cited as the cause. The effects of light, humidity, and solar radiation on plants cause variations in their growth processes, which are then reflected in their phenotypic and anatomical features (Abdul-Wahid, 2003). Plant cover is also vulnerable to a variety of issues, including road construction, sand intrusion, fire, and contamination from the environment. Development initiatives in vegetated areas, haphazard automobile traffic in plant-growing zones, garbage disposal, and soil movement (Al-Shehri, 2009; Tuaih and Al-Asadi, 2023.) (Figure 7).

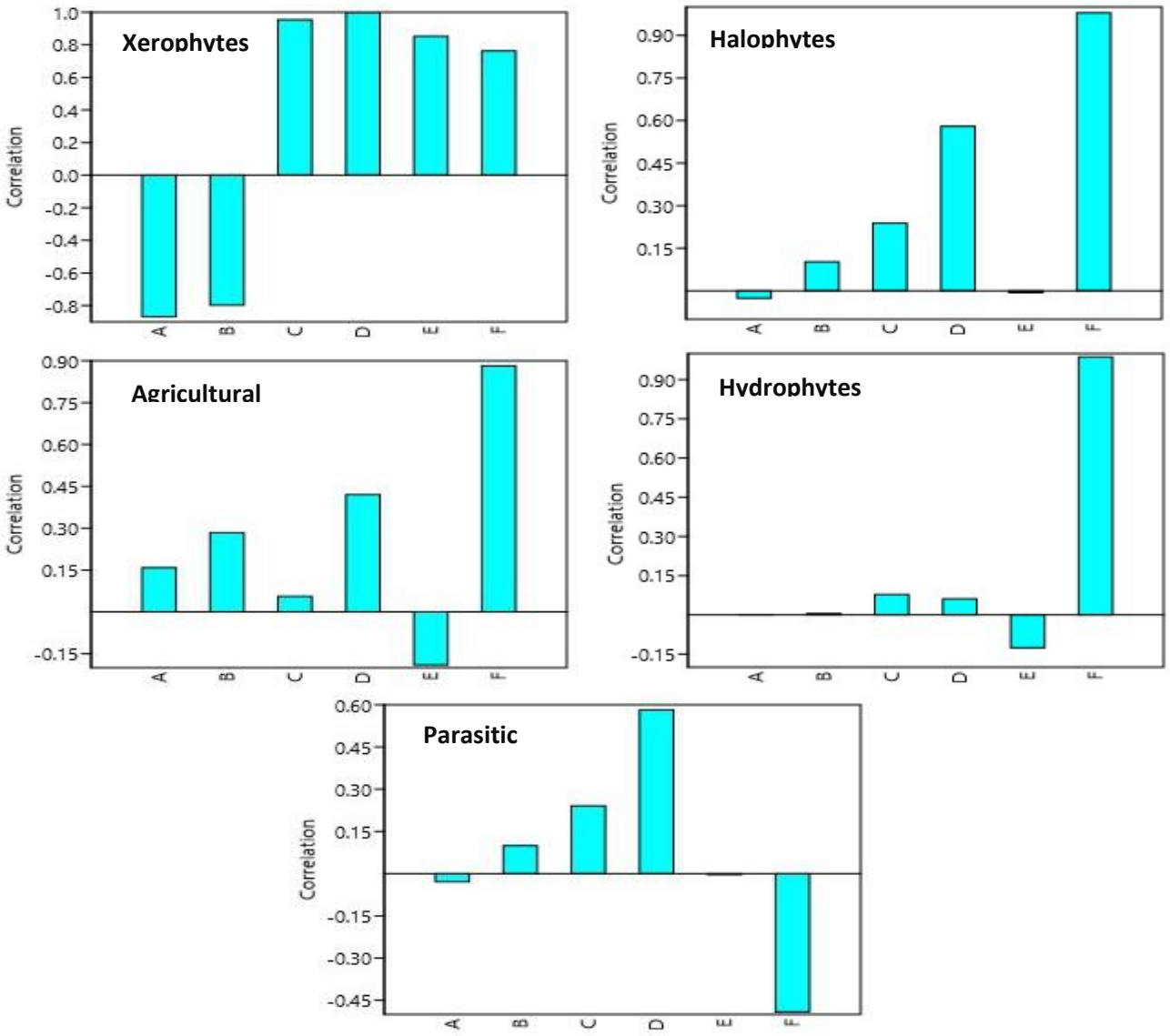

Figure (7) shows the relationship between plants and climate factors based on the plants' existence in the ecosystem during the study period. (A: Maximum temperature, B: Minimum temperature, C:Rain, D: Humidity, E:Evaporation, F:Plant group)

Furthermore, halophytic plants showed -0.03 and -0.01 negative connection with the maximum temperature and evaporation, respectively. The reason behind this is that halophytic plants require high-salinity soil to support their growth, and they also need to maintain their transpiration and evaporation losses to survive. Because the plant dies when the osmotic pressure between the inside of the cell and the outside environment penetrates, the temperatures that cause this loss are those that keep the water in the cells and stabilize the osmotic pressure inside the cells.

Only the parasitic plants had a substantial positive association (0.58) with humidity and a very minor inverse correlation (-0.03 and -0.01, respectively). Its nutrition and access to water depend entirely on the host, as it may require a certain amount of moisture for the growth of its seeds and the action of growth stimulants secreted by the host plants roots. This could be the case because parasitic plants have negligible effect on environmental conditions, especially if they grow and begin parasitism (Al-Mayah *et al.*, 2020; Alsrifi, 2021).

Conclusion

Based on the current study, we conclude that Basrah Province's biodiversity and vegetation cover are continuously declining over time because of changes in the various climatic factors. The two most important of these factors are temperature and rain, and as these factors decline, so does the vegetation cover, resulting in a lack of diversity across the Basrah Province.

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تأثير بعض العناصر المناخية على تواجد وانتشار النباتات الطبيعية في محافظة البصرة وعلاقة الارتباط بينهما

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المستخلص

تم في هذا البحث دراسة الارتباط المتعدد بين عناصر المناخ (درجتي الحرارة العظمى والصغرى والامطار والنسبة المئوية للرطوبة والتبخر) للفترات الزمنية من (1984-2022) الحاصل عليها من محطة الارصاد الجوي والزلزالي في بغداد ومحطة الانواء الجوية في حي الحسين وعلاقتها بتواجد النباتات الطبيعية من خلال عدد النباتات حسب تطورها في البيئة (حزازيات وسرخسيات وعاريات بذور ومغطاة بذور) وكذلك حسب تواجدها في البيئة منها النباتات الصحراوية والملحية والمائية والمتطفلة للفترات الزمنية (1964-2022) بالاعتماد على الموسوعة النباتية العراقية وبيئة ونباتات البصرة والسفرات الحقلية للباحث. اذ لوحظ ان خط الاتجاه لتواجد النباتات في بيئة محافظة البصرة يكون متذبذب من الاعلى الى الادنى للسنوات الاخيرة، اذ سجلت اعلاها لنباتات ذوات الفلقتين تلتها نباتات ذوات الفلقة الواحدة وان النباتات الصحراوية أكثر انتشار وتواجد من بقية البيئات المدروسة. كما لوحظ من نتائج الارتباط المتعدد ان اغلب المجاميع النباتية ارتبطت مع درجة الحرارة العظمى بعلاقة موجبة ضعيفة جداً يقابلها بعلاقة عكسية سالبة مع التبخر اما الامطار والرطوبة فقط كانت علاقة الارتباط موجبة عالية، ماعدا النباتات المتطفلة التي كانت علاقتها بالعناصر المناخية المدروسة سالبة.

الكلمات المفتاحية: العناصر المناخية، درجات الحرارة، كاسيات البذور، الارتباطات المتعددة