Journal homepage
www.ajas.uoanbar.edu.iq
Anbar Journal of Agricultural Sciences
(University of Anbar – College of Agriculture)

INCREASING WILD PLANT SPECIES IN THE WESTERN DESERT DISTRICT OF IRAQ

O. M. Othman [1] A. M. A. Al-Kasiy [1] A. K. H. Al-Hazemawi [2]
S. S. Shahatha [1]* N. M. Abood [1] M. O. Mousa [1]

[1] Center of Desert Studies, University of Anbar, Iraq.
[2] Ministry of Education, Anbar Education Directorate, Ramadi, Iraq.

***Correspondence to:** Suad Shallal Shahatha, Center of Desert Studies, University of Anbar, Ramadi, Iraq.
Email: suad.alfahdawi@uoanbar.edu.iq

Article info

Received: 2025-02-08
Accepted: 2025-04-26
Published: 2025-06-30

DOI-Crossref:
10.32649/ajas.2025.187543

Cite as:
Othman, O. M., Al-Kasiy, A. M. A., Al-Hazemawi, A. K. H., Shahatha, S. S., Abood, N. M., and Mousa, M. O. (2025). Increasing wild plant species in the western desert district of iraq. Anbar Journal of Agricultural Sciences, 23(1): 596-613.

Abstract

Based on the field surveys conducted in farms and prairies across the Western Desert District of Iraq from 1993 to 2023. which aimed to collect wild plant species and weeds; the study concluded to identify increasing wild plant species based on the geographic distribution and numerical density of species in general in this district. According to the ancient Iraqi Flora, and what was recorded during the current study, it resulted in the registration of 41 plant species rapidly spreading and increasing despite the environmental conditions variations and climate changes in the study area. These species were distributed among 13 plant families, with eight species distinguishing the Amaranthaceae and Asteraceae families by 19.5% each. The Brassicaceae and Poaceae families followed with five species each, with a percentage of 12.0%. The Fabaceae family included four species (9.7%), the Polygonaceae family had three species (7.3%), and the Malvaceae family only had two species (4.8%), while the rest of the six families were represented by a single species each, with a percentage of 2.4%. To ensure the modernity and acceptability of names in the scientific community, the study checked the names of all species to adopt those accepted globally, revealing nine species with synonymous scientific names. The information concerning all

species was tabulated by mentioning the families they belong to, common names, plant habits, and duration. By referring back to the history of species in terms of their original environmental habitat or origin at the global level, it became clear that 36 species (87.8%) are native plant species in Iraq, while the remaining five species are non-native or introduced, accounting for 12.2%. This study considered that some of these species had exceeded the increase stage by invading agricultural fields and marginal lands to become invasive plants, represented by the *Atriplex tatarica*, *Prosopis juliflora*, and *Solanum elaeagnifolium*.

Keywords: Wild plants, Weeds, Increasing species, Invasive plants, Western Desert.

الأنواع النباتية البرية المتزايدة في مقاطعة الصحراء الغربية DWD من العراق

عثمان محمد عثمان [1] عبداللطيف محمود علي القيسي [1] علاء خليف حماد الهزيماوي [2]

سعاد شلال شحاذه [1]* نهاد محمد عبود [1] محمد عثمان موسى [1]

[1] مركز دراسات الصحراء، جامعة الأنبار، العراق.

[2] وزارة التربية، مديرية تربية الأنبار، الرمادي، العراق.

***المراسلة الى:** سعاد شلال شحاذه، مركز دراسات الصحراء، جامعة الأنبار، الرمادي، العراق.

البريد الالكتروني: suad.alfahdawi@uoanbar.edu.iq

الخلاصة

استنادًا إلى المسوحات الحقلِيَّة والميدانية المُنَفَّذة في المزارع والبراري، والتي تمتد عبر أرجاء مقاطعة الصحراء الغربية Western Desert District (DWD) من العراق، وخلال الفترة الممتدة من العام 1993 حتى العام 2023، والتي هدفت إلى جمع الأنواع النباتية البرية Wild plant species والأدغال Weeds، فقد خلصت الدراسة إلى تحديد الأنواع النباتية البرية المتزايدة Increasing بالاعتماد على سعة التوزيع الجغرافي والكثافة العددية للنوع الواحد في هذه المقاطعة بوجه عام. وتبعًا لما أوردته الفلورا العراقية القديمة، وما تم تسجيله خلال الدراسة الحالية التي نتج عنها تحديد 41 نوعًا نباتيًّا تنتشر بشكل سريع ومتزايد بالرغم من تباين الظروف البيئية والتغيرات المناخية التي طرأت على منطقة الدراسة. وقد توزعت هذه الأنواع على 13 عائلة نباتية، وبواقع 8 أنواع ميزت كلاً من العائلتين Amaranthaceae و Asteraceae وبنسبة 19.5% لكل عائلة من مُجمل الأنواع المسجلة. وتلتها العائلتان Brassicaceae و Poaceae بواقع 5 أنواع لكل منهما، وبنسبة 12.0%. أما العائلة Fabaceae فقد ضمت 4 أنواع (9.7%)، والعائلة Polygonaceae ثلاثة أنواع (7.3%)، والعائلة Malvaceae نوعين فقط (4.8%)، في حين تمثلت بقية العائلات الست بنوع واحد لكل منها وبنسبة 2.4%.

ولضمان حداثة ومقبولية الأسماء في المجتمع العلمي، فقد حرصت الدراسة على تدقيق أسماء (Check names) جميع الأنواع لاعتماد المقبولة منها عالميًا (Accepted names)، وقد تبين من خلال ذلك أن هناك 9 أنواع بأسماء علمية مرادفة Synonyms. تمت جدولة المعلومات الخاصة بالأنواع كافة مع ذكر العائلات التي تضمها، والأسماء الشائعة Common names، وطبيعة النبات Habit، وديمومته Duration. ومن خلال العودة إلى تاريخ الأنواع من حيث الموطن البيئي الأول أو الأصل على مستوى العالم، اتضح جليًا أن 36 نوعًا منها (بنسبة 87.8%) هي أنواع نباتية متأصلة Native plant species في العراق، أما المتبقي منها (5 أنواع) فهي غير متأصلة أو مُدخلة Introduced وبنسبة 12.2%. اعتبرت هذه الدراسة أن بعضًا من هذه الأنواع قد تجاوزت مرحلة التزايد من خلال اجتياحها للحقول الزراعية والأراضي الهامشية لتصبح في تعداد النباتات الغازية Invasive، والمتمثلة بكلٍ من نبات الرغل *Atriplex tatarica*، ونبات الغاف *Prosopis juliflora*، وعشبة الباذنجان الفضية *Solanum elaeagnifolium*.

كلمات مفتاحية: أنواع متزايدة، برية، الصحراء الغربية، النباتات الغازية، نباتات أدغال.

Introduction

Environmental factors and geographical differences are natural influences that affect the distribution of plant species, whether as individuals or population groups. These factors appear interconnected, led by high temperatures, rainfall, humidity, light intensity, soil type, winds, elevation above sea level, and other factors in which human and animal activity may play a role. This diversity may be beneficial or detrimental, with its general increase or decrease (22). It is well established that plant biodiversity is greatly influenced by the nature of the area under study. The Western Desert District (DWD), with its vast expanses, lies within the Saharo-Sindian Region, where the short winter (growing season) and long summer are evident, a major factor in the environmental degradation of plants in general (13). In addition, there is a difference in elevation above sea level, which ranges from 28 m near Lake Razzaza to 930 m at the Iraqi-Jordanian-Saudi triangle, represented by Mount Anazah (Figure 1). This vast province of Iraq has not received the required level of recent field attention for studying plant diversity, as has the other provinces in the mountainous region (Amadiya Province (MAM), Rawanduz Province (MRO), Sulaymaniyah Province (MSU), and Mount Sinjar Province (MJS). The Geographic Distribution Bulletin (3), in which Al-Rawi noted the presence of 390 wild plants in this province, and the Encyclopedia of Lowlands in Iraq (23), which was published in only one volume. It must be noted, therefore, that this period, which extended for decades, witnessed many changes in the vegetation cover, both quantitatively and qualitatively, with increases or decreases, the decline of some species to the point of complete disappearance from the region, or the emergence of new species across Iraq and the province. One study showed a sharp decline during this period in 12 wild species in the same province (19), while other studies recorded the spread of new species in Iraq, such as Astragalus vogelii (Webb) Bornm (18). As is known, the degree of plant diversity is not commensurate with the size of this province, which is considered one of the modest provinces in terms of the

number of plant species and their numerical density, except in some of its regions, especially in rainy years, which result in a distinct plant cover (2).

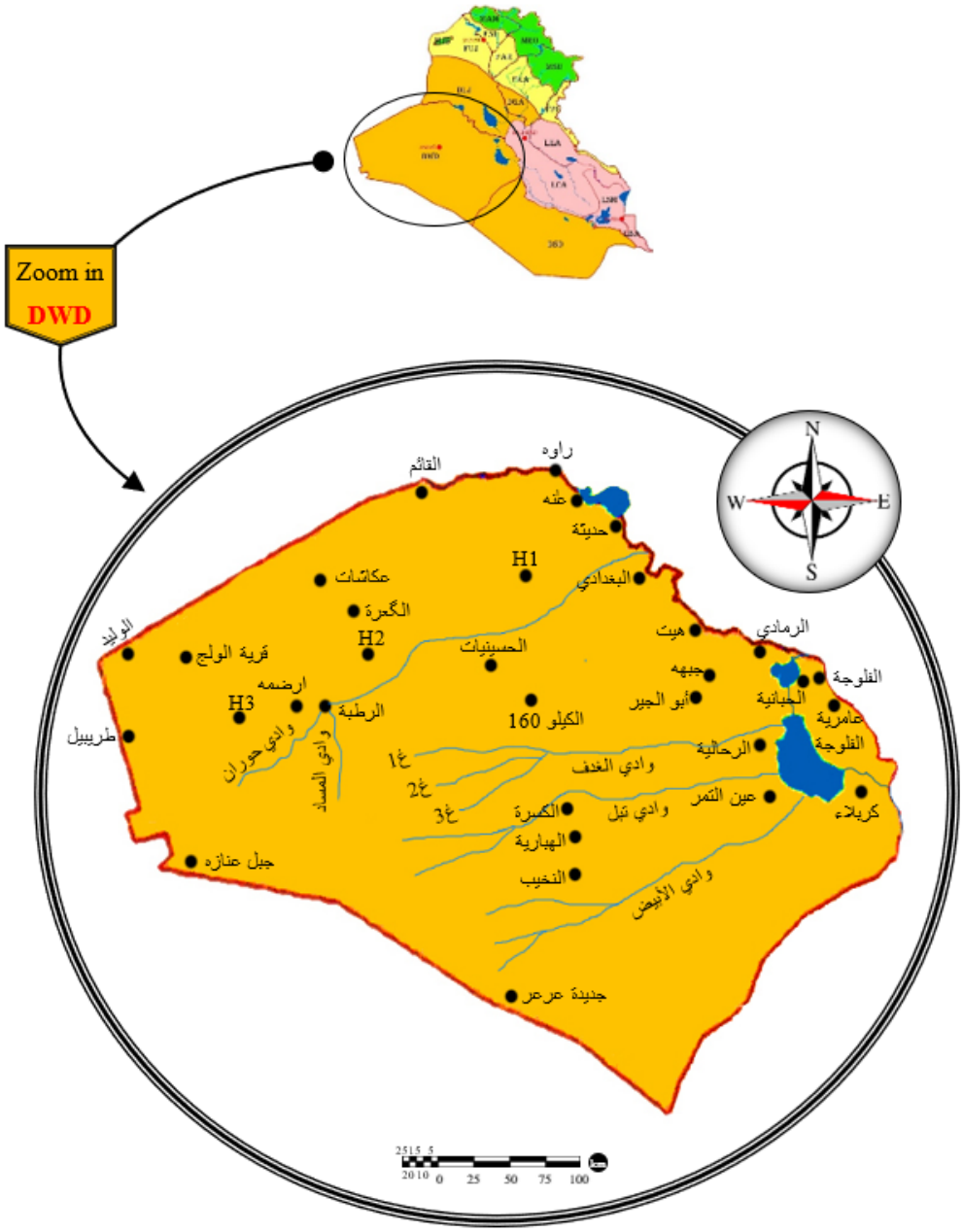

Figure 1: A complete physiographic map of Iraq showing the geographical regions and provinces and a map of the Western Desert District as part of Iraq. Adapted from (13).

This province is home to native wild species, meaning they have evolved, developed, and adapted to live in this environment as their primary habitat thousands of years ago. Other species are called non-native or introduced species, which have never existed historically in the region they now inhabit. Instead, they were introduced randomly, directly, or as a result of human activities (5). The species most harmful to the environment are invasive plants, which are non-native species but possess special characteristics that make them superior to the species initially present in that environment. These characteristics include their rapid growth and spread without exposure to consumers (poisonous or unpalatable plants for animals and humans) and

their tolerance to various environmental changes. They compete with and hinder the growth of native plants, resulting in economic, environmental, and health damage (6). Despite the efforts made by the Iraqi National Herbarium, represented by two recent publications (15 and 16) that focused on the vegetation cover in the lowlands of Iraq, the Western Desert Province has not had a share of this. Through field trips, both past and present, during the rainy and dry years between 1993 and 2023, covering a wide range of areas in the Western Desert District of Iraq, ideas and observations emerged regarding plant diversity, with some species proliferating at the expense of others. This study conducted a historical and field review of the plant species identified by this study as increasing in the province based on a series of years of comparisons. The geographic distribution of the species was based on previously collected samples and indicated by the Iraqi flora, while the recent geographic distributions revealed by the study were compared and adopted as realistic results. Therefore, this study aimed to identify the increasing wild plant species, providing a clearer and more up-to-date picture of the vegetation cover of increasing and invasive species in the Western Desert of Iraq.

Materials and Methods

Dozens (90-100) field trips were conducted in most locations within the Western Desert District of Iraq over the past three decades (1993-2023), during different seasons each year to ensure the collection of annual species in the spring and perennial species in the other seasons (summer, autumn, and winter). The plant species included in this study were collected as growing species after being identified based on all old and new versions of the Iraqi Flora. The necessary steps were followed, including pressing them using wooden presses, cardboard, and drying paper for 8-12 days, depending on the collection season. Electrical (photochemical) drying was used to prevent fungal decay. These samples were mounted on thick paper (files) with an information card containing the internationally accepted scientific name according to recent publications and international name-checking bulletins (12 and 24), the names of the botanical families, the date of collection, the area of collection, and the names of the collectors. With some environmental observations such as habitat, elevation above sea level, and taking photographs of the species in the field whenever possible and within security requirements, especially in areas with a military character or populated areas, as well as in rural areas, large farms, and fields adjacent to residential areas along the Euphrates River, among other observations encountered in this study. In order to develop accurate scientific explanations for the increase shown by these species and their success, this study was diligent in recording all environmental observations and information for each location visited in order to determine the reasons for the increase, which were represented by a mixture of environmental factors, as a natural factor with the role of human and animal factors, in addition to the behavior of the plant and its adaptation to these factors. Plant samples were deposited at a rate of 3-5 typical plant samples for each of the 41 species in the Anbar University Herbarium under numbers 5973-6135, confirming the species identification process before depositing. The study also focused on developing a map of the geographical distribution of all species, which became part of the Western Desert District. After being rare (according to the Iraqi flora), or its

presence in the province was not indicated by any scientific source three decades ago, the study relied on all volumes of the Iraqi flora in order to compare the species mentioned therein with what is present in the study area currently, which was represented by the third volume (29) on the legume family (Fabaceae), and the fourth volume in its two parts (27 and 28), which includes the mustard family (Brassicaceae), the mallow family (Malvaceae), and the tamarisk family (Tamaricaceae). The fifth volume in its two parts (9 and 10), which includes the cockscomb family (Amaranthaceae), the rhubarb family (Polygonaceae), the spring family (Primulaceae), and the umbel family (Apiaceae). The sixth volume (11) is on the Asteraceae family. Finally, the ninth volume (26) is on the Poaceae family and the lowland flora of Iraq (23).

Results and Discussion

After field trips throughout the Western Desert District over the past three decades, this study identified 41 wild or bush plant species that have significantly increased. These species had previously grown at varying levels in terms of their geographical distribution and extent, ranging from non-existent to rare, limited to a single area, or limited in number (three to four locations), and perhaps common in the desert regions of Iraq in general. However, recent years have demonstrated the absence of this variation among species in terms of distribution, numbers, and density of individuals within each species. It has become clear that all the aforementioned species have undoubtedly entered the increasing species stage, and this is the most important result of this study, which was confirmed based on the trips and the resulting consolidation of all basic information related to these species. After a comprehensive review of them through modern scientific sources, the study carefully adopted internationally accepted scientific names (12 and 24). The study included the common and most commonly used names of the species. The species that were characterized by being under shrubs numbered nine, representing 22%, while only two species were distinguished by their shrubby nature, representing 5%.

Regarding plant permanence, the largest share was for annual species, which amounted to 25 species, representing 61%. The remaining species (16 species) were perennial, representing 39%. The names of the plant families these species belong to were added and arranged alphabetically (Table 1).

Table 1: Extended-plant species, including their families and common names, and sustainability.

No.	FAMILY Species	Common Name	Habit and duration
AMARANTHACEAE			
1.	*Amaranthus graecizans* L.	**ABU AREEF**	**Herb-Annual**
2.	*Amaranthus viridis* L.	**AREEF AL-DEEK**	**Herb-Annual**
3.	*Atriplex tatarica* L.	**RUGUL NAIEM**	**Herb-Annual**
4.	*Caroxylon cyclophyllum* (Baker) Akhani	**KHUTHRAF**	**Subshrub-perennial**
5.	*Caroxylon imbricatum* (Forssk.) Moq.	**KHUTHRAF**	**Subshrub-perennial**
6.	*Chenopodiastrum murale* (L.) Fuentes	**RUGAILAH**	**Herb-Annual**
7.	*Chenopodium album* L.	**RIMRAM ABYADH**	**Herb-Annual**
8.	*Suaeda aegyptica* (Hassela.) Zohary	**QALLAAM**	**Subshrub-Annual**
APIACEAE			
9.	*Ammi majus* L.	**ZIND AL-AROOS**	**Herb-Annual**
ASTERACEAE			
10.	*Carduus pycnocephalus* L.	**THAYL AL-KALBAA**	**Herb-Annual**
11	*Carthamus oxyacanthus* M. Bieb.	**KASOOB ASFAAR**	**Subshrub-Annual**
12.	*Cichorium intybus* L.	**HINDIBAA ZARQAA**	**Herb-perennial**
13.	*Erigeron bonariensis* L.	**THUAL AL-THEEB**	**Herb-Annual**
14.	*Lactuca serrula* L.	**KHAS AL-BAR**	**Herb-Annual**
15.	*Launaea nudicaulis* (L.) Hook. F.	**HAUWAH**	**Herb-perennial**
16.	*Silybum marianum* (L.) Gaertn.	**KULAGAN**	**Herb- Biennial**
17.	*Sonchus oleraceus* L.	**MURREER**	**Herb-Annual**
BRASSICACEAE			
18.	*Diplotaxis harra* (Forssk.) Boiss.	**KHAFAJ**	**Herb-perennial**
19.	*Eruca vesicaria* (L.) Cav.	**JIRJEER BARRE**	**Herb-Annual**
20.	*Mutarda arvensis* (L.) D. German	**KHARDAL**	**Herb-Annual**
21.	*Neotorularia torulosa* (Desf.) Hedge	**HASAR**	**Herb-Annual**
22.	*Sisymbrium irio* L.	**HUWERLAH**	**Herb-Annual**
CONVOLVULACEAE			
23.	*Convolvulus arvensis* L.	**MUDEED**	**Herb-perennial**
FABACEAE			
24.	*Alhagi graecorum* Boiss.	**AAGOOL**	**Subshrub-perennial**
25.	*Melilotus indicus* (L.) All.	**NAFIL**	**Herb-Annual**
26.	*Prosopis farcta* (Banks) J. Macbr.	**KHARNOOB**	**Subshrub-perennial**
27.	*Prosopis juliflora* (Sw.) DC.	**AL-GAAF**	**Shrub-perennial**
MALVACEAE			
28.	*Corchorus trilocularis* L.	**MULOUKHEAYH BARREIAH**	**Subshrub-Annual**
29.	*Malva parviflora* L.	**KHUBBAZ**	**Herb-Annual**
POACEAE			
30.	*Imperata cylindrica* (L.) Raeusch.	**HALFAH**	**Herb-perennial**
31.	*Lolium rigidum* Gaudin	**HUNEEDAH**	**Herb-Annual**
32.	*Lolium temulentum* L.	**RUETAH**	**Herb-Annual**
33.	*Phragmites australis* (Cav.) Trin	**QASSAB**	**Herb-perennial**
34.	*Sorgham halepense* (L.) Pers.	**SIFRENDAH**	**Herb-perennial**

POLYGONACEAE			
35.	*Polygonum aviculare* L.	**QURDHAB**	**Herb-perennial**
36.	*Rumex crispus* L.	**HUMEEDH ASFAR**	**Herb-perennial**
37.	*Rumex vesicarius* L.	**HUMEEDH**	**Herb-Annual**
PRIMULACEAE			
38.	*Lysimachia arvensis* (L.) U. Manns	**RUMAIMENAH**	**Herb-Annual**
SOLANACEAE			
39.	*Solanum elaeagnifolium* Cav.	**BATHINJAN BAREE**	**Subshrub-perennial**
TAMARICACEAE			
40.	*Tamarix aucheriana* (Decne.) Baum	**TURFAH**	**Shrub-perennial**
ZYGOPHYLLACEAE			
41.	*Zygophyllum coccineum* L.	**KHANNAG AL-DAJJAJ**	**Subshrub-perennial**

Given the vast area of the Western Desert District, which constitutes 30% of Iraq's area, it is essential to divide it according to regional names. This is what the current study has done, dealing with eight regions identified on the map (Figure 2), assigning each region a number and a name to illustrate the geographic distribution of species accurately. Accordingly, the current study has carefully reviewed species distribution in this province based on three basic scientific sources: the Bulletin on the Geographical Distribution of Wild Plants in Iraq (3), which summarized previous studies. In addition, it relied on existing plant samples in the Iraqi National Herbarium. This bulletin included a mention of the names of the provinces in which each species is distributed, which was referred to in this study for comparison, noting that this bulletin was issued in 1964.

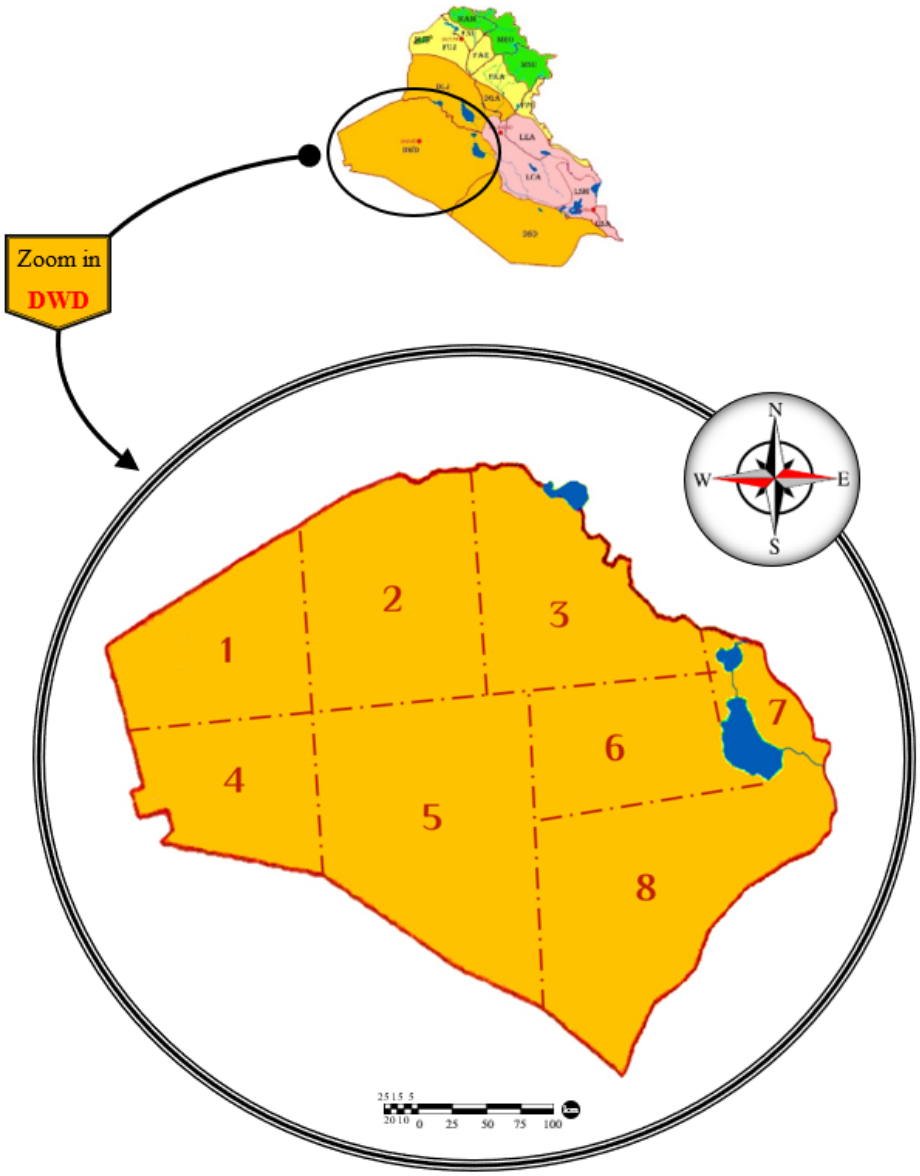

Figure 2: Map of the Western Desert District of Iraq, adapted from (13). The numbers and names of the regions are shown:

1. Al-Walaj region
2. Al-Manaiyyat region
3. Muhayyur region
4. Al-Tabaat region
5. Al-Nukhaib region
6. Al-Akhdar region
7. Al-Razzazah region
8. Al-Lasaf region

The second source (23) was the Iraqi flora of the lowlands of Iraq, which includes this DWD district (the current study area). The third source was the Iraqi flora (1968-1980), which is considered one of the most important local sources of diversity. However, the status of each of these species was examined and distributed on the map to enable us to compare with the numbers of the areas in which each species is distributed according to what was mentioned in the aforementioned sources. This information was also included in a special table, followed by a field specific to the current study showing the distribution of species in the district (Table 2).

Table 2: Comparison between ancient scientific sources and the current study showing the distribution of plant species in the Western Desert District.

NO.	SPECIES	GEOGRAPHICAL DISTRIBUTION OF WILD PLANT 1964	FLORA OF LOWLAND IRAQ 1964	FLORA OF IRAQ 1968-1980	CURRENT STUDY
1.	*Amaranthus graecizans*	♣	3	3	1,2,3,4,5,6,7,8
2.	*Amaranthus viridis*	♣	3	3	1,2,3,5,6,7,8
3.	*Atriplex tatarica*	♣	6	5	1,2,3,4,5,6,7,8
4.	*Caroxylon cyclophyllum*	♣	●	6	1,2,3,4,5,6,7,8
5.	*Caroxylon imbricatum*	♣	2	6,7	1,2,3,4,5,6,7,8
6.	*Chenopodiastrum murale*	♣	3	3	1,2,3,4,5,6,7,8
7.	*Chenopodium album*	●	●	●	2,3,6,7,8
8	*Suaeda aegyptica*	♣	7	6	2,3,6,7,8
9.	*Ammi majus*	●	2,3	●	1,2,3,4,5,6,7,8
10.	*Carduus pycnocephalus*	♣	●	2,3,5,6	1,2,3,4,5,6,7,8
11.	*Carthamus oxyacanthus*	●	●	●	1,2,3,4,6,7,8
12.	*Cichorium intybus*	●	●	●	2,3,6,7,8
13.	*Erigeron bonariensis*	●	3	●	1,2,3,4,5,6,7,8
14.	*Lactuca serrula*	●	2	●	1,2,3,4,5,6,7,8
15.	*Launaea nudicaulis*	♣	●	2,3,5,6,8	1,2,3,4,5,6,7,8
16.	*Silybum marianum*	●	●	●	2,3,6,7,8
17.	*Sonchus oleraceus*	●	1,2,3	2,3	1,2,3,4,5,6,7,8
18.	*Diplotaxis harra*	♣	●	1,2,4,5,6,8	1,2,3,4,5,6,7,8
19.	*Eruca vesicaria*	●	●	●	1,2,3,4,5,6,7,8
20.	*Mutarda arvensis*	●	●	●	2,3,6,7,8
21.	*Neotorularia torulosa*	♣	1	1,2,3,4,5,6,8	1,2,3,4,5,6,7,8
22.	*Sisymbrium irio*	●	8	2,3,6,8	1,2,3,4,5,6,7,8
23.	*Convolvulus arvensis*	●	●	●	1,2,3,4,5,6,7,8
24.	*Alhagi graecorum*	♣	7	6	1,2,3,4,5,6,7,8
25.	*Melilotus indicus*	♣	3,7	3,7,8	1,2,3,4,5,6,7,8
26.	*Prosopis farcta*	♣	7	6	1,2,3,4,5,6,7,8
27.	*Prosopis juliflora*	●	●	●	2,3,5,6,7,8
28.	*Corchorus trilocularis*	●	●	●	2,3,6,7,8
29.	*Malva parviflora*	♣	5,7	2,3,6,7,8	1,2,3,4,5,6,7,8
30.	*Imperata cylindrica*	♣	7	8	1,2,3,4,5,6,7,8
31.	*Lolium rigidum*	♣	2	2,3	1,2,3,4,5,6,7,8
32.	*Lolium temulentum*	♣	2	8	1,2,3,4,5,6,7,8
33.	*Phragmites australis*	♣	7	2,3,7	1,2,3,4,5,6,7,8
34.	*Sorgham nalepense*	●	●	●	2,3,6,7,8
35.	*Polygonum aviculare*	●	●	5	1,2,3,4,5,6,7,8
36.	*Rumex crispus*	●	●	●	2,3,6,7,8
37.	*Rumex vesicarius*	♣	3,5	2	1,2,3,4,5,6,7,8
38.	*Lysimachia arvensis*	●	●	3,6	1,2,3,4,6,7,8
39.	*Solanum elaeagnifolium*	●	●	●	1,2,3,4,5,6,7,8
40.	*Tamarix aucheriana*	♣	●	3,6,7,8	1,2,3,4,5,6,7,8
41.	*Zygophyllum coccineum*	♣	3,7,8	2,3,5,6,7,8	1,2,3,4,5,6,7,8

These following signs mean:

♣ : The species is present in the Western Desert District.

●: No species in the western Desert District.

Numbers 1 to 8 refer to the numbers of the regions shown on the map (Fig. 2).

One of the important results of this study is the recording of 14 species in this province. These three sources had not previously mentioned them in the province but indicated their presence in other provinces within the mountainous region of Iraq or the alluvial plain area. This indicates the potential for these species to expand their distribution and spread in this province. The species that came under the sequences 7, 9, 11, 12, 13, 16, 19, 20, 23, 27, 28, 34, 36, 39 mentioned in the previous table. The current study has proven the distribution of these species in at least five regions, while others were distributed in 6, 7, or 8 regions.

Meanwhile, three species (17, 35 and 38) were mentioned only in the Iraqi flora, and they currently enjoy a wide geographical distribution ranging between 6-8 regions. At the same time, the current study indicated their presence in all regions and under sequences 4, 22, and 40. This indicates that the species continuously migrate and may adapt to a new environment if its harsh conditions flourish and increase if the new environmental conditions are suitable and encouraging (30). Hence, it is clear that at least 20 species have been added to this province during the past three decades, while the remaining 21 species have been able to increase their spread and distribution. Although the presence of the species in the Western Sahara province was indicated in some of the aforementioned sources, the distribution may be in only one location, as was mentioned with the species Amaranthus graecizans. The second source (23) and the third source (9) indicated their presence only in the Hit area, located within region 3. There are other species, such as Suaeda aegyptica, whose three sources indicated its presence only in the Salt Sea near the Shathatha area, while today, it is in five regions and at high density, especially in lands with high humidity and salinity. It should be noted that some of the species under study are initially broadly distributed plants, such as *Diplotaxis harra*, *Malva parviflora*, *Neotorularia torulosa*, and *Zygophyllum coccineum*. Despite their relatively average density, they have emerged during the current study as very large population groups, whether in prairies and valleys, thriving due to rainfall, or existing in thickets near agricultural lands, neglected lands, and highways, where water pools, streams, and irrigation ditches gather, and even on the outskirts of cities, public parks, and other areas. As for the species that have surpassed the stage of increase to reach the stage of invasive plants, represented by the species Solanum elaeagnifolium, Prosopis juliflora, and Atriplex tatarica, the direct increase in geographical distribution areas and the high population density are what make the plant an invasive species, not hindered by natural borders such as rivers or artificial ones such as cities and others (4 and 7). This characteristic has several causes, including rapid growth, the ability to reproduce quickly and successfully, the ability to spread and move quickly, and the ability to withstand a wide range of environmental conditions and adapt easily.

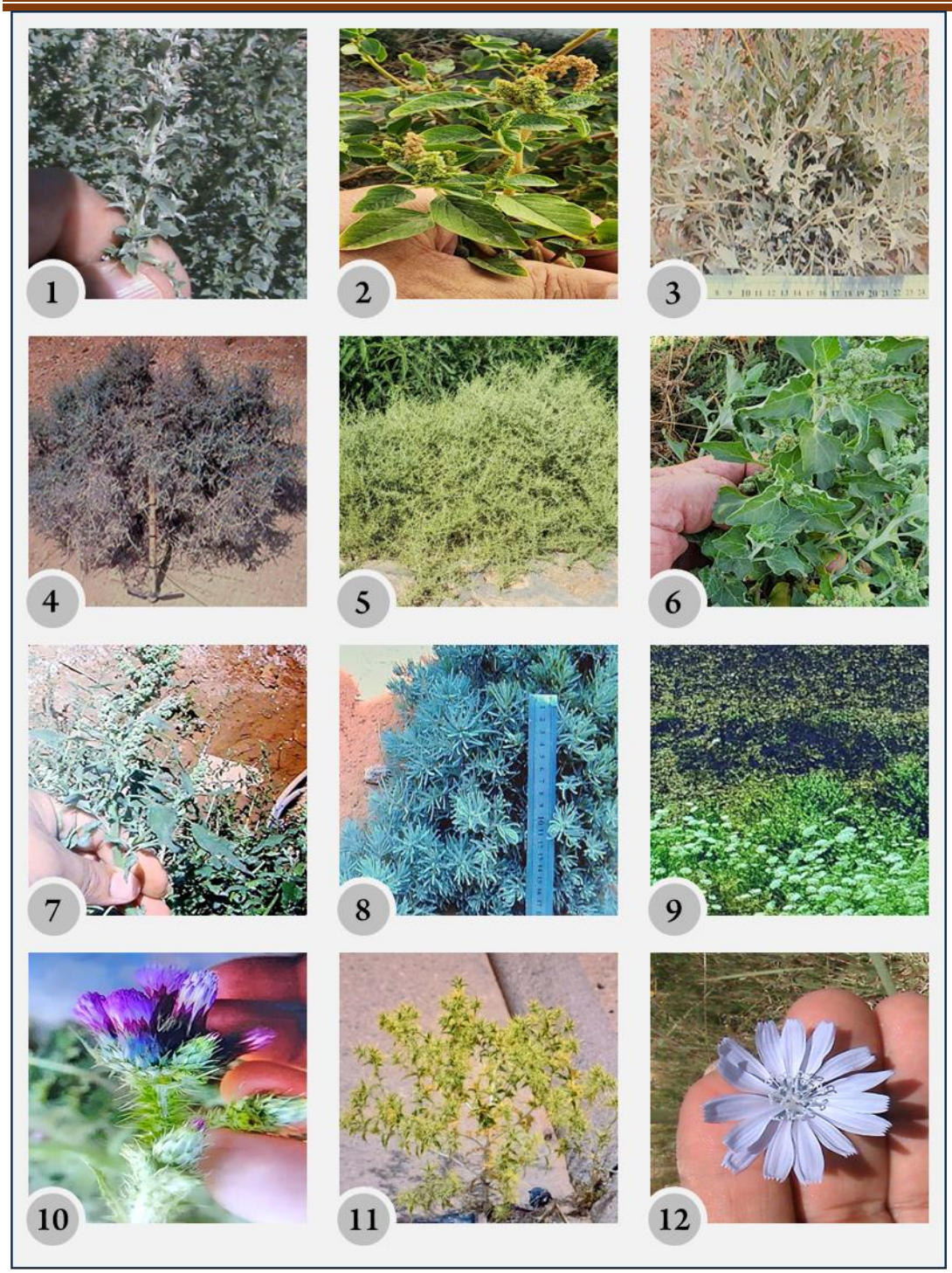

Plate 1: Identification photographs of wild plant species growing in the Western Desert District of Iraq.

1. *Amaranthus graecizans* **2.** *Amaranthus viridis* **3.** *Atriplex tatarica*
4. *Caroxylon cyclophyllum* **5.** *Caroxylon imbricatum* **6.** *Chenopodiastrum murale*
7. *Chenopodium album* **8.** *Suaeda aegyptica* **9.** *Ammi majus*
10. *Carduus pycnocephalus* **11.** *Carthamus oxyacanthus* **12.** *Cichorium intybus*

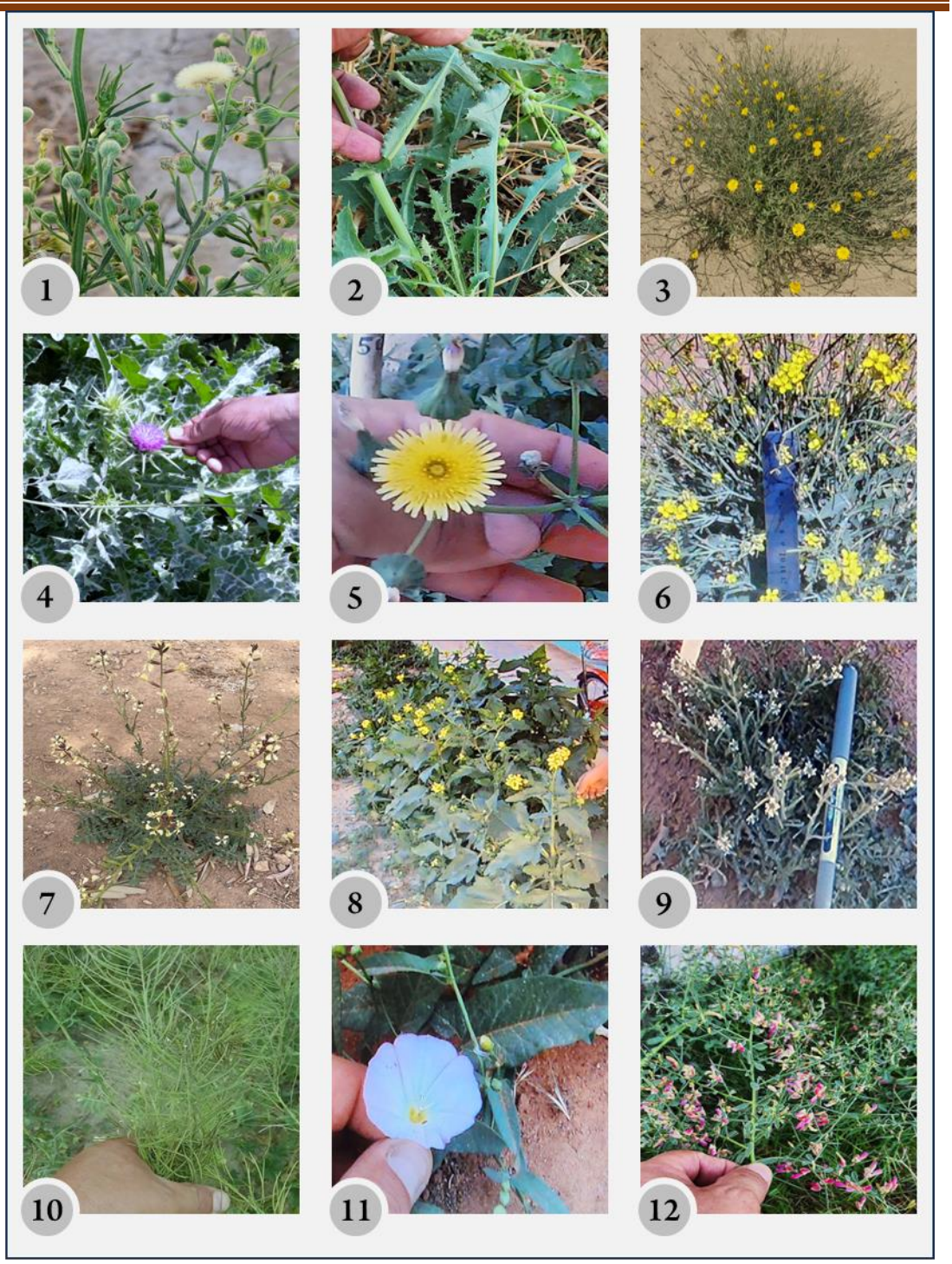

Plate 2: Identification photographs of wild plant species growing in the Western Desert District of Iraq.

1. *Erigeron bonariensis* **2.** *Lactuca serrula* **3.** *Launaea nudicaulis*

4. *Silybium marianum* **5.** *Sonchus oleraceus* **6.** *Diplotaxis harra*

7. *Eruca vesicaria* **8.** *Mutarda arvensis* **9.** *Neotorularia torulosa*

10. *Sisymbrium irio* **11.** *Convolvulus arvensis* **12.** *Alhagi graecorum*

Plate 3: Identification photographs of wild plant species growing in the Western Desert District of Iraq.

1. *Melilotus indicus* **2.** *Prosopis farcta* **3.** *Prosopis juliflora*

4. *Corchorus trilocularis* **5.** *Malva parviflora* **6.** *Imperata cylindrica*

7. *Lolium rigidum* **8.** *Lolium temulentum* **9.** *Phragmites australis*

10. *Sorgham nalepense* **11.** *Polygonum aviculare* **12.** *Rumex crispus*

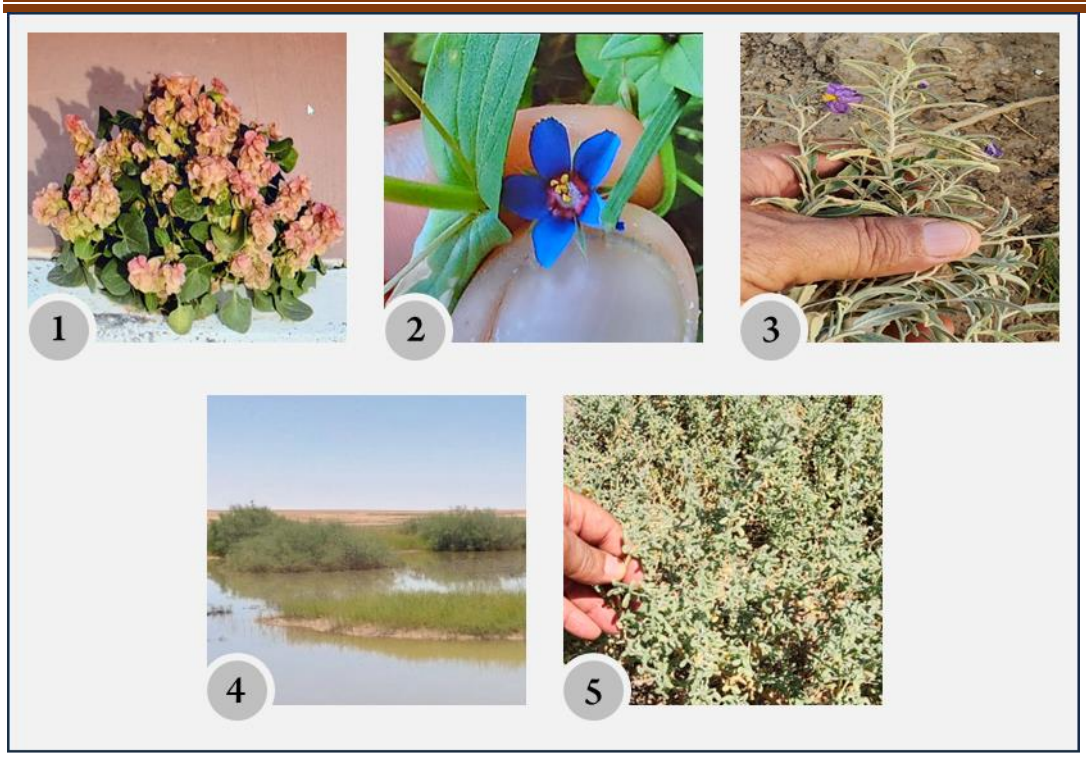

Plate 3: Identification photographs of wild plant species growing in the Western Desert District of Iraq.

1. *Rumex vesicarius* **2.** *Lysimachia arvensis* **3.** *Solanum elaeagnifolium*
4. *Tamarix aucheriana* **5.** *Zygophyllum coccineum*

Conclusions

The results of this study indicate that environmental changes, whether caused by climate or human activity, have led to the increased spread of some wild plant species in the Western Desert of Iraq, while others have become invasive. This research highlights the need to monitor these species, such as Atriplex tatarica, Prosopis juliflora, and Solanum elaeagnifolium, particularly invasive species that may negatively impact biodiversity and local ecosystems. Based on the findings, the study recommends implementing regular monitoring programs and collaboration between research and environmental institutions to develop effective strategies for managing invasive species and ensuring the preservation of ecological balance in the region.

Supplementary Materials:

No Supplementary Materials.

Author Contributions:

Author O. M. Othman; methodology, writing - original draft preparation, Authors A. M. A. AL-Kaisy, Alaa K. H. Al-Hazemawi, S. S. Shahatha, N. M. Abood, and M. O. Mousa writing - review and editing. All Authors have read and agreed to the published version of the manuscript.

Funding:

This research received no external funding.

Institutional Review Board Statement:

The study was conducted following the protocol authorized by the Head of the Ethics Committee, University of Anbar, Iraq Republic.

Informed Consent Statement:

No Informed Consent Statement.

Data Availability Statement:

No Data Availability Statement.

Conflicts of Interest:

The authors declare no conflict of interest.

Acknowledgments:

We want to thank everyone who accompanied us and worked with us to facilitate the survey and field trips, including farmers, landowners, rural residents, and Bedouins in the deserts of Karbala and Anbar provinces.

Disclaimer/Journal's Note:

The statements, opinions, and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of AJAS and/or the editor(s). AJAS and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions, or products referred to in the content.

References

1. Al-Fahdawi, S. T. A., and Al-Warshan, S. H. S. (2024). Effective of some plant extracts on the growth of fungus *Aspergillus flavus* and reduce the production of aflatoxin B1 on stored corn. Anbar Journal of Agricultural Sciences, 22(1): 735-749. https://doi.org/10.32649/ajas.2024.183833.
2. Al-Khateeb, M. (1973). Desert rang of Iraq. Ministry of Agriculture and Agrarian Reform. Iraq, 440.
3. Al-Rawi, A. (1964). Wild plants of Iraq with their distribution. Tech. Bull. No. 14. Genetic Agriculture Research Project. Ministry of Agriculture Government Press, 232.
4. Byalt, V. V., and Korshunov, M. V. (2021). Distribution of Invasive Species Prosopis juliflora (Mimosaceae) in Fujairah (UAE). Russian Journal of Biological Invasions, 12(2): 157-166. https://doi.org/10.1134/S2075111721020053.
5. Convention on Biological Diversity. (2010). Global Biodiversity Outlook. Vol. 3. Montreal, Canada, 93.
6. Dogra, K. S., Sood, S. K., Dobhal, P. K., and Sharma, S. (2010). Alien plant invasion and their impact on indigenous species diversity at global scale: A review. Journal of ecology and the natural environment, 2(9): 175-186.
7. Ehrenfeld, J. G. (2010). Ecosystem consequences of biological invasions. Annual review of ecology, evolution, and systematics, 41(1): 59-80. https://doi.org/10.1146/annurev-ecolsys-102209-144650.
8. Farhan, T. F., and Sekhi, Y. S. (2024). Effect of plant growth regulators and explants on the micropropagation of *Capparis spinosa* L. Anbar Journal of Agricultural Sciences, 22(1): 750-762. https://doi.org/10.32649/ajas.2024.183834.
9. Ghazanfar, S. A., and Edmondson, J. R. (2013). Flora of Iraq, Vol. 5, Part 2: Lythraceae to Campanulaceae. Ministry of Agriculture and Agrarian Reform, 349.

10. Ghazanfar, S. A., and Edmonson, J. R. (2016). Flora of Iraq. Vol. 5, part 1: Elatinaceae to Sphenocleaceae. London, UK: Royal Botanic Gardens, Kew, 285.
11. Ghazanfar, S. A., Edmondson, J. R., and Hind, J. N. (2019). Flora of Iraq, vol. 6. Royal Botanic Gardens, Kew, London.
12. Govaerts, R., Nic Lughadha, E., Black, N., Turner, R., and Paton, A. (2021). The World Checklist of Vascular Plants, a continuously updated resource for exploring global plant diversity. Scientific data, 8(1): 215. https://doi.org/10.1038/s41597-021-00997-6.
13. Guest, E., and Townsend, C. C. (1966). Flora of Iraq: Leguminales (Vol. 3). Ministry of Agriculture of the Republic of Iraq.
14. Haglan, M. M., and Majed, A. A. (2023). Effect of adding fennel seeds (*Foeniculum vulgare* L.) to diets on productive performance of laying hens. Anbar Journal of Agricultural Sciences, 21(2): 494-504. https://doi.org/10.32649/ajas.2023.179749.
15. Haloob, A., Ajeel, A. J., Al-Kaisi, S. T., Abbas, N. D., Hamshkan, R. S., Fadhil, R. M., Abd Al-Razzag, Z., and Qassim, M. (2018). Illustrated Flora of Lowland, Iraq. Vol.1, part 2. Upper plains and foothills subdivision. Ministry of Agriculture, National Herbarium of Iraq, 108.
16. Haloob, A., Al-Kaisi, S. T., Abbas N. D., Hamshkan, R. S., Alwan, H. A., Fadhil, R. M., Hadi, N. J., Qassim, M., Faid, S., and Muaiad, S. (2016). Illustrated Flora of Lowland, Iraq. Vol. 1, part 1. Upper plains and foothills subdivision. Ministry of Agriculture, National Herbarium of Iraq, 161.
17. Lafi, A. Sh. A., Abed, I. A., Hamdan, N. T., Alkobaisy, J. S., and Mutlaq, H. H. (2024). Comparative antibacterial activity of fruiting body extracts from Pleurotus ostreatus grown on substrates supplemented with *Caroxylon cyclophylla* and *Atriplex tatarica* against pathogenic bacteria and common antibiotics. Anbar Journal of Agricultural Sciences, 22(2): 1662-1678. https://doi.org/10.32649/ajas.2024.
18. Mousa, M. O., M., M. Ayyed, I., S. Shahatha, S., M. Abood, N., H. Mukhlif, F., A. Alkubaisy, S., and M. A. AL-Kasiy, A. (2024). Comparative stem anatomy of eight selected wild plant species from papilionaceae family in western desert district (dwd). Anbar Journal of Agricultural Sciences, 22(2): 773-789. https://doi.org/10.32649/ajas.2024.139042.1031.
19. Mousa, M. O., Shahatha, S. S., Ayyed, I. M., Al-Kaisy, A. M., Abood, N. M., MakhliF, F. H., and Meklef, A.A. (2023). Geographical distribution of decreasing wild plant species in the desert of western Iraq. Iraqi Journal of Desert Studies, 13(1): 51-61. https://doi.10.36531/IJDS.2023.139005.1029.
20. Othman, O. M., and Hamad, R. M. (2022). Pollen Micromorphological Study of Ten Genera of Brassicaceae in West Iraq Desert. In IOP Conference Series: Earth and Environmental Science, 1060(1): p. 012103. DOI: 10.1088/1755-1315/1060/1/012103.
21. Qasem, J. R., Al Abdallat, A. M., and Hasan, S. M. (2019). Genetic diversity of Solanum elaeagnifolium, an invasive problematic weed in Jordan. Weed Research, 59(3): 222-234. https://doi.org/10.1111/wre.12360.

22. Radford, A. E., Dikison, W. C., Massey, J. R., and Bell, C. R. (1974). Vascular Plant Systematics. Harper and Row, New York, 891.
23. Rechinger, K. H. (1964). Flora of Lowland Iraq. Weinheim, Verlag Von J. Gramer, Wein, 235-240.
24. Taifour, H., and El-Oqlah, A. (2016). Annotated checklist of the vascular plants of Jordan. Kew Publishing, Royal Botanic Gardens, 162.
25. Tataridas, A., Moreira, M., Frazao, L., Kanatas, P., Ota, N., and Travlos, I. (2023). Biology of Invasive Plants 5. *Solanum elaeagnifolium* Cav. Invasive Plant Science and Management, 16(3): 139-159. https://doi.org/10.1017/inp.2023.21.
26. Townsend, C. C., and Guest, E. (1968). Flora of Iraq. V.9. Gramineae. Ministry of Agriculture, Baghdad, 588.
27. Townsend, C. C., and Guest, E. (1980). Flora of Iraq. Vol. 4. (1) Cornaceae to Rubiacee. Ministry of Agriculture and Agrarian Reform, Baghdad, 627.
28. Townsend, C. C., and Guest, E. (1980). Flora of Iraq. Vol. 4. (2) Bignoniaceae to Resedaceae. Ministry of Agriculture and Agrarian Reform, Baghdad, 572.
29. Townsend, C.C., and Guest, E. (1974). Flora of Iraq. V.3. Leguminales. Ministry of Agriculture and Agrarian Reform, Baghdad, 662.
30. Umkulzhum, F., Ameena, M., Susha, V. S., Renjan, B., Sreelekshmi, K., Sethulekshmi, V. S., and Shanavas, S. (2024). Weeds and Their Response to Changing Climate: A Review. International Journal of Environment and Climate Change, 14(4): 768-779. https://doi.org/10.9734/ijecc/2024/v14i44157.