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RESEARCHARTICLE

Taxonomic study of wild species of the Fabaceae family in Diyala Province-Iraq

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Abstract

The research included the study of one of the aspects of biodiversity in Diyala Governorate and a comprehensive botanical survey of all wild species of the legume family present in the governorate during the years 2022–2021. The research was based on 62 plant samples with their replicates collected by the researcher, where 32 species belonging to 13 genera of the legume family were found classified scientifically, and their local and common names were mentioned in Iraq or the Arab world, as well as their permanence and economic importance (medical, food, fodder, toxic, industrial, fuel, and other uses) with mention of their geographical distribution. In the provinces of Iraq and their affiliation with the neighboring countries (Saudi Arabia, Kuwait, Turkey, Iran, Syria, and Jordan), due to the convergence of environmental systems and natural climatic conditions, especially between Iran and the study area. It was found from the results of the study that all the species collected are herbaceous plants, as 22 of them were annual plants, 5 types of them were perennials, and 5 types were semi-shrub perennials. In terms of economic importance, the majority of them were high-quality fodder and pastoral plants that were very important in improving soil quality; 6 types of them are medicinal, 2 types are toxic, and 2 types have industrial uses, such as the licorice plant, which is used in pharmaceutical industries, and the fruits of the thistle plant, which are used in tanning leather in some countries, and locally, it is used as a holding material, and shrubby species are used as fuel by the local population and have other uses, and most of them are widespread in other Iraqi provinces, in terms of geographical affiliation in neighboring countries , the highest percentage of geographical affiliation to these reached in Turkey then Iran then Syria then Saudi Arabia, Jordan, and Kuwait.

Keywords: Biodiversity, Iraq flora, wild plants, Fabaceae family, Diyala Province.

Introduction

The leguminous family (Fabaceae) is the second most economically important plant family, with cultivated species all over the world and wild species that are no less important than cultivated plants because they are at the forefront of invested plants in grazing, fodder production, pharmaceutical industries and the extraction of medicinal drugs, essential oils, and therapeutic uses because they have no harmful effects (Almayah, 2013), and some of them are considered green manures, so they are used in agricultural cycles and coexist with the roots of plants (the Rhizobium bacteria), which fix atmospheric nitrogen, which contributes to enriching the soil nitrogen reserves and raising plant productivity (Habib, 2013). The legume family, according to the Hutchinson system, includes three subfamilies: Papilionaceae, Caesalpiniaceae, and Mimosaceae, and it includes 650 taxonomic ranks and 17,000 "cultivated" and wild species of trees, shrubs, trellises, and herbs spread in tropical, subtropical, and hot regions

around the world (Townsend & Guest, 1974), and in view of its great importance at the global level and because there is a great global trend to study wild plants on a large scale, to solve problems of food security, medicine, economic, and other needs and to secure the optimal investment for this vital and important aspect of biodiversity in which the study area (Diyala Governorate) abounds, being located within three vegetation regions are the steppes (semi-mountainous region), the desert-steppe region (the plain region), and the riverside region (Diyala River). This diversity has been subjected to the decline of many wild plant species and the disappearance or extinction of others because of excessive and unsustainable local, commercial and industrial use, overgrazing, urban sprawl, bad land investment, or due to invasive plants that threaten 55% of the local plant communities and the ecosystems associated with them, so the protection of important areas for plant diversity is an essential element for plant conservation activities in all countries as a basis for providing ecosystem services and conserving biodiversity, which supports sustainable livelihoods, and the conservation of wild plants on the basis of local communities (within their natural sites) is the most effective way to preserve plant diversity and protect it from the effects of climatic changes and other factors (Convention on Biological Diversity, 2009). The aim of this study is to conduct a comprehensive botanical survey of the genera and wild plant species of the legume family in the study area to develop an updated database for it and introduce its medicinal, poisonous, and forage types and raise awareness of their importance and protection.

Materials and Methods

Materials

- Protective gloves with a shovel for plants uproot, a high-resolution digital camera, a foldable metric scale, a colour bar (2m) and scissors for cutting branches.
- Geographical Information Systems (GPS) to determine sampling locations at sea level.
- Specially sealed bags for collecting samples, and labels with the place and date of sample collection written on them.
- Carton packages, newspaper paper, wooden presses, herbal scales, carton packages, and paper adhesive.
- Thermal fans, in which succulent plants were dried that could not be dried in the usual way.

Methods

Field visits: The various field trips were carried out at the rate of three field trips per month for almost every study area at regular times as much as possible, as the samples were photographed and collected in clear weather (not windy or rainy), and they were carefully selected to be free from diseases and fungal infections.

Pressing the plant samples: The samples were pressed after being shaken and washed from the dust between newspapers and regular cardboard, and packed between the wooden presses, taking into account opening them and moving them daily until they dried. Then, they were transferred to the herbaceous-size cardboard and fixed with paper tape, and their information patch was pasted on the lower right side of the sample. Written on it are the sample number, the local name, the area and place of collection, the name of the collector or collectors, and the date of collection.

Scientific classification of plants

The plants were classified scientifically based on the Iraqi flora in relation to the leguminous family (Townsen and Guset, 1974), the lowland flora (Rechinger, 1964), the first part of the updated lowland flora in Iraq (Kazim et al., 2016), the second part (Kazim et al., 2018), the geographical distribution of Iraqi wild plants (AL-Rawi, 1964), plant wealth in Iraq (Chakravarty, 1976; Al-Khatib, 1978), the key to classifying the genus Medicago (Francis, 1980; Al-Mahdawi, 2014), and botanical encyclopedias from neighboring countries for Iraq are also included, Turkey (Davis, 1965), Iran (Chrtkova-Zertova, 1979), Syria (Post, 1932), Jordan (Fawzi, 1988), Kuwait (AL-Rawi, 1985), and Saudi Arabia (Migahid, 1978).

Preservation of plant specimens

The samples, after their complete information was written down, were placed inside plastic bags, and the bags were well closed in order to preserve the samples from breakage and damage and were kept in the herb.

Results and Discussion

Phytochemical, Mineral Analysis and Proximate Composition

The botanical survey of the areas of Diyala Governorate during the research period (2021–2022) showed the presence of "wild" species organized into genera, whose taxonomic ranks belong to the Fabaceae family, and it is clear from Table 1 that most of the collected plants are herbaceous plants. Species of which are annual, types of which are perennial, and other types are semi-shrub perennial.

From Table 2, it was found that 29 types of plants are of high fodder and pastoral value and are of great importance in improving soil quality, and types of them are of medical importance (Al-Mosili, 2013), and 2 of them are poisonous. *L. corniculatu* and *M. indicus* are at different stages of its life cycle (Al-Musali, 2018). Some of them are industrial, such as the licorice plant *G. glabra*, which is used in the pharmaceutical industries; the fruit of the thistle plant *P. farcata* is used in leather tanning in some countries; and some of them are used as fuel.

The results of Table 3 showed that all plants are widely spread in the different provinces of Iraq (Towensend & Guest, 1974) and (AL-Rawi, 1964). In terms of geographical affiliation, the highest percentage of geographical affiliation was in Turkey, Iran, Syria and Saudi Arabia, Jordan and Kuwait.

Table 1. Plants of the legume family classified according to the nature of their growth in the study area

Family		The scientific name	Common name	The nature of growth
Fabaceae	1	*Alhagi graecorum Boiss.*	Al-Aqoul -Al-Haji	Perennial shrub
	2	*Astragalus asterias Steven*	Qitad najmi	Annual
	3	*Astragalus dactylocarpus Boiss*	Khanasir Al Arous- jadad	Perennial
	4	*Astragalus russelii Banks et Sol*	jadad -takik	Perennial shrub
	5	*Astragalus spinosus(Forsk.)H-M.*	Spiny jadad - takik	Perennial shrub
	6	*Astragalus tribuloides Del.*	Khishnan- Sharshir	Annual
	7	*Glycyrriza glabra L.*	SWS	Perennial shrub
	8	*Hippocrepis bicontorta Lois.*	Umm Al-Qurain -Qurena	Annual
	9	*Hippocrepis multisiliquosa L.*	Hudwat alhisan	Annual
	10	*Hippocrepis unisiliquosa L.*	Qurena- Hadwat alhisan	Annual
	11	*Hymenocarpos circinnatus (L.)*	Qurena	Annual
	12	*Lotus corniculatus L.*	Qarn alghazal-rajul aleusfur	Perennial
	13	*Medicago ciliaris Willd.*	Alajt albariyu	Annual
	14	*Medicago laciniata (L.) Mill.*	Alajt -Al-Hasakah	Annual
	15	*Medicago orbicularis (L.) Bartal.*	Qurt- nafla	Annual
	16	*Medicago polymorpha L.*	Lazij	Annual
	17	*Medicago turbinata (L.).*	Alajt	Annual
	18	*Melilotus indicus (L.) All.*	Hundiquq	Annual
	19	*Onobrychis crista-galli(L.)Lam.*	Earf aldiyk-Eanbaris	Annual
	20	*Onobrychi sptolemaica (D).DC.*	Adhan alkharnaqu- Hatala	Perennial
	21	*Prosopis farcta (B et S)Eig*	Alshuwk-Alkharnub	Perennial shrub
	22	*Scorpiurus muricatas L.*	Al-Khuzaima - Hissar	Annual
	23	*Trifolium lappaceum L.*	Nafal	Annual
	24	*Trifolium nigrescens Viv.*	Qadabi -Nafal aswd	Annual
	25	*Trifolium resupinatum L.*	Nafal – Qurt	Annual
	26	*Trifolium repens L.*	Nafal abid	Perennial
	27	*Trifolium tomentosum L.*	Nafal sufi-Nafal Sur	Annual
	28	*Trifolium alexandrium L.*	Barsim	Annual
	29	*Vicia assyriaca Boiss.*	Habu alzarit	Annual
	30	*Vicia narbonensis L.*	Ful bariy	Annual
	31	*Vicia sativa L.*	Bazlat ablis	Annual
	32	*Vicia tenuifolia Roth.*	Aezrat	Perennial

Table 2. Plants of the legume family classified according to their uses in the study area

		The scientific name	Common name	Economic importance
FABACEAE	1	*Alhagi graecorum* Boiss.	Al-Aqoul Al-Haji	Medical,industrial, and fodder
	2	*Astragalus asterias Steven*	Qitad najmi	Medical,toxic
	3	*Astragalus dactylocarpus Boiss*	Khanasir Al Arous- Jaded	Fodder
	4	*Astragalus russelii Banks et Sol*	Jadad –Takik	Fodder,fuel
	5	*Astragalus spinosus(Forsk.)H-M.*	Spiny jaded-Takik	Fodder ,fuel
	6	*Astragalus tribuloides* Del.	Khishnan- Sharshir	Fodder,Medical
	7	*Glycyrriza glabra* L.	SWS	Medical ,industrial
	8	*Hippocrepis bicontorta* Lois.	Umm Al-Qurain -Qurena	Fodder
	9	*Hippocrepis multisiliquosa* L.	Hudwat alhisan	Fodder
	10	*Hippocrepis unisiliquosa* L.	Qurena- Hudwat alhisan	Fodder
	11	*Hymenocarpos circinnatus (L.)*	Qurena	Fodder
	12	*Lotus corniculatus* L.	Qarn alghazal-rajul aleusfur	Fodder,Toxic
	13	*Medicago ciliaris* Willd.	Alajt albariyu	Fodder
	14	*Medicago laciniata* (L.) Mill.	Alajt- Al-Hasakah	Fodder
	15	*Medicago orbicularis* (L.) Bartal.	Qurt-nafle	Fodder
	16	*Medicago polymorpha* L.	Lazij	Fodder
	17	*Medicago turbinata* (L.).	Alajt	Fodder
	18	*Melilotus indicus* (L.) All.	Hundiquq	Medical , Toxic
	19	*Onobrychis crista-galli(L.)Lam.*	Earf aldiyk-Eanbaris	Fodder,Medical
	20	*Onobrychis ptolemaica (Delile).*	Adhan alkharnaqu -Hatala	Fodder
	21	*Prosopis farcta (B. et S)Eig*	Alshuwk-Alkharnub	Fodder,Medical, industrial,Fuel
	22	*Scorpiurus muricatas* L.	Al-Khuzaima –Hissar	Fodder
	23	*Trifolium lappaceum* L.	Nafal	Fodder
	24	*Trifolium nigrescens Viv.*	Qadabi-Nafal aswd	Fodder
	25	*Trifolium resupinatum L.*	Nafal-Qurt	Fodder
	26	*Trifolium repens* L.	Nafal abid	Fodder,Medical
	27	*Trifolium tomentosum* L.	Nafal sufi- Nafal Sur	Fodder
	28	*Trifolium alexandrium* L.	Barsim	Fodder
	29	*Vicia assyriaca* Boiss.	Habu alzarit	Fodder
	30	*Vicia narbonensis L.*	Ful bariy	Fodder
	31	*Vicia sativa L.*	Bazlat ablis	Fodder
	32	*Vicia tenuifolia* Roth.	Aezrat	Fodder

Table 3. Plants of the legume family and their places of spread in Iraq and the neighboring countries of Iraq

Family		The scientific name	Province																						
			Amadiyah	Rawanduz	Sulaymaniyah	Sinjar mountain	upper island	Nineveh	Erbil	Kirkuk	Eastern Border Highlands	Upper Island	Lower Island	Chamber - Al Azeem	Western Desert	Southern Desert	Eastern alluvial plains	Central alluvial plains	Basra	The southern marshes	Kuwait	Kingdom Saudi Arabia	The Hashemite Kingdom of Jordan	Arab Republic of Syria	Islamic Republic of Iran	Turkey
FABACEAE	1	*Alhagi graecorum* Boiss.			X		X	X								X	X	X	X		X	X	X	X	X	X
	2	*Astragalus asterias Steven*	X		X		X		X		X		X		X	X		X					X	X	X	X
	3	*Astragalus dactylocarpus Boiss*	X	X	X				X	X	X	X	X										X	X	X	X
	4	*Astragalus russelii Banks et Sol*	X		X		X	X	X	X	X	X	X					X						X	X	X
	5	*Astragalus spinosus(For sk.)H-M.*			X			X		X	X		X		X	X		X		X		X	X	X	X	X
	6	*Astragalus tribuloides* Del.									X			X	X	X		X	X		X	X		X	X	X
	7	*Glycyrriza glabra* L.		X			X				X							X	X			X	X			X
	8	*Hippocrepis bicontorta* Lois.			X						X	X	X	X		X		X			X	X			X	
	9	*Hippocrepis multisiliquosa* L.								X																X
	10	*Hippocrepis unisiliquosa* L.	X	X	X	X	X	X	X	X	X		X	X	X	X					X	X		X	X	X
	11	*Hymenocarpos circinnatus (L.)*	X	X	X	X	X		X	X	X							X		X	X		X	X	X	X
	12	*Lotus corniculatus* L.		X	X													X			X	X			X	X
	13	*Medicago ciliaris* Willd.									X			X							X	X			X	X
	14	*Medicago laciniata* (L.) Mill.									X				X	X	X				X	X			X	X
	15	*Medicago orbicularis* (L.) Bartal.	X	X	X	X					X					X					X	X	X		X	X
	16	*Medicago polymorpha* L.	X	X		X				X						X	X	X	X		X	X				X
	17	*Medicago turbinata* (L.).			X																X	X	X			X
	18	*Melilotus indicus* (L.) All.								X	X				X	X	X	X	X			X	X			X
	19	*Onobrychis crista-*	X	X	X			X	X	X	X	X			X		X	X			X	X	X			

		galli(L.)Lam. *Squarossa*																						
	20	*Onobrychis ptolemaica (Delile)DC.*	X	X	X				X	X		X	X		X		X	X				X			X
	21	*Prosopis farcta (Banks et Solan)Eig*						X	X	X		X		X	X	X	X	X	X						X
	22	*Scorpiurus muricatas* L.	X	X	X		X	X	X	X	X				X		X	X				X			X	X
	23	*Trifolium lappaceum* L.	X	X	X									X				X			X				X	X
	24	*Trifolium nigrescens Viv.*	X		X			X				X										X			X	X
	25	*Trifolium resupinatum L.*	X	X	X			X	X	X	X	X	X						X	X					X	X
	26	*Trifolium repens* L.	X	X	X			X														X			X	X
	27	*Trifolium tomentosum* L.	X		X			X	X						X			X	X						X	X
	28	*Trifolium alexandrium* L.	X						X	X	X		X		X	X		X				X			X	X
	29	*Vicia assyriaca* Boiss.		X	X				X	X	X	X	X												X	X
	30	*Vicia narbonensis L.*	X		X			X	X	X	X	X	X					X							X	X
	31	*Vicia sativa L.*			X			X		X	X	X		X	X	X				X		X	X		X	X
	32	*Vicia tenuifolia* Roth.			X			X								X	X	X	X				X		X	X

This is explained on the basis of the convergence in natural conditions with the neighboring countries of Iraq, especially Turkey and Iran, and the climatic convergence that leads to overlap in biological diversity, especially plant diversity. The wind blows from Turkey, Iran, Syria, and Jordan, which has a great impact on the nature of the province and carries with it the seeds of various plants that grow in their appropriate environments in Iraq, including Diyala province Fig. a (1-4), b(5-8), c(9-12), d(13-16), e(17-20), f(21-24), g(25-28), h(29-32).

Figure 1a, b, c, d,e,f,g,h. The field images of plants of the family Fabaceae in the study area

Figure 1 a

Figure 1 b

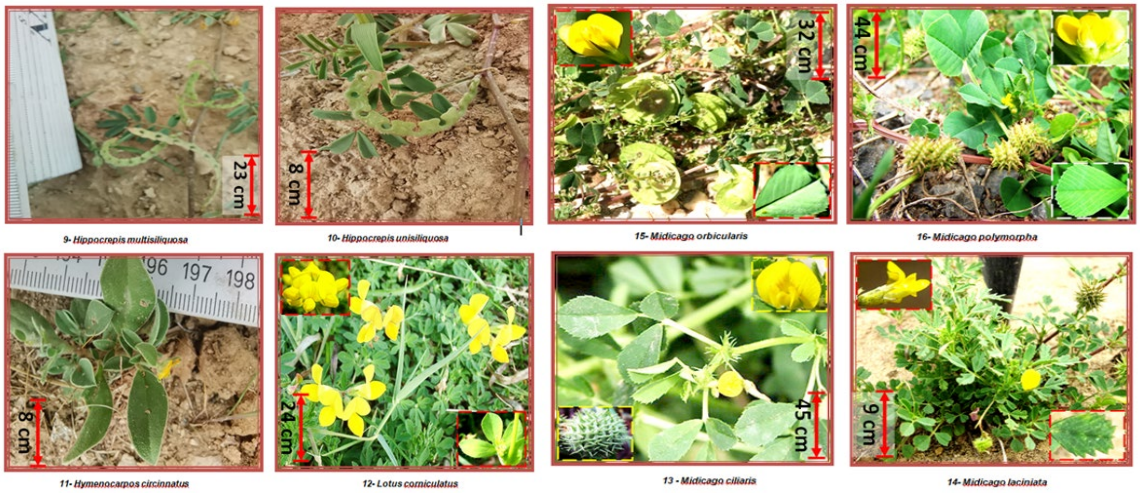

Figure 1 c

Figure 1 d

Figure 1 e

Figure 1 f

Figure 1 g

Figure 1 h

This survey may not show the true number of wild species of the legume family in the study area due to the exposure of the natural vegetation cover in it to the decline of many plant species and the disappearance of other species due to the harsh drought conditions and wind erosion that the area suffered during the years of study and the conversion of a lot of agricultural land into residential, industrial and other investments. In an unthoughtful manner, this led to the disappearance of many natural plants, marginal lands, and pastures in most of the governorate's districts.

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