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Geographical and environmental distribution of S*tipa sp.* in Iraq

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Abstract
The present study was conducted to determine the prevalence of species of the genus *stipa* in different areas in Iraq. By studing the sources and spacement preserved in Baghdad University Herbarium and (BUH) and field survey. Where the results showed that there are nine species of the genus *stipa* (*S. capensis, S. hohenackenana, S. barbata, S. bromoides, S. pulcherima, S. lagascae, S. tortilis, S. parviflora, S. kurdistanica*) distributed in four regions: Desert, Steppe, Mountain-Forest, Mountain Region, and showed in tables and illustrated maps to describe the results in details.
Stipa sp. Are belonging to Poaceae family (Gramineae), which are one of the most large and economical families, It`s commonly known as a Grasses. One of this grasses is the Genus *Stipa* it`s considered as food for many animals and as fodder for the cattle, fresh or dried.

Keywords: check list, geographical distribution, gramineae, poaceae, steppe in Iraq

Introduction
Recent shifts in species distribution and extinction, particularly in fragmented or vulnerable habitats, are a result of climate trade (Hilbert *et al*., 2007) [18]. Many scientists believe that in the upcoming decades, changes in climatic factors like temperature and precipitation patterns would affect how suitable herbal habitats are. Understanding how *Stipa* species will respond to anticipated future local weather change is essential for excellent biodiversity management and conservation given these potential effects (Hannah *et al*., 2002) [17]. These adjustments in general surroundings and climate result in differential distribution of vegetation cowl. The distribution of some species has receded, while others have spread in an unprecedented manner. Some species are starting to spread in areas that are otherwise restricted
It is vital to gather knowledge about the species and related environmental factors, as well as to integrate this knowledge with fresh environmental conditions, in order to comprehend the spread of *Stipa* Iraqi (Rehfeldt *et al*., 2012). To respond to typical inquiries, it is crucial to have these knowledge (Andersen, 2010): What current climatic conditions do a species exist in? In the future, where will these requirements be found?
It is essential to connect regional processes to the global climate machine using appropriate regional models that capture climatic impacts at the regional ecosystem scale while trying to understand plant distribution in Iraq (Kafatos, 2012). This research focused their examination on a particular area of Iraq where the *Stipa* genus is found. now being grown.
The focus of this study is the perennial plant *Stipa*, which is found in dry and semi-arid environments in the southern and western Mediterranean basins. (Suárez *et al*., 1991). Most grasslands in the Maghreb and semi-arid areas of Spain are dominated with the aid of alfalfa or associated plant communities (Puigdefabregas and Mendizabal, 1998), representing an intermediate kingdom of desertification (Le Houréou, 2001). This plant has a crucial ecological function, and many writers agree that *Stipa* has a remarkable effect on soils because it links the soil floor to its root system, reducing runoff duration and sediment mobility down slopes. (Puig defábregas and Mendizábal).,1998). In addition, it varieties a dense mass that traps sediment and plant debris and affords refuge for the growth of different species (Maestre *et al*., 2001; Garcia-Fayos and Gasque, 2002). In addition, steppe guard soil from erosion (Sánchez and Puigdefábregas, 1994; Bochet *et al*., 1998), it can face up to extended droughts (Pugnaire *et al*., 1996) [28], and due to the fact 2012 researchers have determined in fieldwork (Al-Dulaimi *et al*., 2013) and have the ecological ability to grow in nutrient-poor soils (Le Houérou, 1969) [23]. Furthermore, the taiga has traditionally provided for human needs.
Because they have lengthy been used and managed by means of humans, Cortina *et al*. (2009) [5] cited that *stipa* steppe, due to its vast geographic distribution and long-term close affiliation with human activities, represents a great system mannequin that can develop our understanding of the dynamics of arid ecosystems. In line with the Intergovernmental Panel on Climate Change's IPCC (2000) scenario, Africa will experience significant changes in temperature and precipitation in the ensuing decades (IPCC, 2007; Richardson *et al*., 2009), with the Mediterranean basin being identified as the region most susceptible to climate-related problems (Giorgi and Lionello, 2008). From this vantage point, this study aims to identify the environmental factors that have the biggest bearing on the distribution of *Stipa* sp., and investigate the potential effects of projected changes in climatic conditions on this distribution.
If a population cannot migrate to another place, then the ecological niche of a species is a collection of environmental circumstances (Levine *et al*., 2007; Peterson and Nakazawa, 2008) [26].

Vegetation Distribution in Iraq
Iraqi lands are considered to have diverse environments with their natural content in the soil and the diversity and difference of their environments between the north, center

and south. Even the western Anbar region, which is considered a desert environment, but is characterized by the spread of many wild plants of medicinal and therapeutic importance due to its soil contains many elements that give plants the chemical content that had a physiologically and therapeutically effective. Therefore, interest has increased in recent years in describing and studying wild plants in that region. (Hamid. *et al*., 2018) [16].

Since ancient times, Iraq has been known as the valley of two rivers in Mesopotamia. Its fertile soil, fresh water, and variable climate have created a deeply ingrained civilization that nurtured humanity from prosperous sources over thousands of years. (FAO, 2007) [6]. The climate of Iraq is generally a dry continental climate with very hot summers and cold winters, with less precipitation in the south and central parts and more precipitation in the north. Rainfall in the north of the country is sufficient to support winter crops, while both winter and summer crops in central and southern Iraq depend on irrigation. In desert areas, there is little rainfall, usually in winter. There is no doubt that Iraq has a great geographical location, including mountainous regions with sub-zero temperatures, desert regions with extremely high temperatures, and pelagic humid regions. (FAO, 2007) [6]. Activities on plant genetic resources started by the Ministry of Agriculture in 1977 were limited in scale and few scientific researchers. A gene bank was established in Abu Ghareeb Baghdad with support from FAO/IPGRI. In 1977, an Iraqi team started the collection, and they helped collect 1,400 accessions of various crops. There is an urgent need to raise awareness among the scientific community and managers of the important role of plant genetic resources in crop improvement programmes, and to obtain financial and technical support for genetic diversity conservation in Iraq. Collections saved in GenBank are saved in working collections. (FAO, 2007) [6]

Material and Method

Study area

Iraq is located between longitude (38° 48' E) and latitude (29° 37' N). The length from northwest to southeast is about (1 000 km) and the width is about (500 km). The widest area from Jordan to the Persian border in Rawandoz will be about 750 kilometers long. The area is about 4,444,500 square kilometers. More than half of this area is strictly below the end zone.

Iraq's climate is generally dry continental, with very hot summers and cold winters, with less precipitation in the south and central parts and more precipitation in the north. Rainfall in the north of the country is sufficient to support winter crops, while both winter and summer crops in central and southern Iraq depend on irrigation. In desert areas, rainfall is very low, usually in winter.

The material in this report aims to provide some helpful data on the geographic distribution of genus *Stipa*. This data may be utilized to improve species conservation plans and boost surrounding populations' capacity for adaptation to reduce their vulnerability to regional weather change.

A total of more than one hundred samples from the Baghdad University Herbarium (BUH) and field survey were collected as (9) species of the genus *Stipa* were distinguished. An illustrated maps and tables have been created to distribute species abundance.

To derive appropriate findings for better directed and informed conservation decisions, it is necessary to consider additional factors impacting species distribution, such as biotic interactions, genetic adaptability, and the capacity for species to spread.

The study was once conducted by means of quantitative analysis of four major bodily areas, which are:

1. Lower Mesopotamia.
2. Desert areas.
3. Plateau and hilly areas.
4. Mountains.
5. Each of region is analyzed to see the geographical and ecological distribution of *Stipa sp*.

Result and Discussion

The vegetation and biogeography of Iraq is specified in Volume 1 of the Flora of Iraq (Guest & Al-Rawi, 1966). A precis of the vegetation zones can be located here.

Iraq can be divided into four primary vegetation zones, every with its attribute vegetation map (1).

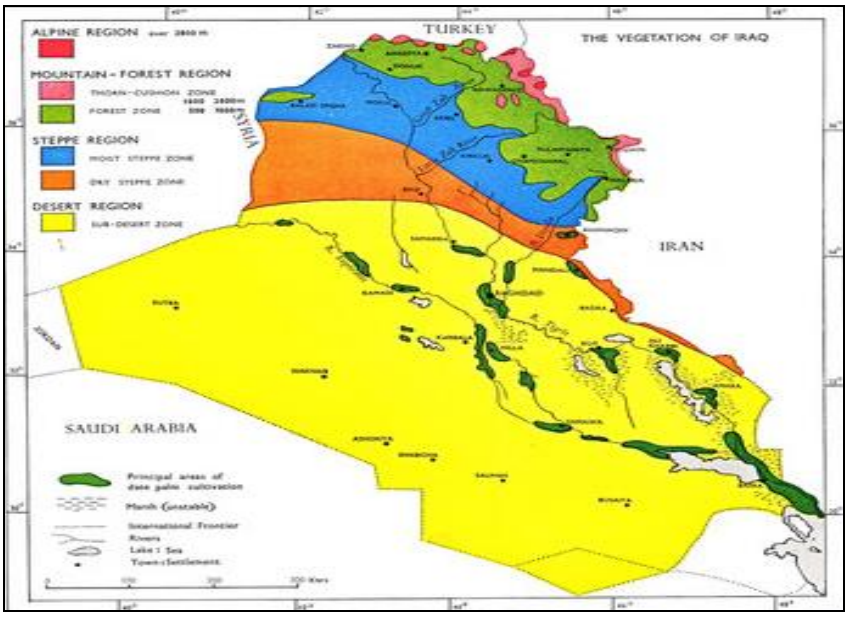

Fig 1: Vegetation zones of Iraq. From Guest & Al-Rawi (1966).

1. Desert Area
Land Classification
The southern desolate tract and sub-desert (steppe) borders Saudi Arabia, Jordan, Syria and Kuwait. Sand, gravel plains, rocky outcrops; river structures and marshes; Sabha and salt areas of the alluvial plains of Lower Mesopotamia.

Approximate area
350,000-400,000 square kilometers.

Altitude range
50–950 meters. Annual precipitation: <75–150 mm.

Region
DLJ, DGA, DWD, DSD.

Habitat and Vegetation
In sandy deserts and uninhabited dunes, sparse, open brush and halophytes are present. The most notable and significant villages in the Iraqi desert are called *Stipa* communities, which are also common in the deserts of the Arabian Peninsula. Related species include *S. capensis*, which grows on sandy soil above salt flats. Other, rarer species include *S. bromoides*, *S. hohenackenana*, and the more exotic *S. parviflora and S. tortilis* (in sandy depressions). The most unique sabkha neighborhood standard in the saline tidal flats of southwestern Iraq is dominated by way of *S. capensis*. it happens on the facet of a small salt depressions in the sand.

Biogeography and Endemicity
Indo-Saharan [Saharan Region + Sub-Saharan Arab Region]; Endemism: 5 species.

2. Steppe area
Land classification
In the area, which borders Syria to the east and Iran to the west, are the damp and dry grasslands of northern Iraq. In Iraq, it takes the shape of top plains to foothills, gravel plains, rocky outcrops, the Great Zab River, and agricultural cultivation in the winter.

Approximate area
65,000 square kilometers.

Altitude range
100–300 meters of steppe is dry; 300–500 meters is wet. 200-350 mm and 350-500 mm of precipitation every year.

Districts
LEA, LCA, LSM, LBA.

Habits and Vegetation
sparse, short grassland that is dry and has isolated tiny shrubs. Steppe Vegetation Characteristics Open grassland, dominated by *S. capensis* only, but with high distribution density in original vegetation and grazing and unmanaged and protected grasslands. *Stipa* species in the steppe region of Iraq. figure 2).

Biogeography and Endemicity
Mesopotamian subregion of Iran-Turan; endemism: 1 species.

Fig 2: *Stipa*. A perennial herb that grows in grassland areas.

3. Mountain forest
Land classification
This region is the hilly region in the north that borders Syria, Turkey, and Iran. It also includes Jabal Sinjar's highest summit. The location has both a forested section and a thorny area.

Approximate area
30,000 square kilometers.

Altitude range
Thorn-cushion Zone 1750-3000 m and Forest Zone 500-1800 m.

Annual precipitation
700–1400 mm & > 1000 mm, partly snow.

Districts
FUJ, FNI, FAR, FKI, FPF.

Habits and Vegetation
The predominant flora is composed of low perennial herbs and shrubs from the families Compositae, Cruciferous, and Poaceae (*S. capensis, S. bromoides, S. barbata, S. hohenackenana, and S. lagascae*).

Biogeography and Endemicity
Iran-Anatolia subregion of Turan; endemism: 5 species.

4. Mountains Region
Land classification
The region comprises the northern mountains' alpine zone.

Approximate area
100 square kilometers.

Altitude range
2750-3730 meters. Annual precipitation: >1000 mm, basically snow.

Districts
MAM, MRO, MSU, MJS.

Habits and Vegetation
Forest region of Eldarica pine trees, open to closed pine woods (Pinus brutia var. eldarica). Steppe vegetation, such

as *S. capensis* vegetation, often replaces disturbed wooded area vegetation in lower wooded area areas. In contrast, large, low-thorned shrubs associated with *S. bromoides*, including *S. capensis, S. barbata, S. pulcherima, S. lagacae, S. hohenackenana, and S. kurdestanica*, are found in open scrubland.

Biogeography and Endemicity

The Iran-Anatolian Subregion of Iran-Turanian. Plants ± 800 species; 7 endemic.

Figures (3) and (4) exhibit the infusion of this species in specific regions of Iraq. While Figures (5), (6), (7) exhibit selected herbariums of this species.

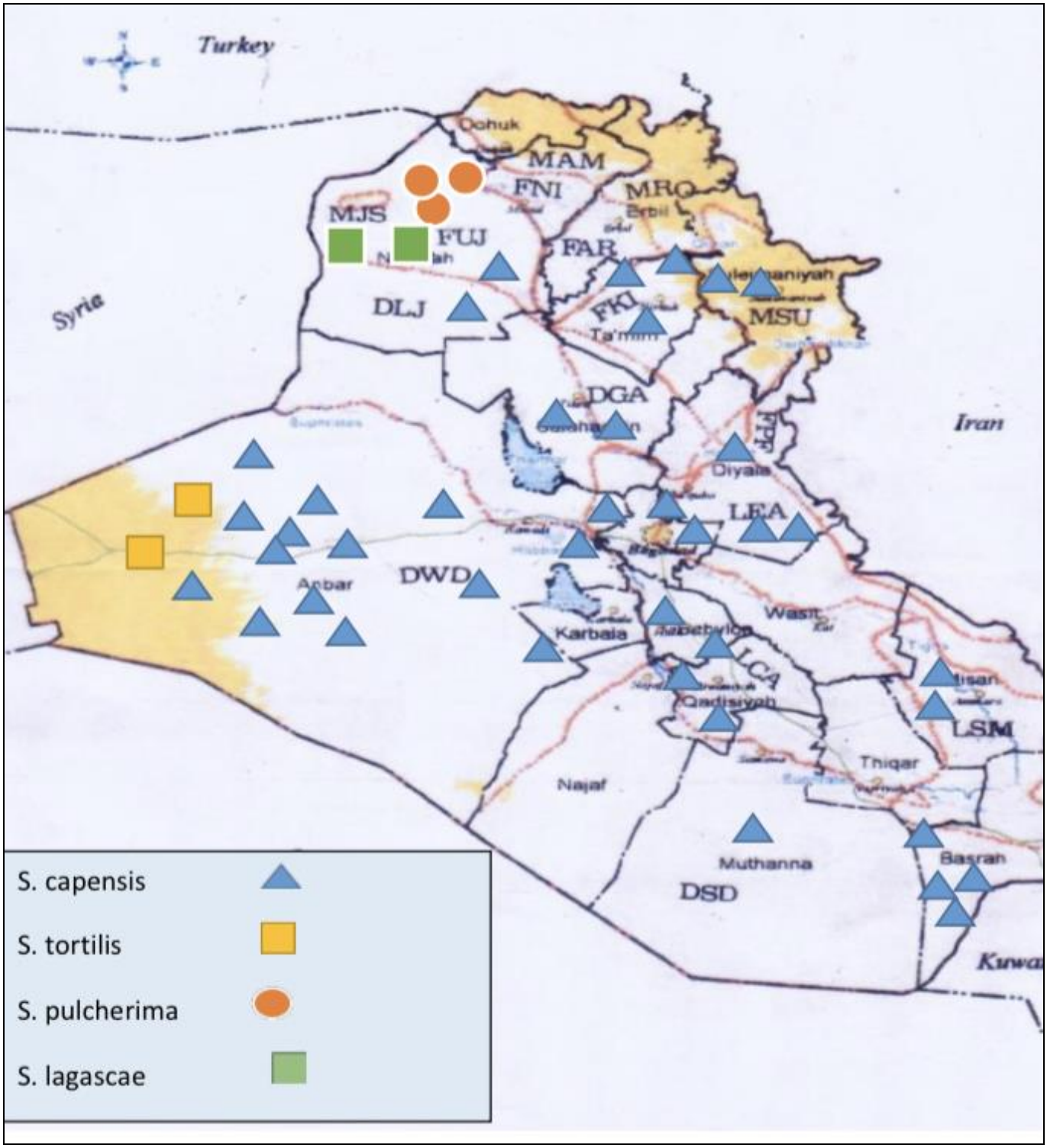

Fig 3: Distribution of *Stipa* sp. in different Districts of Iraq.

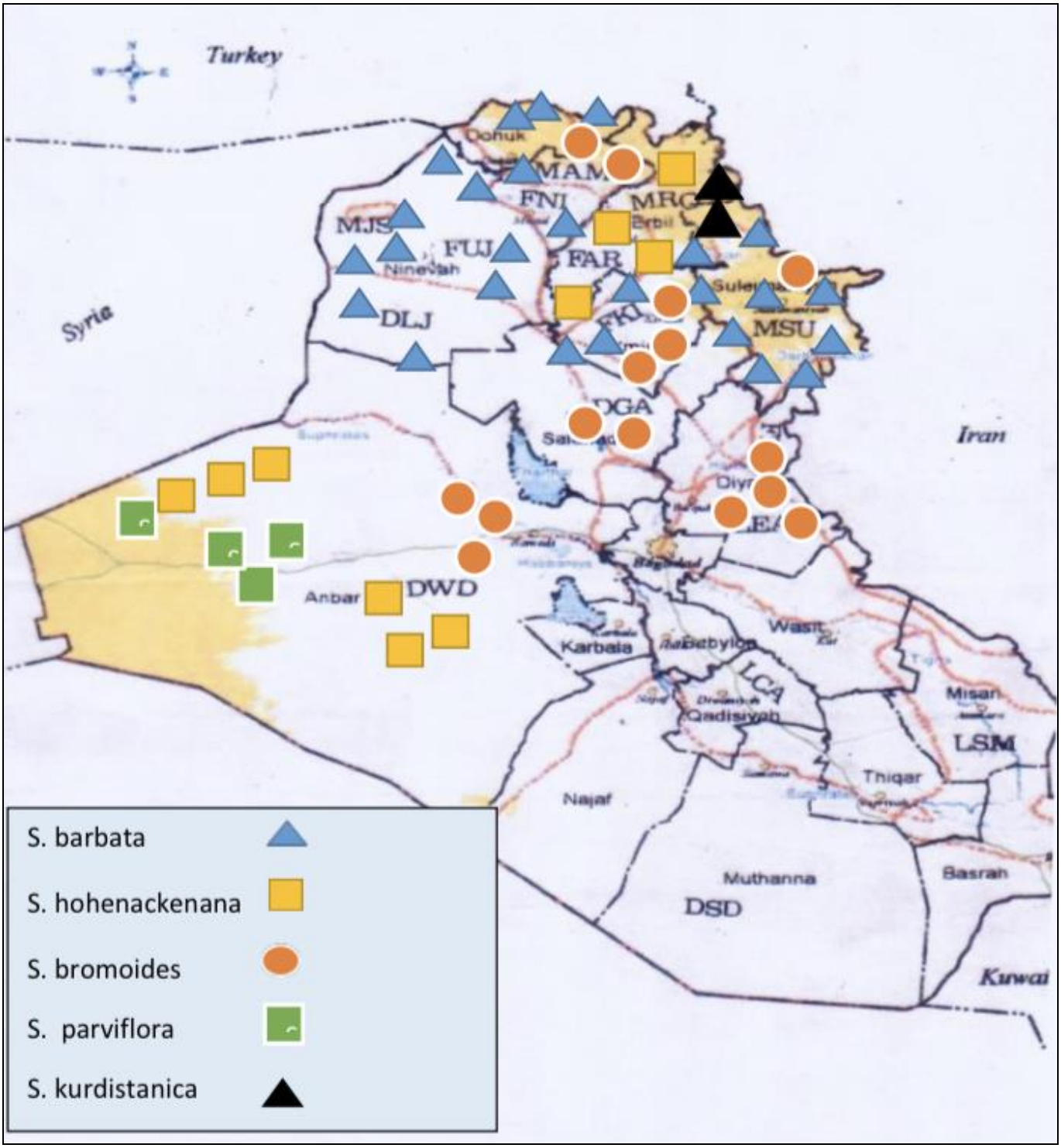

Fig 4: Distribution of *Stipa* sp. in different Districts of Iraq.

Table No. (1) below briefly shows the spread pf species in the provinces with a description of environment in terms of soil and its type.

Table 1: The data of Baghdad University Herbarium specimens.

No.	Species	No. in BUH (Baghdad University Herbarium)	Distribution in Distracts	Habit
	S. capensis	0031498-0030493-0030458-0027068-0025463-0025643-0028311-0023437-0001794-0001789-0001784-0033555-0001783-44502-0033751-0001782-0001779-0025494-0030251-0001868-0001807-0001802-0001802-0001800-0001798-0001795-0001693-0001791-0032312-003282-0032998-0001806-0001805-0001804-0001803-0001801-0001797-0040622-0031393-0031302-	DGA, DWD, DSD, DLJ FPF, FUJ, MSU, LBA, LCA, LEA	Loumy soils, in hills, near the rivers,, green lawns, corn fields,salty clay soils, near the springs water fountain, Dry rocky mountains, rocky loamy and herbaceous soils, sandy soils.

		0031278-0031732-0001781-0001780-0001799-0001796-0001790-0001788		
	S. barbata	0035549-0035550-0035551-0035552-0035563-0035546-37843-0035547-0037131-0035548-0035555-0001820-0029891-0027868-0001776-0001824-0001822-0001813-0001818	MJS, MSU, MRO FNI	Dry rocky mountains, lime soils, mudflats, rocky hills, wet slopes, rocky loamy and herbaceous soils,
	S. bromoides	0001487-0001810-0001825-0001829-0043233-0039816-0039106-0039073-0028931-0028185-0001809	MSU, MAM, DWD, DGA, FNI FKI	rocky loamy and herbaceous soils, cultivates wheat fields
	S. hohenackenana	0001815-0001816-0001817-0000729-0001826-0001774-0001819-0001814-0001812	MRO, FKI, DWD	Dry rocky mountains, rocky loamy soils, sandy soils
	S. parviflora	0001828-0001823-0001821-0001773-0029387	DWD	sandy soils
	S. pulcherima	0035557-0035559-0035558	MJS	rocky loamy soils
	S. lagascae	0035554-0035555	MJS, FUJ	rocky mountains
	S. tortilis	0001827	DWD	sandy soils
	S. kurdistanica	0001893	MRO	Calcareous soils, shady forests

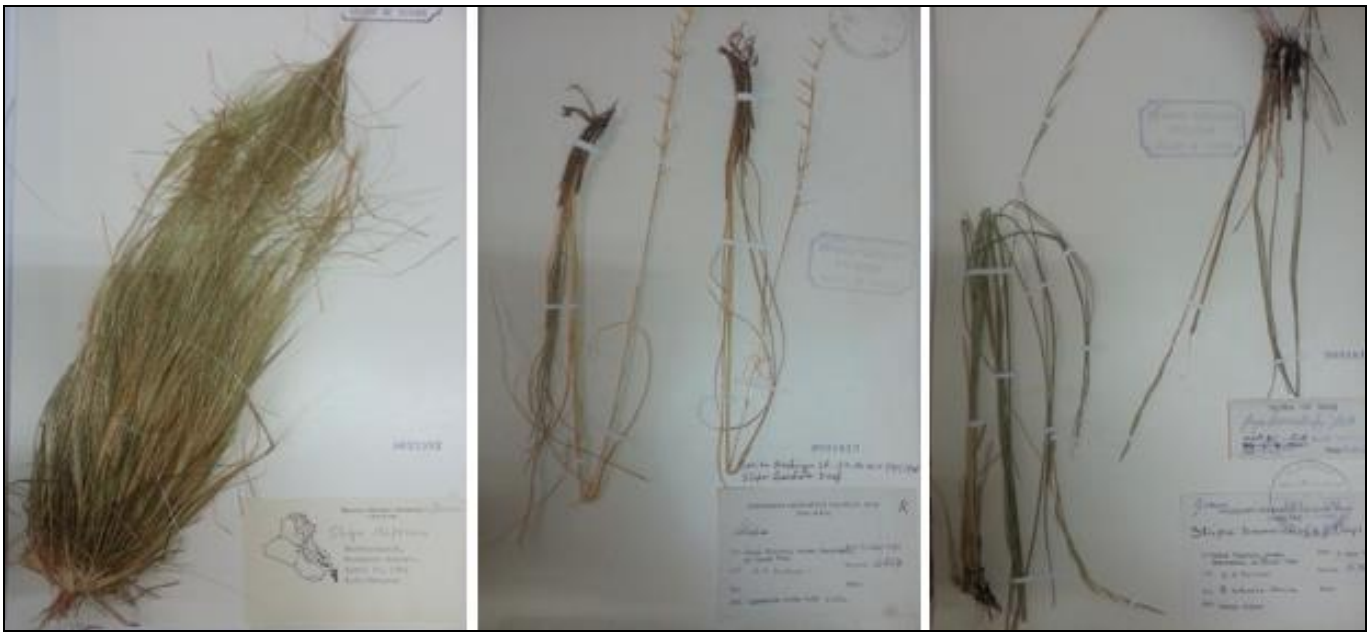

Fig 5: Selected herbarium sheets, (*S. capensis, S. barbata, S. bromoides*)

Fig 6: Selected herbarium sheets, (*S. hohenackenana, S. parviflora, S. pulcherima*,)

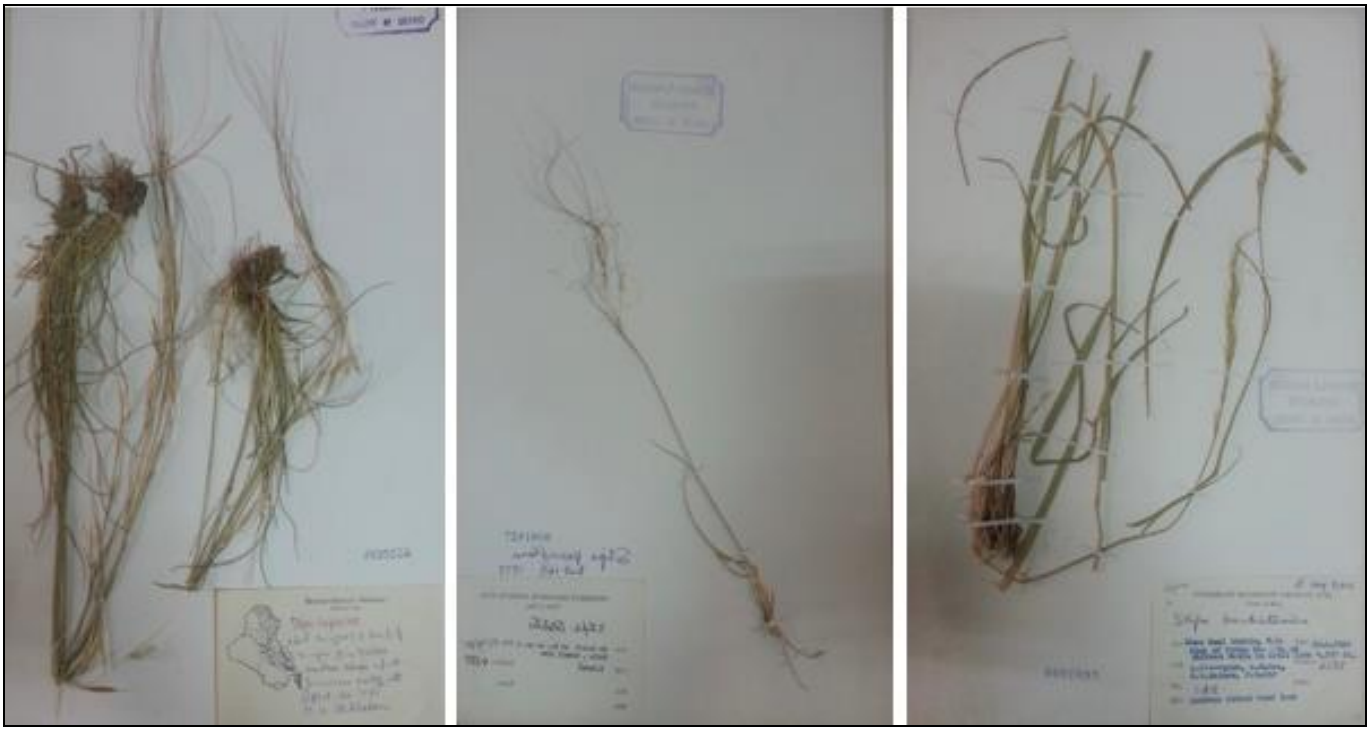

Fig 7: Selected herbarium sheets, (*S. lagascae, S. tortilis, S. kurdistanica*)

Discussion

The Iraqi Foundation for Nature and the Ministry of the Environment have recently carried out extensive research to document the country's floral and faunal richness, identify important biodiversity hotspots, and assess its conservation reputation. (Iraq National Report on Biodiversity, 2010 year). According to the data, the Arabian desolate tract and the dry scrub of Eastern Saharan Arabia, the forest-steppe of the Zagros Mountains, and the alluvial salt marshes of the Tigris and Euphrates rivers are among the ecoregions of Iraq that are in critical or endangered status, while the Mesopotamian irrigated Deserts and Middle Eastern steppe areas are at risk. The increase of building and development sites, poor regulation, and a lack of designated protected areas have all been cited as key factors in the long-term destruction of biodiversity habitats, especially crucial herbal ecosystems like conifer habitats. As a signatory to the 2009 Convention on Biological Diversity, Iraq is updating and upgrading its documentation on biodiversity and conservation.

The reasons for these differences in distribution are due to the fact that some plants are of high fitness that enabled them to move in different environments, depending on the internal characteristics of plant such as genetics, physiology, anatomy and others.

Conclusion

There are lack in Iraqi sources or sufficient information about this genus and there are absence of a detailed recent study showing the spread of its species in Iraq. So, the main objectives were to produce table and maps to explain the distribution of *Stipa* species.

As it was observed in the results, the species *S. capensis* is the most highly distribute in different regions of Iraq, especially in the north and west middle districts of DWD-DGA- DSD- MSU-FPF- FUJ- LEA and LCA in addition to little showed prevalence in Basra south of Iraq. In the other hand, *S. hohenackenana* has been scattered in west and north districts of Iraq in DWD-FKI-MRO. While the dispersal of ***S. barbata*** is limited in northern districts in MRO-MSU- MJS and FNI. In addition, the species *S. bromoides* has been observed in wide diversity in west of Iraq in DWD and DGA district and MSU- MAM- FNI and FKI.

Four species of *Stipa* (*S. pulcherima, S. lagacae, S. tortilis, S. parviflora, S. kurdistanica*) considered as a rare species because of its limited distribution and its poor specimens, it is located in MJS-MJS-FUJ-DWD and MRO respectively.

As we see, *Stipa sp*. can inhabit in wide range of soils in different climates.

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