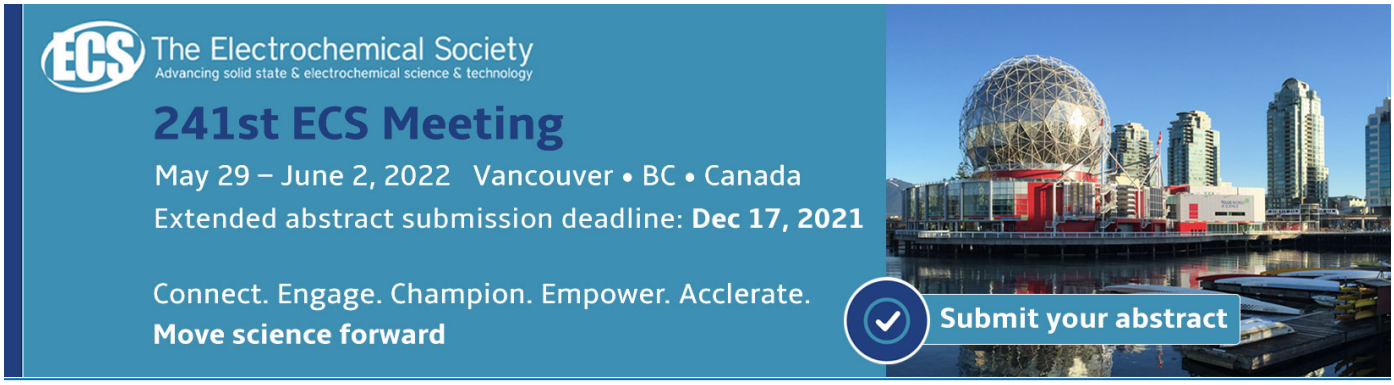
A New Record For The Flora of Iraq: *Astragalus vogelii* (Papilionaceae)



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A New Record For The Flora of Iraq: *Astragalus vogelii* (Papilionaceae)

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Abstract: The Western Desert is a wide area of Iraq, it is bordered by three Arab countries, and characterized by the great plant diversity in the rainy years, including year 2019, during the spring season of the same year, a number of field trips were carried out in which wild plants were collected, and among them was *Astragalus vogelii* (webb) Bornm. of the papilionaceae family for the first time in Iraq, specifically in the Obealah valley, which intersects with the highway road towards Jordan and Syria (about 18 km. west of Rutba). The species was identificated according to the Flora of neighboring and near countries, the morphological description of the sprcies was done through a taxonomic treatment supported by photographic and microscopic images for all floral and vegetative parts, as well as anatomical description of the stem based on the cross section. Amap was also developed the specifies the locations of the species distribution. After making sure that there was no previous sample for the species in the Iraqi Herbaria, the sample of this study were deposited in the Iraqi National Herbarium with numbers 60340, 60341, 60342 and in the Anbar University Herbarium with numbers 6670, 6671, 6672 and 6673.

1. Introduction

The desert areas in Iraq are considered as a promising economic support for future development, even though they did not be paid enough concern yet. TheWestern Desert District of Iraq comprises an area of more than 108.000 km^2 [1]. It is one of the most arid regions in Iraq and is nearly barren of people today. The Leguminales order, which is generally called legume plants, is very important as most of its members facilitate infixing nitrogen in the soil with the collaboration of special bacteria that live in their roots, its species can be recognized by their fruit (legume) and compound leaves, and this order is consist of three families (Caesalpinaceae, Mimosaceae and Papilionaceae) [2].

The papilionaceae is the third largest plant family with 730 genera and about 19.000 species found both in temperate and tropical region [3]. *Astragalus* L. with about 2900- 3000 species in the world is considered the largest and most complex genus in Angiosperm. It is more diversified in the Irano-Turkish region of South- Westerns Asia [4]. In Flora Iranica [5] pointed to 850 species of the genus *Astragalus* involving *A. vogelii* (Webb) Bornm., then a recent study [6] followed, in which 840 species were mentioned. either in Turkey [7] there are 475 species, while [8] stated 133 species in Syria, Palestine and Sinai. Either in India [9] there are 80 species, most of them are distributed in the

Himalayan region, it was found that, icluding the registered species under this study. In Jordan [10] mentioned that 67 species of the genus found.

Each of [11]; [12] stated that 8 species of the genus found in Qatar and Kuwait. In Flora of the United Arab Emirates [13] stated 8 species, while [14] stated 10 species. The Flora of Saudi Arabia [15] pointed to 19 annual species and 3 perennial species. In Egypt [16] pointed to 32 species distributed mostly in desert areas with sandy soils. In the Flora of Iraq [2] pointed to 116 species distributed in all physiographic regions and districts of Iraq, while the Flora of Lowland Iraq [17] mentioned of only 31 species. The recorded species under this study is one of the medicinal plants whose geographical distribution was studied in Al-Baha region in Saudi Arabia [18], it was recently used in cancer treatment [19], and that is because it contains important chemical compound, which are two new rhamnocitrin glycosides [20]. There are some similar studies [21]and [22,23] in which three new species were recorded in Iraq, distributed in the Western Desert District. The current study confirmed the presence of *A. vogelii* in Iraq depending on the recent collection, as well as taxonomic treatment, pollen grains characters and stem anatomy of the species.

2. Materials and Methods

Plant specimens have been collected within field trips and for selected regions on the highway road between Rutba and the Jordanian border within the Western Desert District (DWD) of Iraq, specifically, in Wadi Obealah region, 18 km. west of Rutba in 2019. By relying on the taxonomic keys in Flora Iranica and Flora of Egypt, as well as many field images of the species in some modern Flora such as Flora of Qatar, the species was accurately identified. After confirming the identified of the new species recorded to Iraq, modern references were reviewed as well as a comprehensive survey of the Iraqi Herbaria, especially the Iraqi National Herbarium to ensure that species was not previously found in Iraq, some plant samples were dried and preserved in the aforementioned Herbarium, while the other samples were preserved in Anbar University Herbarium at the Center of Desert Studies (Figure 1).

Some environmental notes were cleared, and a map (Figure 1) was used. A Canon camera was used to photographing the vegetative and reproductive organs of the species. In order to complete the morphological study, the scientific terms mentioned in [24] were used. Regarding pollen grains, the young flowers were fixed by F.A.A. contains formaldehyde 10 ml + acetic acid 5 ml + ethylalcohol 50 ml + distil water 35 ml and using for fixed the samples. where they were studied by using safranin stain with drops of glycerine according to Al-Hajj method [25]. Also, the direct manual cutting method has been adopted in preparing the stem transverse section.

Figure **1.** Herbarium plant samples of *Astrgalus vogelii*

Figure 2. A map of Iraq shows the location of *Astrgalus vogelii*

3. Results and Discussion

Astrgalus vogelii (Webb) Bornm. Beih. Bot. Centralbl.,
Abt. 2, 33:233 (1915), Fl. Turkey, Davis, 3:275(1970); Fl. Iranica, Rechinger, 174: 63(1979); Fl. Egy., Boulos, 1: 329(1999); Fl. Sa
udi Arab., Chaudhary, 2: 242(2001); Fl. U.A.E. , Karim & Fawzi, 1: 315(2007).

3.1. Taxonomic treament

Annual, herb, branches many, 6-10 cm., stems prostrate, white villous, greenish yellow, 18-35x1.2-2.5 cm. (Figure 2). Leaves alternate, imparipinnate, petiolate, leaflets 11-13, oblong, margin entire, apex rounded, base rounded-acute, puberulent, dark green, lower cauline leaves 4.5-5.3x1.7-2.1 cm., leaflets 0.7-0.9x0.3-0.4cm., upper cauline leaves 1.8-2.2x0.7x0.8 cm., leaflets 0.4-0.6x0.2-0.3 cm.. Stipules narrowly deltoid or triangular, margin entire, apex acute- acuminate, velutinous, yellowish green 3-4x1.5-2.0 mm.. Bracts narrowly lanceolate, 0.9-1.1x0.2-0.3 mm.(Figure 3). Flowers in terminal racemes 4.5-5.8x0.5-0.8cm. , peduncles semiglabrous cylindrical, very long (18-22x0.9-1.3 mm.), pedicels villous, brownish yellow, very short (0.7-0.9x0.2-0.3 mm.).

Calyx of five equal sepals, united at the base, very narrowly deltoid, margin entire and hairy, apex acute-acuminate, base united, velutionous-villous, yellowish green, calyx tube 1.5-1.8x1.3-1.5mm., lobed 1.0-1.2x0.2-0.3 mm. . Corolla papilionaceous, very small, standard obovate, margin entire, apex retuse, base acute-obtuse, yellow, glabrous, 3.7-4.0x1.9-2.1mm., wings two, ligulate- lorate with long lateral claw, apex rounded, base attenuate, 3.5-3.8x0.7-0.9 mm., keel partelly united of two petals, broadly spathulate, apex acute, base attenuate and curved, 2.8-3.2x1.0-1.2 mm. . Stamens ten, synstemony, diadelphous, nine of them united in lower half, semi-cylindrical, narrows at the top, 1.6x0.5 mm., filaments filiform, pale yellow, 0.7x0.1mm., the tenth stamen is free single, 1.3x0.1 mm., anthers ellipsoid, yellow, dorsal attachment with the filament, 0.15x0.7 mm.(Figure 4).

Pollen grains, bright yellow, single, radially symmetric, isopolar, tricolporate, rounded triangular in polar view, prolate in equatorial view, small size, polar axis 16-19 µm., equatorial axis 12-14 µm. (Figure 5). Pistil simple, unicarpous, ovary superior, semi- cylindrical, hairy, pale yellow, 0.9-1.1x0.3-0.4 mm., style lateral ventral, filiform, glabrous, colorless, 1.3-1.4x0.1-0.2mm., stigma capitate, yellow, 0.18-0.21x0.24-0.27mm. .Fruit pod, narrowly ellipsoid, tomentose, greenish yellow, 9-10x3.5-3.8mm. Seeds 4-5 in each fruit, reniform, yellowish brown, wavy (undulate), 1.0-1.3x0.9-1.1 mm. . It has been evident that there is a very great similarity in the quantitative and qualitative

morphological characteristics between the species under this study with the most recent biosystematic study of the same species in Egypt, which included 35 traits of vegetative and reproductive organs [26]. A table has been drawn up for the rates of previous measurements of the vegetative and floral parts.

3.2. Anatomical study

A cross section of the fruiting plant stem has been taken to be the material of the stem anatomy. The epidermis was a single layer of elongate cells and in different sizes, the thickness of epidermis depending on the differences of the cell sizes, 28-33 µm. , convex or straight external and internal walls, 8.5-11.8 µm. . The cuticle layer was 4.2-6.3 µm. . The cortex consists of 2 layers of chlorenchymal tissue, 42-58 µm. . The vascular bundles 7-9, very large and closely spaced, sclerenchymal tissue (bundle cap) 3-4 layers, with a thickness of 65-95 µm. , phloem wide, 95-135 µm. , xylem form radial rows, 170-215 µm. . The pith consists of ordinary parenchymal cells, polygonal or semi-circular, with many intercellular spaces, the thickness of the pith surrounded by vascular bundles is about 750-950 µm. (Figure 6).

3.3. Samples from the studied specimens

DWD: Wadi Obealah region (18 km. west of Rutba), 625m. alt., 15.2.2019, Mohammed O. Mousa & Suad Shallal, 60340 (BAG); Highway rood (20 km. west of Rutba), 625m. alt., 13.3. 2019, Mohammed O. Mousa & Suad Shallal, 60341(BAG); 15 km. west of Rutba (on old rood) 620m. alt. 25.3.2019, center of desert studies staff, 60342 (BAG).

By looking at the map (Figure 2) of geographical distribution of *A. vogelii* in the world and reviewing most of the countries Flora as well as modern scientific references, it was found that the species under this study belongs to the Saharo-Sindian Region, as it grows in most countries of Africa [27] such as Libya [28] and the deserts in eastern, western and southern Egypt [29]; [30]; [31], as well as the Aswan reservoir [32]. In Asia, the species is one of the common plants in sandy soils and arid lands, as in Turkey [7], Iran [33]; [34] and India [35], in the Arabian Peninsula, it grows almost in each of the Jizan region [36]; [37], Yemen [38], Oman [39] and the desert of the Untid Arab Emirates [40].

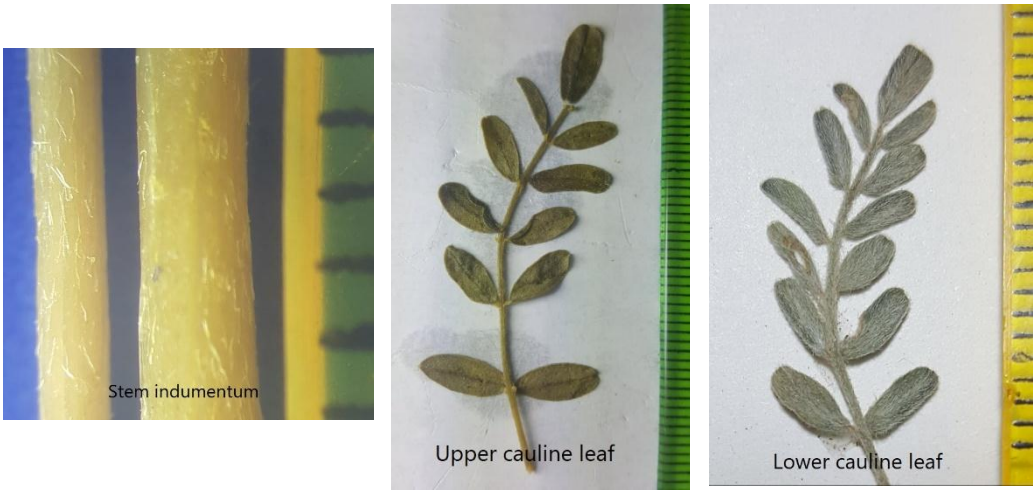

Figure 3. Vegetative parts of *Astrgalus vogelii* (scale: 1 mm.)

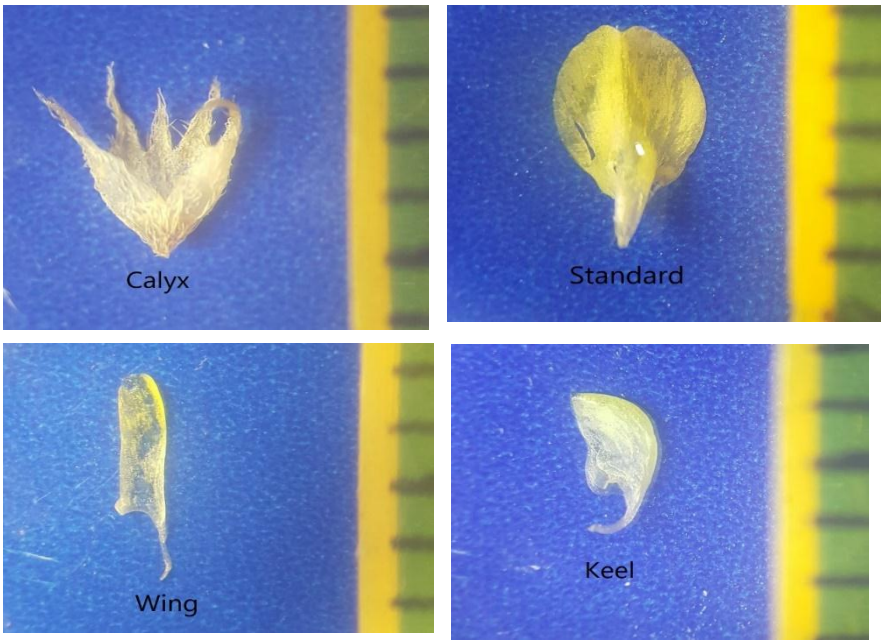

Figure 4. Reproductive parts of *Astrgalus vogelii* (scale: 1 mm.)

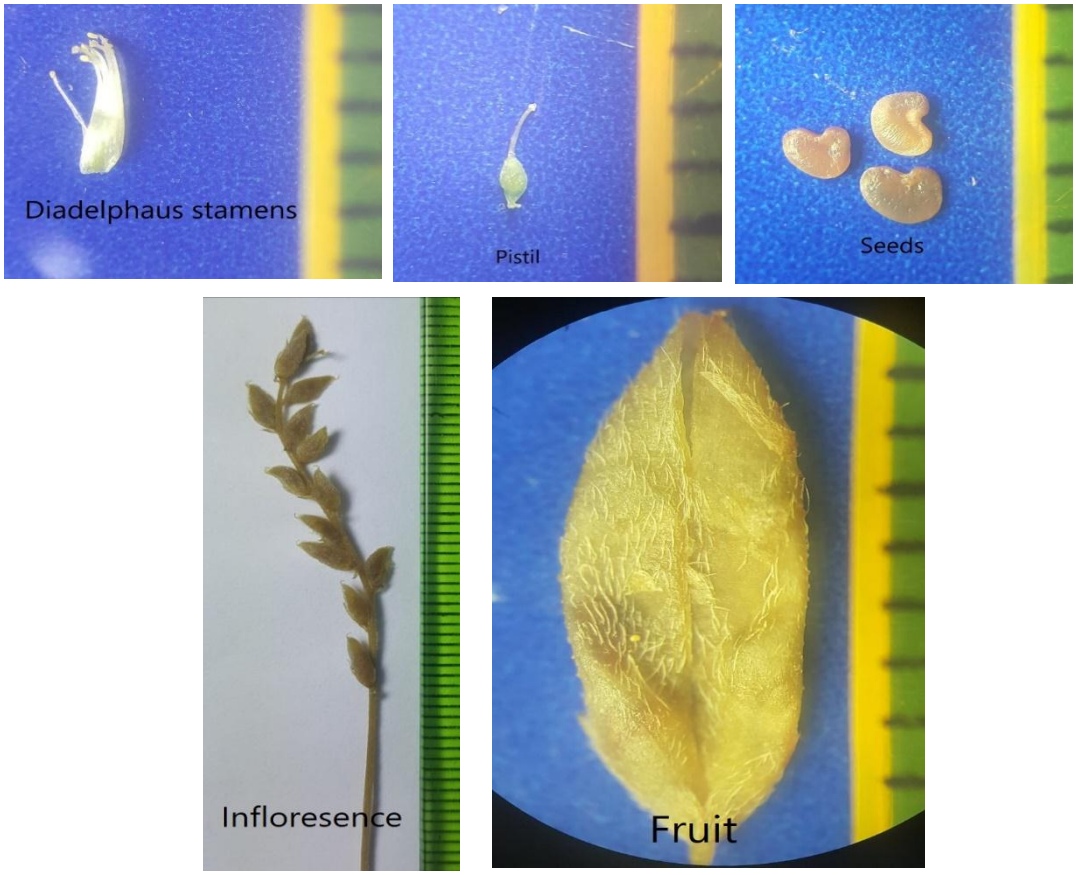

Figure 5. Reproductive parts of *Astrgalus vogelii* (scale: 1 mm.)

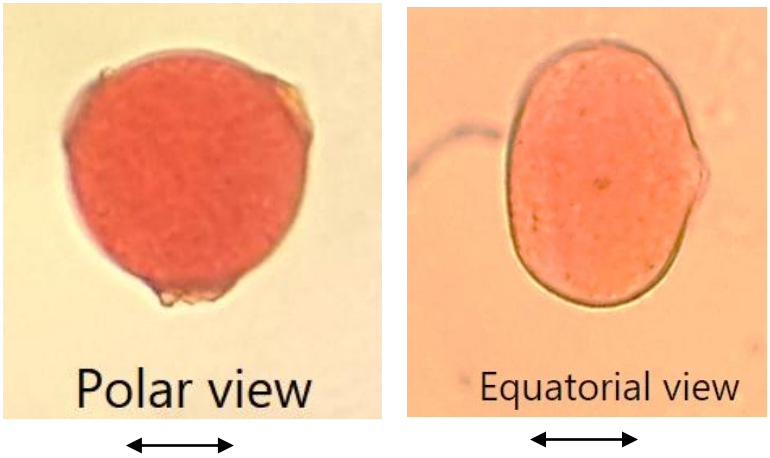

Figure 6. Pollen grains of *Astrgalus vogelii* (scale: 6 µm.)

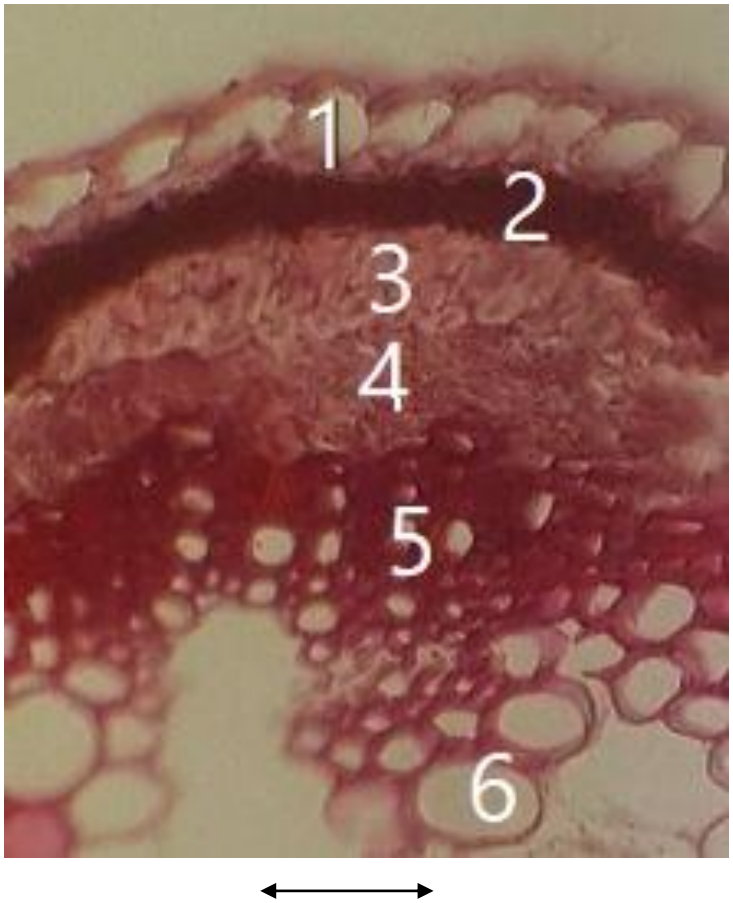

Figure 7. Cross section of stem of *Astrgalus vogelii* (scale: 100 µm.)
1: Epidermis 2: Chlorenchyma 3: Sclerenchyma 4: Phloem 5: Xylem 6: Pith

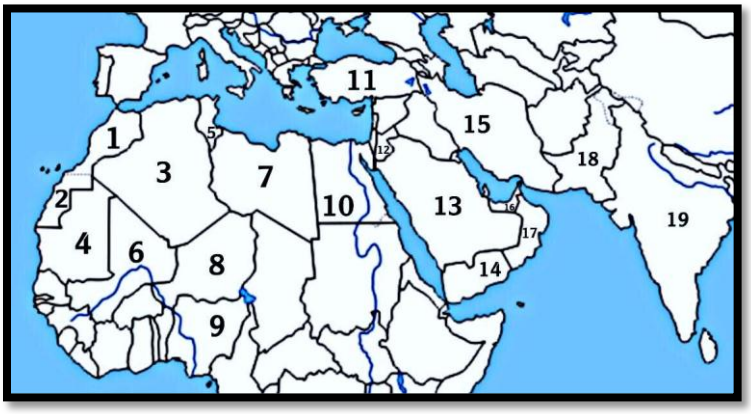

Figure 8. The world geographical distribution of *Astrgalus vogelii*

1: Morocco 2: Western Sahara 3: Algeria 4: Mauritania 5: Tunisia 6: Mali 7: Libya 8: Niger 9: Nigeria 10: Egypt 11: Turkey 12: Jordan 13: Saudi Arabia 14: Yemen 15: Iran 16: United Arab Emirates 17: Oman 18: Pakistan 19: India

Researchers specializing in the field of wild plants gave great importance to the desert region, especially the western desert district, this is due to its vast area rich in long valleys, which have great plant biodivresity, note there are placeae that researchers have not reached during the past twenty years, as they are border, military, or unsafe regions, which made them nature reserves, as well as not allowing shepherds to exploit them, the vegetation become as more dense and varied, especially in rainy years.

By observing the world distribution map of the species *A. vogelii*, especially the countries nearly and neighboring Iraq, we expect the seeds of the species to be transmitted through the severe dust storms that the region is exposed to, whether their source is from the Sinai desert, passing through Jordan, or from Saudi Arabia, in addition to the torrents that happen to most of the valleys, whose first branches start from inside the neighboring countries, such as Wadi Houran and Wadi Al-Walaj, to extend into Iraqi lands, the severe storms are also able to uproot some dry subshrubs with their fruits and seeds to move them away from the old habitat to other areas, this process results in a new distribution of species in general, some researchers [41] have emphasized that this phenomenon is one of the means of migrating plant species. Finally, it must be pointed out that the species of *Astragalus* are constantly evolution at the level of the world, and the best evidence is the recorded of three new species on science in Iran alone during the past recent years [42]; [43], while another study [44] indicated that two new species were recorded on the science and a new species on Iran belonging to the genus Astragalus, the latest studies [45] have indicated that the geographical distribution of Astragalus will be greatly affected in the near future as a result of climate changes.

4. Conclusion

The process of migration of wild plants is not prevented by international borders between countries at all. Migration may be forced as a result of one of the environmental factors such as strong winds or dust storms that cross hundreds of miles carrying many seeds and fruits to new environments. If the new environment is not harsh, success is certain for this type. Whenever there are many field studies, we expect to record new plant species in the country, especially in rainy years, which produces a large plant diversity.

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