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Abstract: The present investigation is about the only two species of Equisetum L. (Horstail) that have been recorded so far in Kurdistan region of Iraq. The study involves distribution, locality, illustration and morphological description of Equisetum ramosissimum Desf and E. arvense L. across the country. The project covered areas from Kifri (200-300 m a s l) in far south up to Halgourd mountain(3000m a s l) in far north. Starting from May 2014 up to May 2016. In the present study distribution and illustration for E. ramosissimum var fragilliferum Mild were described for the first time in this area.

Keyword: Pteridoflora, Equisetum, Kurdistan, Iraq

I. Introduction

For the best of our knowledge, there is no any detail comprehensive study yet on any species or genus of ferns in Iraqi Kurdistan region or Iraqi as a whole. However [1] reviewed the work of [2], [3] and [4] in then comprehensive study of flora of Iraq referred to the existence of the twelve genera of ferns in Iraq. They showed that Marsilia and Salvinia are confined to the marshes in south of Iraq where as almost all other ferns are distributed in Kurdistan part of Iraq. Although [5] have referred to the existence of Azolla in Iraq. [6] recently referred to the presence of Azolla Lam in Kalal area making up the total known genera to 13.Morever Maulood and Ali have recorded presence of ophioglossum in Piran(Mergasoor) raising the total known genera to 14 ferns in Iraq. Other investigations about existence of ferns in Iraq confined only few cytological studies that took place in Iraq under the scope of M.Sc thesis such as ( [7] and [8]). All previous investigation about ferns involves ( [9], [1], [10], [11], [12], [5] and [13]). All briefly referred to fern distribution only. Whereas detail morphological, anatomical and cytological investigation remain vaguely and have not been dealt with. Morphological description and distribution of Equisetum as one of the common genera of pteridophyts in the area as a start then will be in near future followed by a series of papers dealing with other existing genera of ferns in Kurdistan. The present study which is the outcome of 3 years survey and distribution of ferns in Kurdistan region of Iraq with particular emphasis on Equisetum. The survey included areas from far north of height of Hulgurd mountain with an altitude more than 3000m above sea level across the country toward the Garnian area of Kalar and Kifri with an altitude of only 200-300 m above sea level at the foothills of Himreen area. This paper deals with morphological description, illustration and distribution of three taxon of E. arvense L., Equisetum ramosissimum Desf. and Equisetum ramosissimum var. fragilliferum Mild the last taxon have been reported and recorded for the first time in Kurdistan region and even Iraq. All the identification have been confirmed by prof(Ihsan Al-Shahbaz) from Mezori Botanical Garden st. Leuis Mezori U.S.A.

II. Material and methods

Twelve trip to different regions of Iraqi Kurdistan took place during April 2014 up to July 2016. Areas included in this investigation confined to 24 stations table(1). Throughout all four seasons of the year. The four provinces of Kurdistan(Erbil, Duhok, Sulaimaniyah and Kirkuk) were covered in this study with 11, 3.8 and 2 stations in each province respectively table(1) and figure(1).

Fresh Equisetum samples were collected and photographed during each trip. Samples were examined under light microscope in Garnian university, Biology department and Hawler Botanical Garden. Measurement and diagram of the specimens were illustrated. Herbarium samples were made for all samples and deposited in Kurdistan Herbarium in Hawler Botanical Garden. All identification have been confirmed by Prof Ihsan Al-Shahbaz from Mezori Botanical Garden st. Leuis Mezori U.S.A.
Table(1):-The location of studied area at four provinces in Kurdistan region of Iraq

<table>
<thead>
<tr>
<th>Erbil</th>
<th>Duhok</th>
<th>Sulaimaniyah</th>
<th>Kirkuk</th>
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</thead>
<tbody>
<tr>
<td>A- Choman (2000-3600 m a s l)</td>
<td>A-Duhok (400-700 m a s l)</td>
<td>A- Sulaimaniyah ( 800-1200 m a s l)</td>
<td>A-Kirkuk ( 300-450 m a s l)</td>
</tr>
<tr>
<td>1-Gondazhour</td>
<td>1-Gali Duhok</td>
<td>1-Bakrao</td>
<td>1-Kirkuk</td>
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<tr>
<td>2-Hulguard</td>
<td>2-Zawya</td>
<td>B-Dukan (400-600 m a s l)</td>
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<tr>
<td>3-Robari Mazria</td>
<td>B-Imadiya (1600-2200 m a s l)</td>
<td>2-Chemonizan</td>
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<tr>
<td>4-Nawand</td>
<td>5-Sulave</td>
<td>C-Penjwen(2100-2800m a s l)</td>
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<tr>
<td>5-Shaqlawa</td>
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<td>3-Naw Pariz</td>
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<tr>
<td>6-Khalifan</td>
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<td>D-Halabja(1200-2800 m a s l)</td>
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<td>7-Malakan</td>
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<td>8-Gabi Ali Bag</td>
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<td>9-Ruwandiz</td>
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<tr>
<td>10-Baikhmza</td>
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<tr>
<td>11-Baikhal</td>
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<tr>
<td>12-Koysenjaq (400-700 m a s l)</td>
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</tbody>
</table>

II. RESULTS

1- *Equisetum arvense* L. (Horsetail, scouring rush)
This species have a very wide range of distribution in Kurdistan. It have been recorded from Gondazhour in Erbil district North west of Choman Fig.(2) at an altitude of 2300m above sea level of the foothills of Halgord mountains during months of April,May,and September 2014 -2015,along the stream of Mazria at both sides of the river Fig.(3) . The plant also recorded along the stream down Qula Sotaw in Sulaimania district and also at the side road toward Chemi Rezan Fig(4a). In this station it was found in dens quantity along the side of the stream during July ,August,2014 and September-November 2015 . This quite species was also recorded in Naw Pariz area along the road to the Tweela after Kormal in Sulaimaniyah province Fig.(4b) at an altitude of 1600 m above sea level .Habitat in this locality was at a grass land closed to the town. Finally *Equisetum arvense* L. was also recorded far south of Kurdistan in Garmian area specifically in Qula Sotaw closed to Kalar at an altitude around 230 m above sea level during May.
2016, in this station almost semi forest crowded tall grassland of *Equisetum arvense* L. was evident. All these stations where *Equisetum arvense* L. have been recorded. The stem length between 30-220cm and the stem a brunched dimorphic. The width of the stem varied from 4-7 mm with an internodes distance reached up to 12 cm with the scales around the nods vary between 12-20 scales. The branches (8-12) are tuff and wiry with whorls of numerous branches coming up from the joints to form brushy plants. Rhizoms with around 4 mm diameter and with length of 7-20 cm. That go deep down the soil. Strobilus was single on the main axis and brunched are generally sterile. The strobilus has an ellipsoidal shap with long 12-15 mm and width 3-5 mm.

2- *Equisetum ramosissimum* Desf.

It was found and recorded in Gonda Zhor 2300m above sea level Northeast of Choman East of Nawand in Halgord area. This species was widely distributed along the water channels and ditches it was also recorded in Qula Sotaw Fig.(5 and 6). Species have been also recorded during this investigation along the Rubari Koyi and also in Gali Duhok.

The rhizome are very long and penetrated to depth of around 1m below the soil. The length of plant is normally between (32-60 cm) but it may reach around 120 cm. The diameter of stem is (4-5mm) and number of the wooly branches at each nods is between 6-8 branch where as the number of scales is between (14-16) and the length exceed (20mm) the distance between the nodes is 6-8 cm in mature plants. The diameter of the rhizome is around (4mm), the branches is terminated with cons and no contain re brunch. In Qula Sotaw the plant found near the ditches and closed to channels integrated between forest trees Fig.(6).

3- *Equisetum ramosissimum* Desf. var. *flagilliferum* Milde

This variety was confined to two localities only in this investigation Gonda Zhor and Qula Sotaw in two completely different altitude. one in height mountain area at more than 2000m above sea level and the other in Garman plane of about 200-300m above sea level. This plant in distinctive from others by their multi brunching and re brunching in adens quantity Fig.(7a and b), its length exceed 150 cm. The plant have very tall perennial aerial shoot and lateral brunching exceed 50 cm, whorl brunch which are usually brunched to even to third extend. The number of scales in each node is between 14-16 scale and the distance between the nodes is 6-8 cm. This taxon is recorded in this area for the first time in the present study.

![Fig (2): Distribution of Equisetum in Kurdistan region](image-url)
Fig. (3) Equisetum arvense L.

Fig. (4a) Equisetum arvense L.

Fig. (4b) The cone of Equisetum arvense L.

Fig. (5) Equisetum ramosissimum Desf.
Accordingly to the previous references only 24-25 living species of *Equisetum* exist in our planet. A genus which widely distributed in most arctic, tropical and temperate regions with the exception of Australia. However all referred to the presences of the *Equisetum arvenus* L. and *Equisetum ramosissimum* Desf in Iraq. Out of 15 living species *Equisetum* as recently have been conferred by many authors([14]; [15]; [16] and [17]) , it is worth to refer that *Equisetum* is one of the most ancient and distinctive clades of living vascular plant with rich fossil record from which to infer evolutionary transformations leading to the single living genus *Equisetum* [18]. One study of an Alaskan shrub wetland reported that horsetail played an important role in removing and recycling certain nutrient.
[19], however there is considerable evidence of exotoxicity effect of different parts of this plant it was also used as food under special circumstances and generally coincided as medicinal herb. One species in Canada (Equisetum plasuta ) has been reported as injurious to cattle and sheep thought normally animals may graze in pastures contain the plant without any harm. It’s worth to mention that sickness caused by Equisetum poisoning is known Equisetosis and its symptoms have been duplicated in feeding experiment on the horses. Any way the medicinally use Equisetum is of very long standing and has been incorporative as pharmalogical drug in Germany. The ash obtained by burning the plant is considered to be beneficial in acidity of stomach horsetail (Equisetum) containing silica which is significant in its active therapeutic properties [12; [3] and [5] ] . Distribution of Equisetum arvensis L. according to [1] is presented only in niberhood or the Ruwandiz district in the forest zone of Iraq Khanal and between Khoran and Haji-Umran and close to Rubari Rusta. Its habitat according to [1] is ditches in orchard moist silt of perennial streams at flood level by road side on mountain slope at altitude 1100-1500m during June-September. [1] suggested that very restricted distribution of this species iv Iraq may be due to its restrictive to non calcareous soil, lime free soil been very rear in our country but occurring in several localities to the north east of Ruwandiz. The other species of horsetail recorded in Iraq is Equisetum ramosissimum Desf which have been distributed in forest zone of Iraq, rear in steps and desert zone, Gal-Zaweta, Sarsang, Bekhal, Ruwandiz, Hulgurd, Kholarahan, Pishthashan, Bakrajo, slope of Peeramagroon, Kirkuk, Tooskhormatoo, Rawa and Baquba. Equisetum limosum L. that was reported from Jibal Himreen by [2] is found to be aquatic form of E ramosissimum Desf ([1] and [12]). However [5] referred to the possibility recording more species and varieties of horsetail (Equisetum ) in Kurdistan and even Iraq, as he referred to the presences of Equisetum in Hilla area. [20] showed that field horsetail ( Equisetum arvensis L ) is quite widely distributed in the world which comes in accordance of the present finding [21] and [22]. The tall length of the stem around 2cm sheathed number across the nodes (13-20) fith with Equisetum telematia but other characters particularly smaller cones ( not exceeding 2cm) make us too considered the specimen to the Equisetum arvensis L. However according to [1] this species have been found in Gali Zaweta, Sarsang, Baikhma, Ruwandiz, Halgord, Khoran, Bakrajo, Kirkuk, Tooskhormatoo and Baquba so one can state that Equisetum ramosissimum Desf is most widely distributed species of horsetail in Kurdistan. This was clearly reflected in the present investigation. This plant has a worldwide distributed as it had been recorded in British isles, Canada, Australia, India and Qauqas. The geographical area of Equisetum in Asia covers from east of Afghanistan, Pakistan, India, Nepal, Bhutan, Bangladesh and Sirilanka with four number species according to [23 ].This plant was also recorded in Hilla around Shatt Al-Hilla near Babylon . [13] recorded this species from Kirkuk, Erbil and Sulaimaniyah. [12] showed that this plant has a medicinal important in stop bleeding and helpful in Kidney trouble. Finally, some detail and morphological characters and illustration for the two species of Equisetum in Iraqi Kurdistan were given as well as Equisetum ramosissimum Desf var flagilliferum Milde were recorded for the first time. This paper may be regarded as the first detail study on fern in Iraqi Kurdistan and Iraq as a whole. Undoubtedly it well follow with a series of more papers on fern distribution in Kurdistan. 

VI. References


