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Survey of pteridophyta from Iraq and Iraqi kurdistan region

Farhad Hasan Aziz

Department of Environment ,College of Science,University of Salahaddin-Arbil, Kurdistan, Iraq.

Corresponding Author: farhad.aziz1948@gmail.com

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Abstract:

A total of 27 species in 5 orders, 10 families, 17 genus of Pteredophyta were recorded in Iraq, four species, *Salvinia*spp, *Marselia capen Ceratopteris halictroides, Pinus halepensis* and *Thujao vientali*s are distributed in middle and south part of Iraq, while the rest species (23) were recorded in deferent locations of Kurdistan. The rare species are *Equisetum arvens, Phylitis scolopndrium, Asplenium virid, Anogramma leptophyla* and *Cystopteris regia* are mostly found either in one or two locations in Duhok, Slemani and Erbil governorates, while, the most common species are *Equisetum ramosissimum, Cheilanthes*s pp. *Adiantum capillus- veneris. and Asplenlinium ceterach.* The new records are *Cheilanthes margirata* (L.) Mick *Cystopteris regia* (L.) Bern and *Athyriumfilix- femina* (L) Roth.

Keywords: Pteridophyta, New records, New Photos, Mountains, Kurdistan region, Iraq.

Introduction:

Pteridophyta is small trees or shrubs, and perennial small cryptogrammic vascular plants reproducing by spores in indusium, mostly on under surface side, in pairs along veins; These flowerless vascular plant characterized by regular alternation of generation sporophyte and gametophyte of which the former is dominant. While, Spermatophyte with naked ovules non enclosed in ovary, sexual organs in cones; female cones woody or fleshy and berry- like; Leaves are scale and needle – like. Male cones are small surrounded by needle –like structure [1]. After a gap of about 40 years since 1966 by which Townsend, Guest and Al-Rawi represented in Townsend and Guest [2] who have done a good work and had given are relating to Pteridophyta flora of Iraq. They recorded represented 27 species in 17 genera in while, the first work on Pteridophyta had given by Al - Rawi [3] and Al-Rawi and Chakravarty [3] in Townsend and Guest[2].

Methods:

The identification and classification was based on the available references[2] Townsend and Guest, [4] Mickel and Beitel and Phillip[1], Drawings have been represented, also photos were supported from reference books. Photographs were taken in the field and laboratory using a digital camera. A digital camera joined to a dissecting Olympus microscope was also used. Measurements were done in mm and cm. The samples were collected in deep valleys, dense forest, quite shaded areas at the edge of streams mainly in Zalm – Slemani, Gali - Ali Beg, Gurtk –u- Rusti villages, Doli-Balaiyan, Doli Haji Omaran- Kawshan, Qandil Range, and Halgord – Nawanda village. From 1997- 2015. Most samples know kept in Herbarium of College of Science. Finally this work have done because the previous was depended on hand drawings, here most new and previous recorded species in Kurdistan are fresh with new photos and supported by those photos presented in Phillips[1]. This study was carried out during growing season during winter, and spring and summer.

Study sites:

The study area located in Iraqi Kurdistan Region of Iraq. It extended within 43°15' - 45°14' E, 37°24' - 36°34' N. The total study area is about 65000 km^2. It covered higher mountains and foothills areas at an altitude of 200 to more than 3500m above sea level. Physiographically the studied covering three main regions: High Folded Zone, Low Nape Zone and Folded Zone (Anon, 1975). The rocks of hills and mountains are of calcareous type, covered by alluvium; they were formed by stream and river flows forming alluvial plains. Climate is cold in winter from October to April with winter rainfall (250 to more than 1200 mm/ year) and snow falls. While, the summer season is hote and dry[5,2].

Results and discussion:

It is appear from List 1 that a total of 27 species in 5 orders, 10 families,17 genus of Pteridophyta were recorded in Iraq, four of them (Salvinia *adans*, *Marselia capensis*, *Ceratopteris, thalictroides*, *Pinus halepensis* and *Thuja ovientalis*.) Found in middle and south part of Iraq, while the rest (23) species recorded in deferent part of Kurdistan. The rare species are *Equisetum arvens*, *Phylitis scolopndrium*, *Asplenium virid*, *Anogramma leptophyla* and *Cystopteris* regia**.** While, the most common species are *Equisetum ramosissimum*, *Cheilanthes* spp, *Adiantum capillus- veneris. and Asplenlinium ceterach.* While, *Polypodium s*p recrded as a fossil in Iqri district. In mountains in Duhok provinces. These few numbers of Pteridophytean flora of Iraq and Iraqi Kurdistan region(Townsend et. [2]) are contributed to climatic conditions, because these group of plants for their growth, abundance and distribution depend on low temperature, high rainfall, soil humidity, air moisture regime and woody forests at high and low altitude[2]

List (1): The Pteredophyta flora recorded in Iraq and Kurdistan From 1961- 2014.

Plantae
Pteriodphyta F. Ballard
Eequisetales
Equisetaceae F. Ballard
Equisetum L.
E. Arvense L.
E. Ramosissimum Desf, FL. Atlant
Filicales
Marsileaceae F.Ballard
*Marsilea*L.
M. capensis A.Br.
Salviniaceae F. Ballard
Salvinia adans
S. natans(L.) All. Flor. Pedum
AdiantaceaeF. Ballard
Adiantum (Qaitarani Rash)
A. Capillus- veneris L.
Anogramma Link
A. leptophylla (L.) Link
C.Persica (Bory) Melt ex lkuhn
Ceratopteris Brongn
C. thalictriodes (L.) Brongn.
Aspelinaceae F. Ballard
Aspleninum L.
A.trichomanes L.
A. virid
Cheilanthes Sw.
C. fragrans (L.) Sw.
C. margirata (L.) Mick *
Huds.
A.haussknechtii Godett Reater
A.ceterach L(*ceterachofficinarum*) DC

Phyllitis Hill
P. scolopendrium (L.) Newm

Athyriaceae F. Ballard
Cystopteris Bernh
C.fragilis(L.) Bernh
C.regia…*
Athyriumfilix- femina (L) Roth.*
Polypdiales
Polypodeacea
Polypodium sp. (cultivated)
Aspidiaceae F. Ballard
Polystichum Roth
P. setiferum (Forssk) Woynar, mitt
Sperrnatophyta
Gymnospermae
Gnetales Alata Decne
Ephedraceae R.A. Blakelock and J.B Gillett
Ephedra L.
E. alata Decne

E. transitoria Riedl
Coniferales
Cupressaceae R.A Blaeklock
Janipperus L (3ar3ar or Harharh)
J. polycarpos L. Koch in linnaae
J. oxycedrus L.
Cupressus L
C. arizonica Greene
C.sempervirens L.
Thuja L.
T. orientalis L.
Pinaceae
Pinus L (Snobar in Kurdish)
p. halepensis Mill
p. halepensis var. *brutia* (Ten) Henry ex Elwes and Henry

Equisetum Linnaeus (L.)

This species is in the family, Equisetaceae, which is in the plant division, Pteridophyta. This means that Equisetum species are closely related to ferns, and their reproductive spores are dispersed by the winds. The popular and widely used name "Horsetail" comes from the Latin words Eequus (horse) and seta (bristle), from the peculiar bristly appearance of the jointed stems of the plants.

Equisetum ramosissimum Desf., Fl. Atlant. (Pl.1, Figs.1-7)

Rhizomes very long about 50cm long, densely branched, up to deep and penetrated into the soil, blackish-brown, very strong very hard and strong for removing from the earth, branched up to fortiori branches, the branches not appear till the end of the April, all branches are fertile, corticated, with nodes and internodes, nodes surrounded by hair pointed with green sheath, stem up to 180cm high in favorable conditions. Cones, longer than of *E arvens10- 40* mm long. Found in Hanara village/ Bastora valley, near Erbil city in 1988 by Aziz and in Rwandiz, Choman districts and Haji Omaran, Erbil (See Townsend et. al, 1966; P.56, Pl.1,Figs. 1-5 edited by Townsend and Guest,[2].

Plate 1: ***Equisetum ramosissimum*,** Figs.:1-More Branching, 2-Less branching, 3-Stem and sheath,4- Stem c.s., 5- stem t.s.,6- Cone.(from Townsend and Guest,[2]) .
7-Herbarium specimen / College of Science / Salahaddin University-Erbil.

Equisetum arvense L. (Pl. 2, Figs. 1- 3)

Rhizomes slender, highly spreading, extending downwards to a depth 1m, densely brown- hairy with small hairy tubers on deep rhizomes. Stems cylindrical, dimorphic more than 1m high un branched, corticated, has nodes and internodes. Cones appearing at early spring 10-25 mm long, stout, hexagonal, slightly attenuated. Brown, without chlorophyll. Leaves rudimentary appear as a short sheath, green, with acute teeth, present around nodes, hair pointed. Branchlets are numerous, spreading, soled. Rare in distribution, distributed in forest zone in Rwandiz district, and between Haji Omaran-Khalan and Rubari Rusti in Joman district. At an Alt. 1750 m. It is rare species because it is preferred soils free from calcium which is rare in a Iraq as a whole.(Townsend et .al, 1966, P. 55, Pl.1, Figs 1-6 edited by Townsend and Guest,[2]).

Plate 2, Figs.1-3: ***Equisetum arvense* L**. (From Phillips,[1]).3-Herbarium spacemen-College of Science

Marsilia capences A.Br.(Zamra in Arabic)(Pl.3, Figs., 1-4)

This plant is aquatic, flouting found in Marshes in south part of Iraq in shallow waters, rise fields. Rhizomes with hairs, infiltrated in to water body, often with as lender horizontal, sparsely hairy, with long pale flex Frond consist of 4 folio late, representing contiguous pairs of pinnae borneat the tip, pinnate sub sessile, equal ,ovate – deltoid(fan –shaped) or lanceulate more or less hairy. Spore carps (Sporangia) stalked borne on the axial of thefrond or from lower part of sips, bean- like , sub globes or ellipsoid, hairy dark brown at maturity. 3.1mm long, 2.8- 3.0mm broad, pedicals3-5mmlong It is used as food at the time of scarcity. (See Townsend et. al, 1966; P 58, Pl. 3, Figs.1-4 edited by [2]).

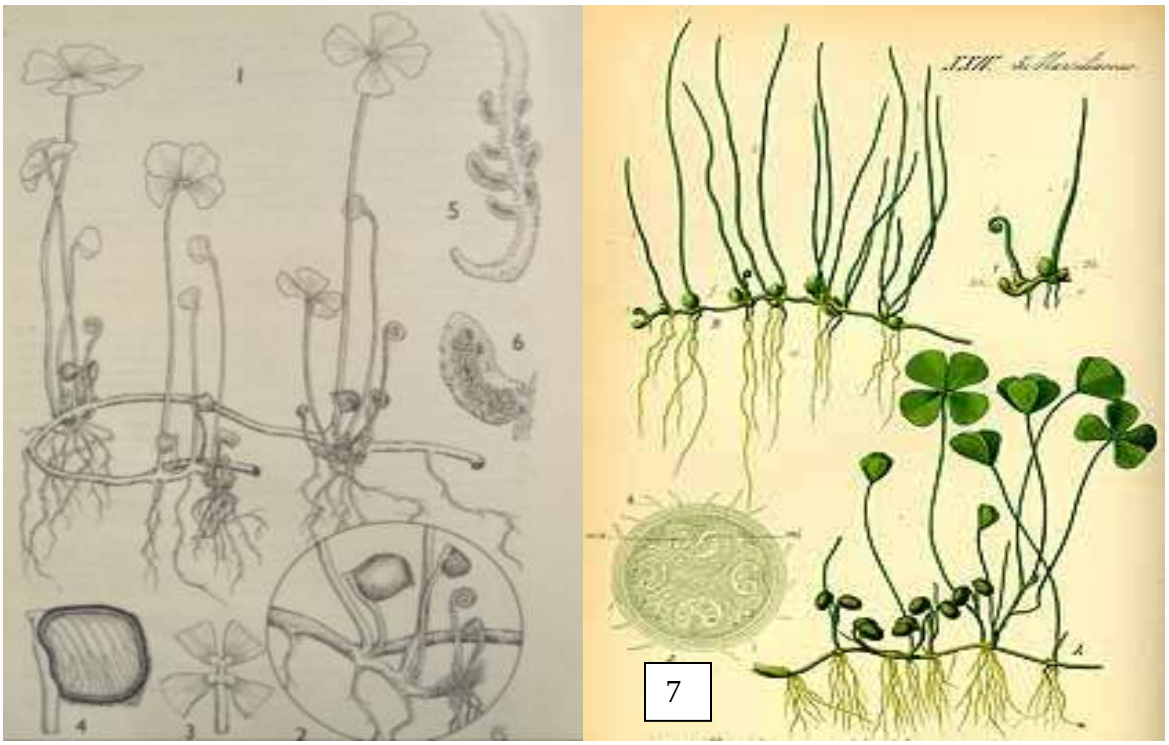

Plate 3: ***Marsilia capences*** A. Br., Figs.: 1-Branches and appereance, 2- Portion of rhizomes, 3- Pinnae,4- Sporecarps surface, 5- Sporangia and sori, 6- Single sorus Townsend and Guest,[2]). Figs.:7-9 http://www.ispotnature.org/species-dictionaries/sanbi/Marsilea

Salvinia natanas (L.) All. (Pl.4, Figs.1- 5)

Plant is aquatic, floating found in Marshes in south part of Iraq in shallow waters Rhizomes very slender, branched , with long filamentous pointed hairs, laying just below water surface to the depth of 6cm. Fronds are floating sub sessile to shortly stalked, bright in color, broad, elliptic - oblong, chordate at the base, while rounded at the apex. Fronds 15mm long, 10mm broad, lower surface bearing hairs similar to those of the rhizomes, upper surface with papillae in rows between the second veins, each papillae bearing a tuft of up to 4 pointed hairs, midrib of frond with 20 pairs of secondary veins. Sori 2.5mm in diameter and up to 8mm in cluster.(See Townsend et. al, 1966; P. 59, Pl.2,Figs.1-6 edited by Townsend and Guest,[2]).

Plate 4**:** ***Salvinia natanas*** (L.) All. Fig: 1- Plant showing habit, 2-Leaf surface, 3-papillawith tuft hairs,4-Portion of plant with sporocarp. (From Townsend and Guest, ,[2]). Fig.5 from: https://commons.wikimedia.org/wiki/Main_age

Adiantum capillus – veneris L. (Qaytarani Rash 0r Karais Al- Beir) (Pl. 5, Figs. 1- 8)

Adiantium has 200 species, only one of them recorded in Iraq and in Kurdistan, which is**. It is** terrestrial plant .Rhizomes short creeping or sub erect, scales not clattered .frond usually decompounds and deltoid in outline strips and stalk often black and polished, with u-shaped vascular strand. Mostly sori marginal and without true indusial, sometime substitute indusial formed by modification of leaf margins. Leaf blade glabrous rarely hairy or elongate. Sore borne bellow and on the oblong reflected margins which may be continuous or broken into a number separate oblong or orbicular laps. Spores usually red and tetrahedral.(See Townsend et. al, 1966; P. 65, Pl.4, Figs. 1- 5 edited by Townsend and Guest, ,[2]).

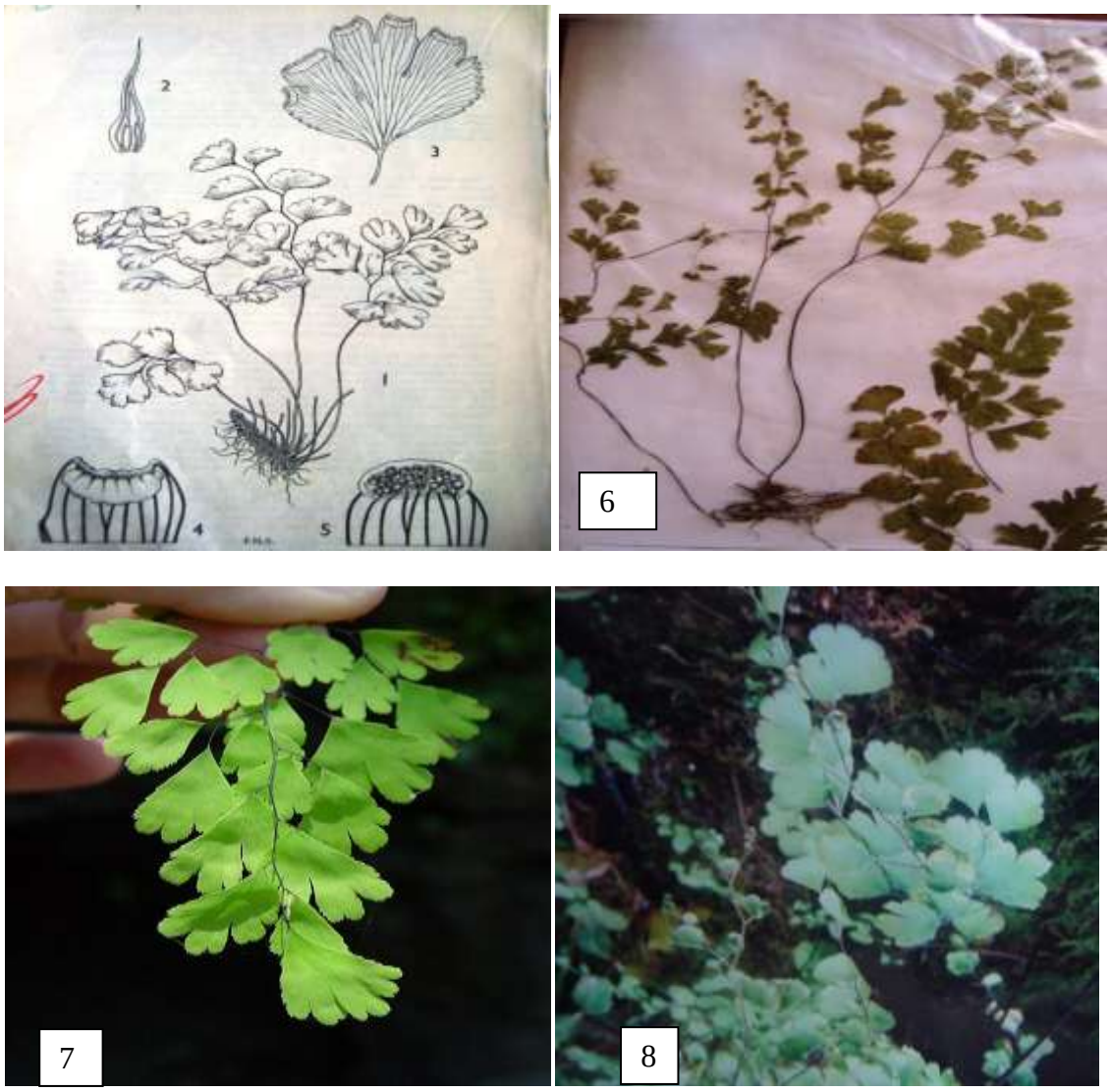

Plate 5:***Adiantum capillus – veneris*** L.; Fig. 1- Plant feature, 2-Scale, 3-Pinnule segment, 4- Pinnule apex, 5-Pinnule with indusium and sori in back. (from Townsend and Guest, ,[2]).Fig. 6- from herbarium ,7,8 Shwing plant habit in Gali Ali –Beg .

Anogramma leptophyla (L.) Link. (Pl.6, Figs. 1-6)

A genus of small emphemeral ferns with small rhizomes bearing narrow brown haisr- like scales . Fronds more or less dimorphic clustered, sub glabours thin, 2-3 pins as fronds. Veins forked and free. Sporangia seriate naked located along the veins without indusium; spores tetrahedral. Blades ovate to elliptic, bicuneate, toothed. Distributed in lower forests zone in Darbendikhan and Khanaqin in Shaded area along, over hanging rocky edges, damp limestone fissures in shady valleys. (See Townsend et. al, 1966; P.67, Pl.5, Figs. 1- 5 edited by Townsend and Guest, ,[2]).

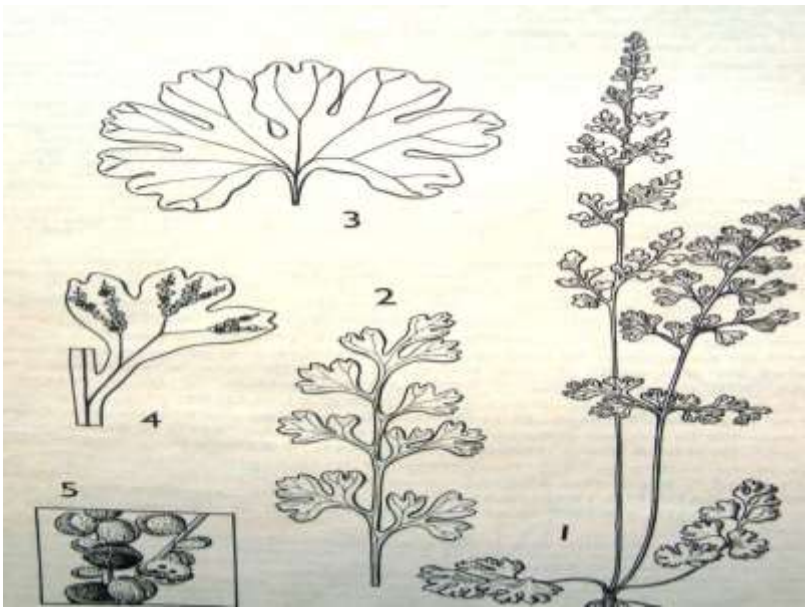

Plate 8:*Anogramma leptophyla* (L.) Link.: Fig.:1Plant Habit, 2- Frond, 3-Pinnate from basale frond, 4- Sori in pinnae, 5- Sori Shape.(from Townsend and Guest, ,[3]).
6-Herbarium spacemen-College of Science / Salahaddin University-Erbil.

Cheilanthes fragrans (L.) Sw. (Pl.7, Figs.1- 6) *(from Geerk cheils=lip* and anthos= flower). This ferns are widely distributed in arid and warm tropical regions. It is small ferns with Short creeping reddish-brown hairs and slender rhizomes. Frond, simply clustered to multi- pinnate, hairy3-20cm long, stips(petiole) about one- thirdto half aslong , dark brown, shiny, hairy. Veins free. Sori marginal at the tip of veins; indusium absent. Blades1.5- 10cmlong, narrow, ovate to lanceolate- ovate, thick, glabrous, bright green, bipinnate-pinnatifid to tripinnate. Found in Sinjar, Makhmure- Qarajugh mountain, Rwandiz and Joman districts. (Townsend et. al, 1966; P. 69, Pl.6, Figs. 1- 5 edited by Townsend and Guest, ,[2]).

Plate 7: ***Cheilanthes fragrans*** (L.) Sw. Figs.: 1-Plant feature, 2- Scale, 3- Underside pinna, 4- uper surfacepinnule,5- Indusium with sori (from Townsend and Guest, ,[2]),6-in the field

Cheilanthespersica(Bory) Melt ex Lkuhn (Pl.8, Figs.1-2)

Rhizomes ascending,very similarto that of *C. Fragrans*with dark to blackish- brown, rigid ,linear,Cuminate. Frons5-20cmlong one halfto tow third medium to dark-brown, less shiny at the base ,densely covered with scales (hairs) to those of rhizomes scales.blades 3-10cm long, soft,narrowly ovate to lanceolate, bipinnate –bipinnatifid to tripinnate – quadripinnatifid, ultimate pinnules ovate – oblong, 0.7-1.5mm across margins, undulate. Sori contiguous; indusial confluent, whitish, with wooly hairs in lower surface, found in Sarsang, safin and Harir mountains, Gali –Ali-Beg, Kharand, Serkapkan, Rania,Malakan, Iquyan- Feqianand other placesin Kurdistan……(See Townsend et. al, ,[2]; P. 69 edited by Townsend and Guest, ,[2]).

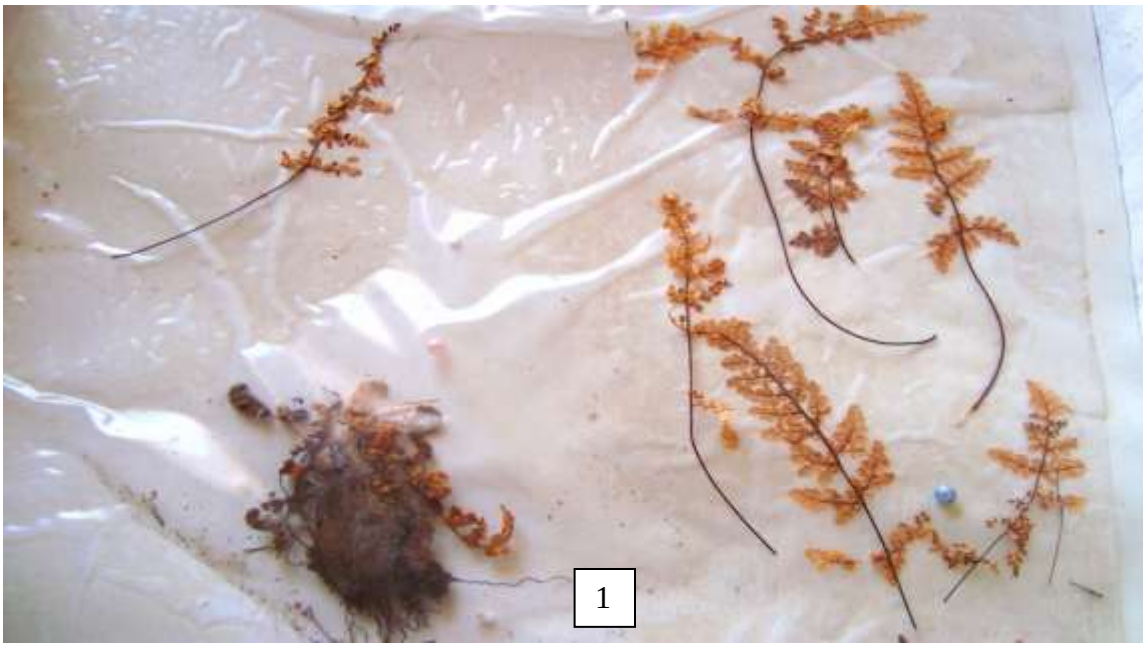

Plate 8:*Cheilanthespersica*(Bory) Melt ex Lkuhn Fig. 1-from herbarium, 2- Plant showing habit in the field.

Ceratopteris halictroides (L.) Brong (Pl. 9, Figs. 1-6)

It is water fern, floating fern among a aquatic ferns, annual, rooting in mud or shallow water, rhizomes small, short, erect with few hairs. Fertile frond pinnatified. Veins forming a fine network. Sporangia at the lower surface, sessile, arrange singly at the edge of pinnules, spores tetrahedral Frond 65-100cm long, stips half as long as frond ovate to lanceolate. Sterile fronds with narrow branches 2mm broad, fleshy, attenuated 45cm long. Ultimate segments variable in shape, but mostly ovate to triangulare, linear ,5cm long, 2cm broad. Meshes of areolate polygonal. sporangia scattered irregularly along the veins only five species recorded in tropical areas, prefer warm water. Found in marshes in south of Iraq (See Townsend et. al, 1966; P.70, Pl.7,Figs.1-5) edited by Townsend and Guest, ,[2]).

Plate 9: ***Ceratopteristhalictroides*** (L.) Brong: Fig.,1-Plant feature, 2 and 3 Spores on frond surface, 4 – Single sporangium.from Townsend and Guest, ,[2]).5,6 in the field

Asplenium trichomanes L. (Pl.10, Figs. 1-2)

Fronds 5-35cm long,0.5-2.0 broad with shiny black black strip or rachises or stalk or petiole (so called black spleenwort) , half as long as fronds, with hard dark green pinnate (leaves) tufted, blades have, up to 30 pairs of sessile, sub oblong pinnate. Sori located under the leaf surface along the veins between midrib and margin, long , narrow; spores ripe, indusium linear, appear from January. Rhizomes creeping, dark – brown with , hairs. Fund in Kurdistan found in Bekhal, Tawella and we found in Zalm. (See Townsend et. al, 1966; P.73, edited by Townsend and Guest, ,[2] andPhillips, ,[1], P.98).

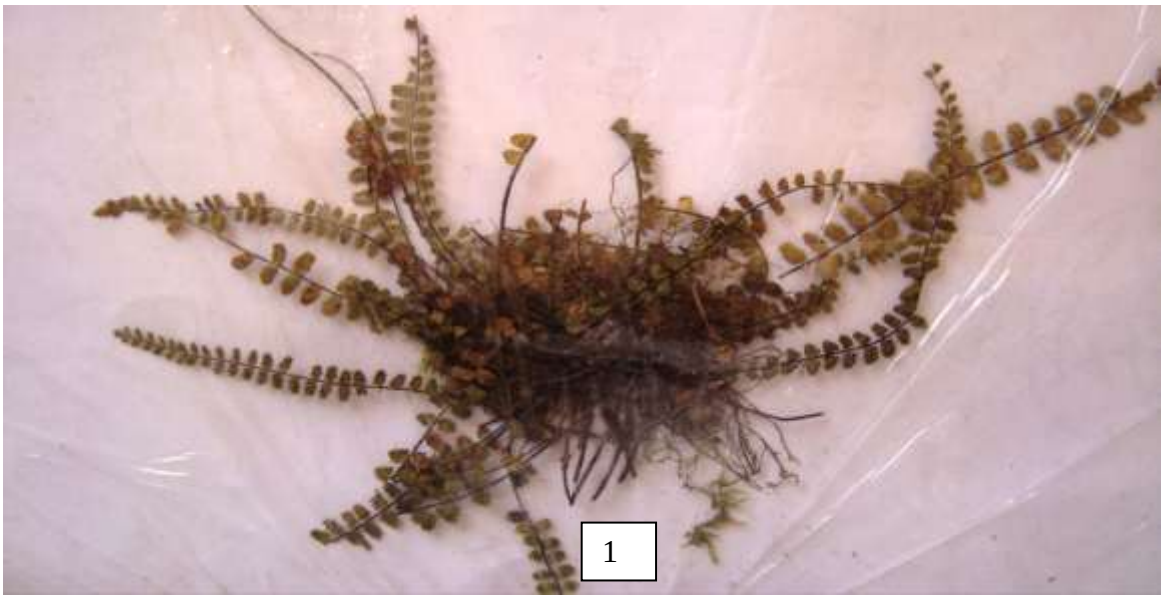

Plate 10:***Asplenium trichomanes*** L.: Fig., 1- from herbarium , 2- Plant showing habit in the field and herbarium.

Asplenium hausskaechtii Godet Reuter (Pl. 11, Figs.1- 2)
Often grow on walls, bridges and rocks as in Kurdistan forming Thick massein suitable habitats. Used as a herbal remedy for rickets. It is similar to ***A. ruta- muraria*****found** in England. Rhizomes short creeping clothed in blackish- brown linear- lanceolate, acuminate, hair-tipped clathrate scales. Fronds slender, green, with fine hairs, 2-15cm long and irregular in shape, bipinnate at the base. Blades in shaded areas in forest zone in the N.W. Sector; MAM, Sarsang, Duhok, Hains W. (See Townsend et. al, 1966; P.74, edited by Townsend and Guest, ,[2] and Phillips, ,[1], P.101).

Pl. 11: ***Asplenium hausskaechii*** Godet Reuter : Figs.: 1-from herbarium .2- in the field

Asplenium virid Huds. (Pl.12, Figs.1- 2).

This ferns are common in limestone rock in mountain areas. It is similar to ***A. trichomanes*** but has a green stips or rachises or stems or/ and petioles (called green spleenwort) and more delicate in appearance. Pinnate are shiny and has whitish powdery like hairs scales. Sori long arranged along and neare midrib than margins and in cluster in under surface leaflets (pinnulate) redish- brown in color, surrounded by bent leaf edges. Rhizomes short creeping clothed in blackish linear – to lanceolate hairs-pointed scales; indusium linear then become hidden below sporangia at maturity. Very rares species fond once in alpine region; MRO in Al- Qqradagh(See Townsend et. al, 1966; P.74 edited by Townsend and Guest, ,[2] and Phillips, ,[1], P.99).

Pl.12: ***Asplenium virid*** Huds., Figs.1- Plants showing habit, Sori on underside pinnules. (Philips, 1994). 2- In the field

Asplenium ceterach Garsault.

A.Ceteragh L.Synonam***Ceterach officinarum*** *DC.*(Pl.13, Figs.1- 6)

With rhizomes of lateral scales bearing linear- lanceolate acuminate, hair-tipped scales. Frond from few to12cm long, looseleytufted. Stips or stalks are vary in length, slender, green, brownish at exterm base, smooth with few fine scales. Bladeselliptic totriangular- ovate in appearance, pinnate-pinnatified to bipinnate- bipinnatifid at the base, variable in size (2- 7cm and 1.5-3.0cm); pinnules are acunnate- lobate withy rounded ends. Sori linear- elongate along the veins without indusial, located underside leaves in rust colour at maturity, mostly toward the base of the pinnules, covered most part of pinnule in shaded areas. Widely growing in cracks, distributed in Kurdistan, in Rwandiz, Haibat sultan, Zalm, Tawilla, Rania…… Used as a herbal remedy against spleem and liver disorders. (See Townsend et. al, 1966; P. 74, Pl.8, Figs.1-4, edited by Townsend and Guest, ,[2] and Phillips, ,[1], P.100).

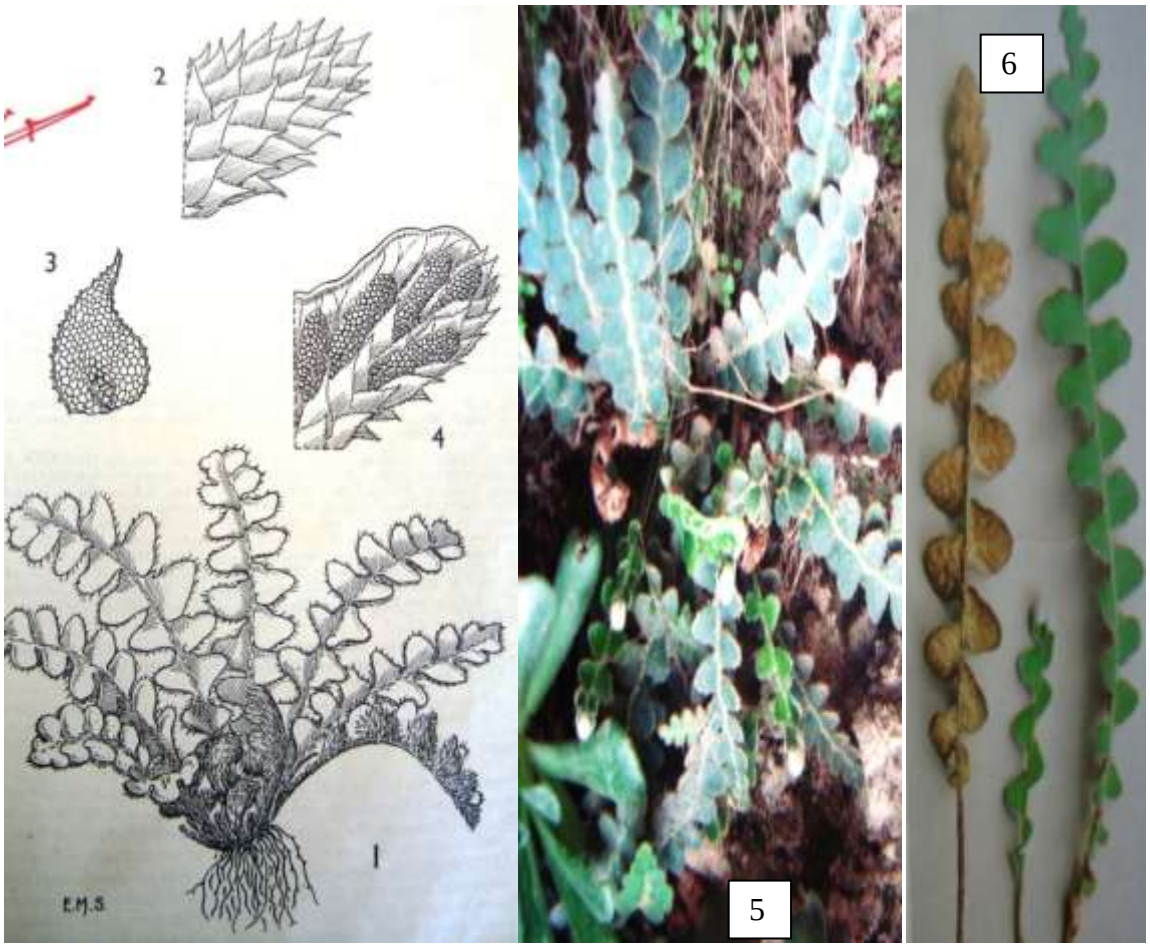

Plate13: ***Asplenium ceterach*** Garsault. Fig., 1- Plant showing habit, 2- piina with scales, 3- Scales, 4-Sori after removing scales from Townsend and Guest,1966.5 –In the field and 6- showing sori from Philips,[1].

Phylitis Hill

P. scolopndrium (L.) Newm (Pl. 14-, Figs.1-2) .

It is a simple genus of simple – leaved ferns with ascending or erect hairy rhizomes. Frond tufted green to brown, vary variable in length 10-70 cm. Blades entire or irregularly lobed 5- 40 cm and 2-6cm wide, lancelets to linear, cordate at the base, while tapered at the tip an thick; venation free, with parallel branches at an obtuse angle to the rachis and forked. long, stips stout half of leaf in length. Sori in pairs adjacent veins and opening toward each other appear as a single sorus; indusial overlaping. It is using for treatment poison bites. It is very rare speceis found in Sulaimani(See Townsend et. al, [2]; P.7,7 edited by Townsend and Guest, ,[2]). Note present inBritish herbarium**).**

Phylitis *scolopndrium* (L.) Newm (Pl. 14-, Figs.1-From hrbarium,2- In the field.

Cystopteris fragilis (L.) Bernh (Pl. 17, Figs. 1-3)

Short creeping ferns, with short erect rhizomes, covered with short, fine lance late- acuminate soft brown hairs. The fronds about 6-35cm long bipinnate and tripinnate, attenuated to hair point. Stalk or stips are dark brittle when old and green when young nearly half that frond length. Sori in two rows or in pairs or irregularly arranged when few underside pinnules of each pinnate on each side of midrib; indusium membranous later on converted into bladder shape after swollen of which its Latin name derived, spores ripe by April. Found in in upper cushion and alpine zones of Iraqi Kurdistan: MAM Sarsang, MRO Safin mountain, Bradost, Hasari-Skran, Rusti and Qandil range.(See Townsend et. al, 1966; p.79, Pl.9, Fig.1-6 edited by Townsend and Guest, ,[2]and Phillips, ,[1], P. 92).

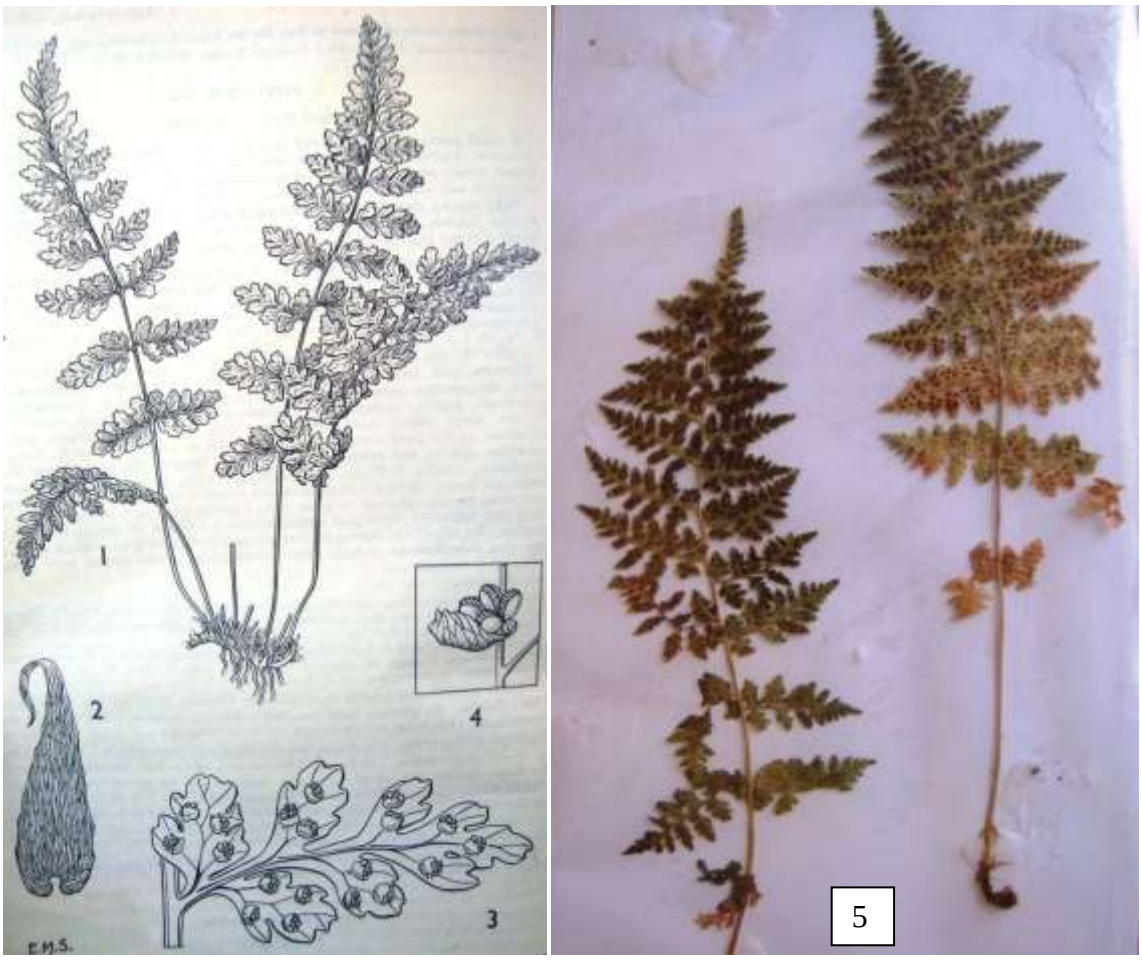

Plate 15: ***Cystopteris fragilis*** (L.)Bernh; Fig. 1- Plant showing habit, 2- Scales, 3- Pinna with sori, 4- Sorus.). (From Townsend and Guest, ,[2]).5- From herbaium

***Cystopteris* regia** L. (Pl. 16, Figs. 1-3)

This fern found in Doli Balaiyan, Wassan village in spring 18.9 2009, it is confused to one of the mentioned above genus, while it thought be one species of ***Chielanthes.*** Native, frond 15- 40 cm long, whit light green stem. half as long as frond. Fronds much tapered. Pinnules with deep lobed, sessile, small, rounded. Sori reddish- brown, in two rows at each side of veins. It is ***Cystopteris* sp** but not shiny and smooth surface. It thought to be ***C. regia*** L. as mentioned in Townsend and Guest ,[3]. Which was recorded in Halgord area and it is similare to ***C. fragilis* (L.) Bernh** (See Townsend et. al, 1966; P.79, eddited by Townsend and Guest, ,[2] and Phillips, ,[1], P. 92).

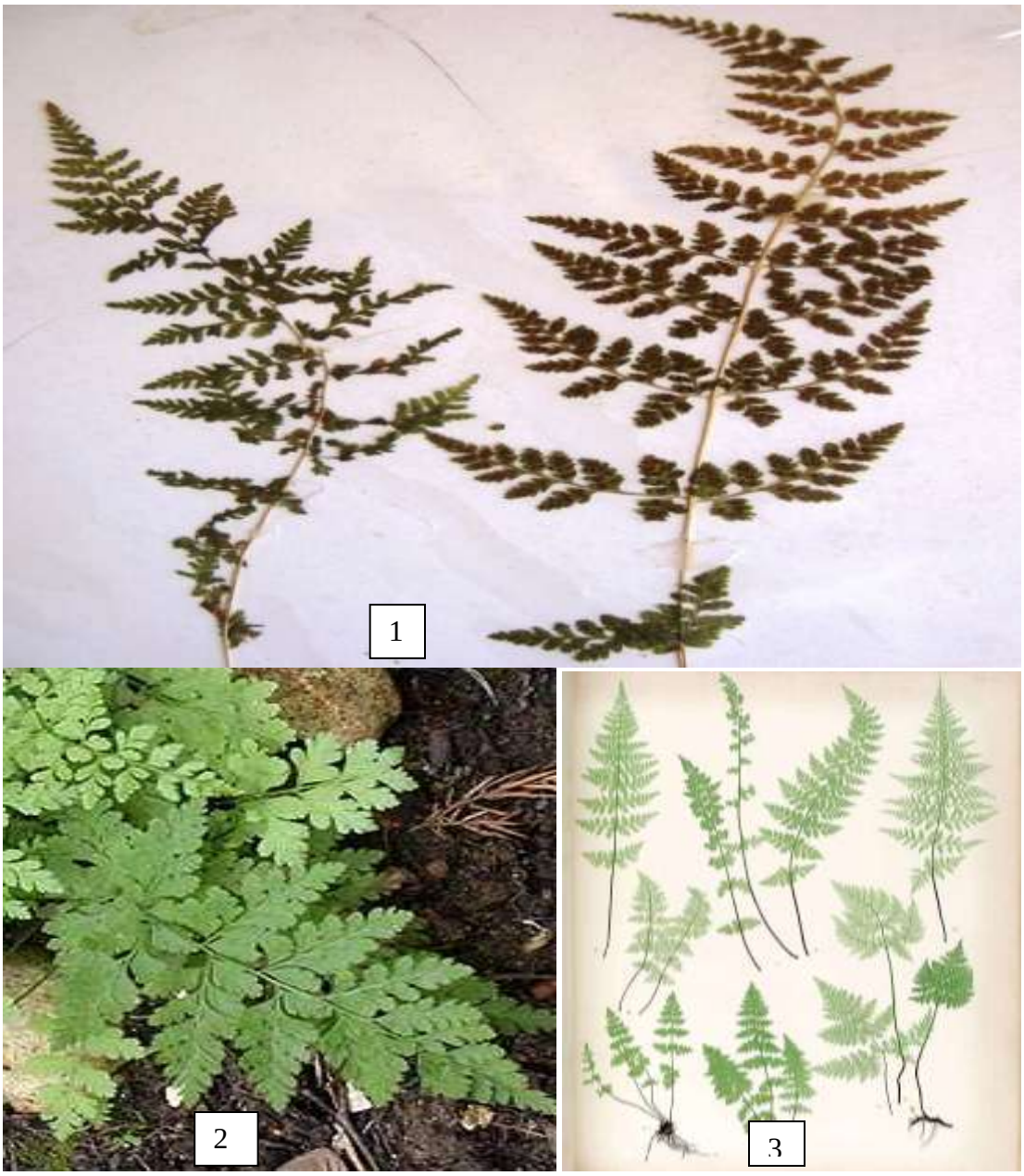

Plate 16: ***Cystopteris* regia** L., Fig, 1 Plant showing fronds , pinnules and sori (From herbarium, 2- In the field

Athyriumfilix- femina (L) Roth. (Pl. 17, Figs. 1-2)

Native forming a dense clump with short rhizomes, common in shaded areas in woody rainy forests at high altitudes as in Ulodagh in Bursa, Turky and in hedgerows, rocks Damps. It is a hard ferns. Fronds pinnate, 20-100cm long, with scales, gracy feathery in appereance. Sori linear, often hooked into a comma- shape, in two rows on the underside leaves at each veins sidepinnules, pinnuleslobate with hairs. Found in Bursa, Ulodahg, Turky. 2010. ,[1].

Plate 17**:** ***Athyrium filix- femina*** (L) Roth. Fig.,1 Plant showing fronds , pinnules and sori (From our herbarium and 2 in the field from Philips,[1].

***Polypodium* sp.** (Pl.18. Fig. 1-3)

Fossile, found in Aqri in mountains district by geologists (Yet not published) preserved at natural museum of College of Scirnce ,University of Salahaddin- Hawler. There are some cultivated species of ***Polypodium*** sp. in Kurdistan distributed among home gardens. The below picture of **polypodium** is showing plant habit in general.

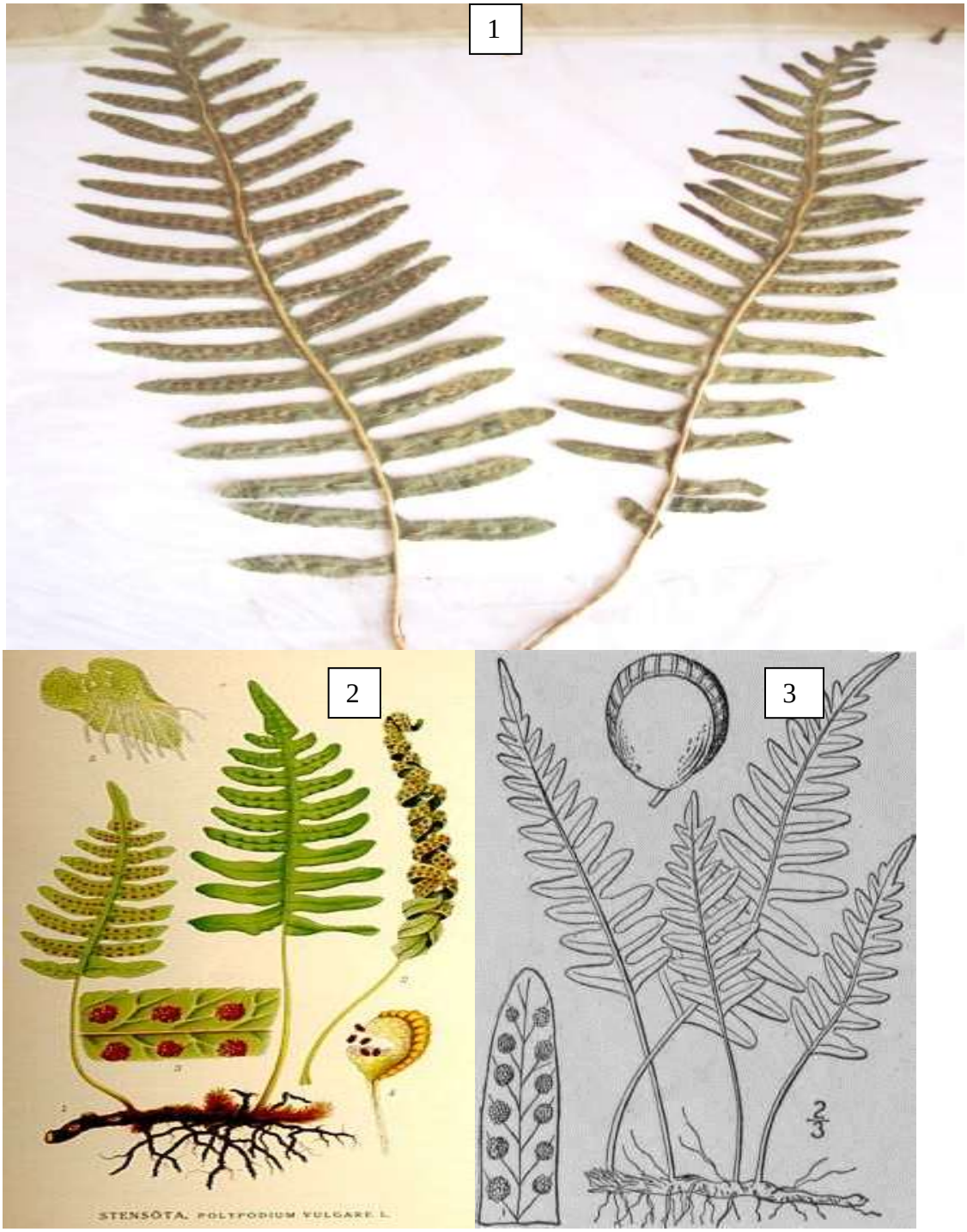

Plate 18: ***Polypodium*sp.** Fig., 1- from herbarium,2 from internet, 3- Sowing plant habit(this sp. Cultivated not native)

Polystichum setiferum **(**Forssk) Woynar (Pl. 19, Figs. 1- 2)

Rhizomes erect short stout upto 1.5cm in diam. and more, the bases is brownish-black covered with brown lanceolate- accminate hairs. Fronds much soft, light green, , arranged in dense basket-like whorls about 30-100cm long. blades drooping towards the apex The pinnules(leaflets) of pinnate with short stalks or strips and overlap the main stem, lanceolate, bipinnate, tapering.Sori in two rows on each side of midrib and that of basal lobes. Spores ripe in April. We found among woods and fissures in shaded moist area in deep

valley at the edge of stream in Zalm village in Slemani and by others in Tawela.(See Townsend et. al, 1966; P.80, edited by Townsend and Guest, ,[2] and Phillips, ,[1].

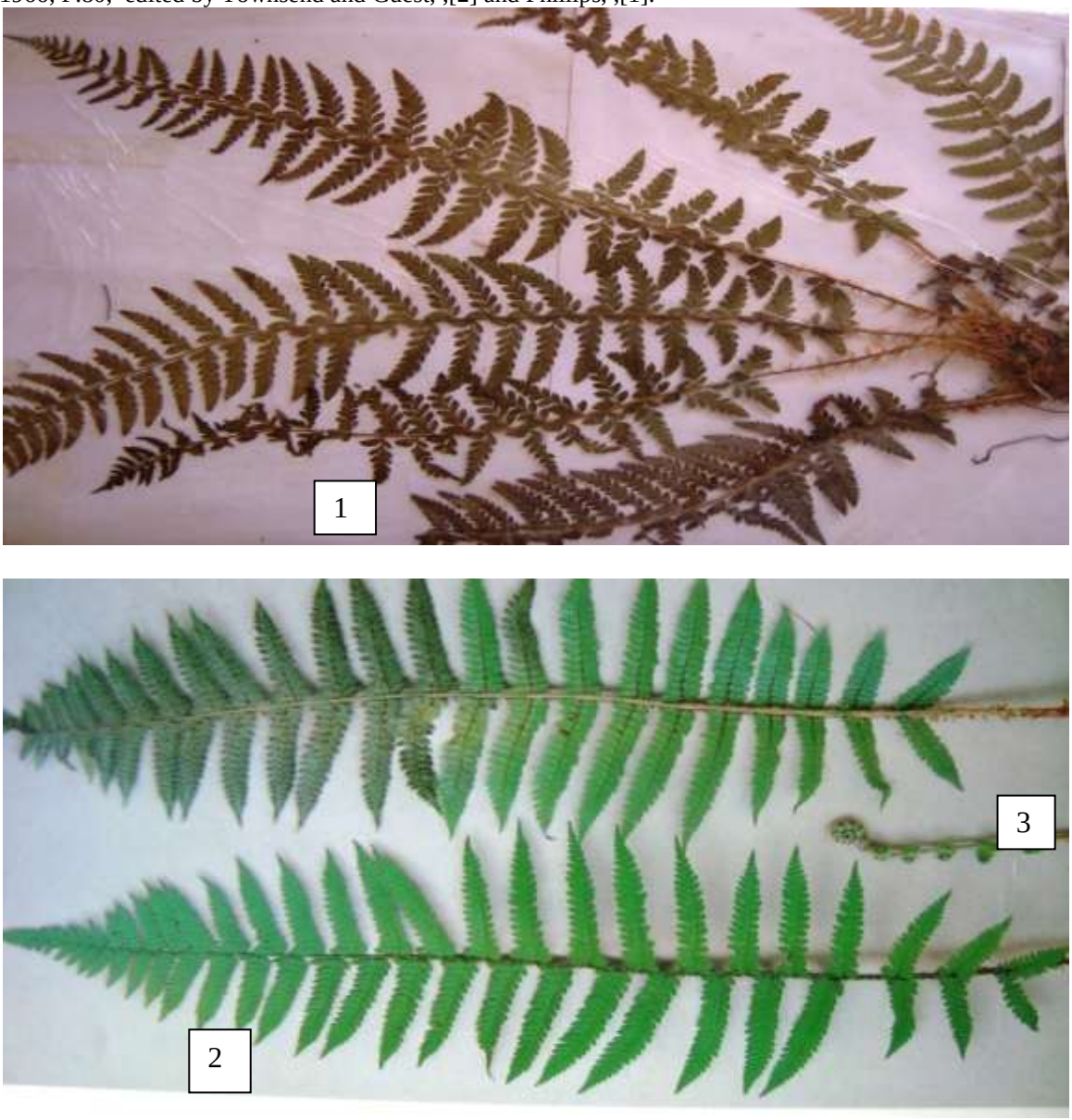

Plate 19: ***Polystichum setiferum*** **(**Forssk) Woynar: Fig.,1 from herbarium, 2–In the field Phillips([1]), and 3- unfolded leaf.

Ephedraalata Decne (Pl.20, Fig. 1).

Shrub minutely scrabed., Twigs yellowish green, up to1m high. Leaves in whorls 2-3 up to 5mm long, surrounded by a sheath. Male cones sessile, Yellowish green, shortly lacerate margin, 10mm across. Female cones up to 10 mm wide, maxillary cluster or at the end of short (2cm) branches or rarely at long branches, composed of 5 pairs bracts. Seeds f winged at the margin. Ferquent to dominant in parts of southeren S.E. sector of desert region (between Zubair and Safwan) in Iraq.(See Townsend et. al, 1966; P.84, Pl. 10, Figs. 1-7, edited by Townsend and Guest, ,[2].

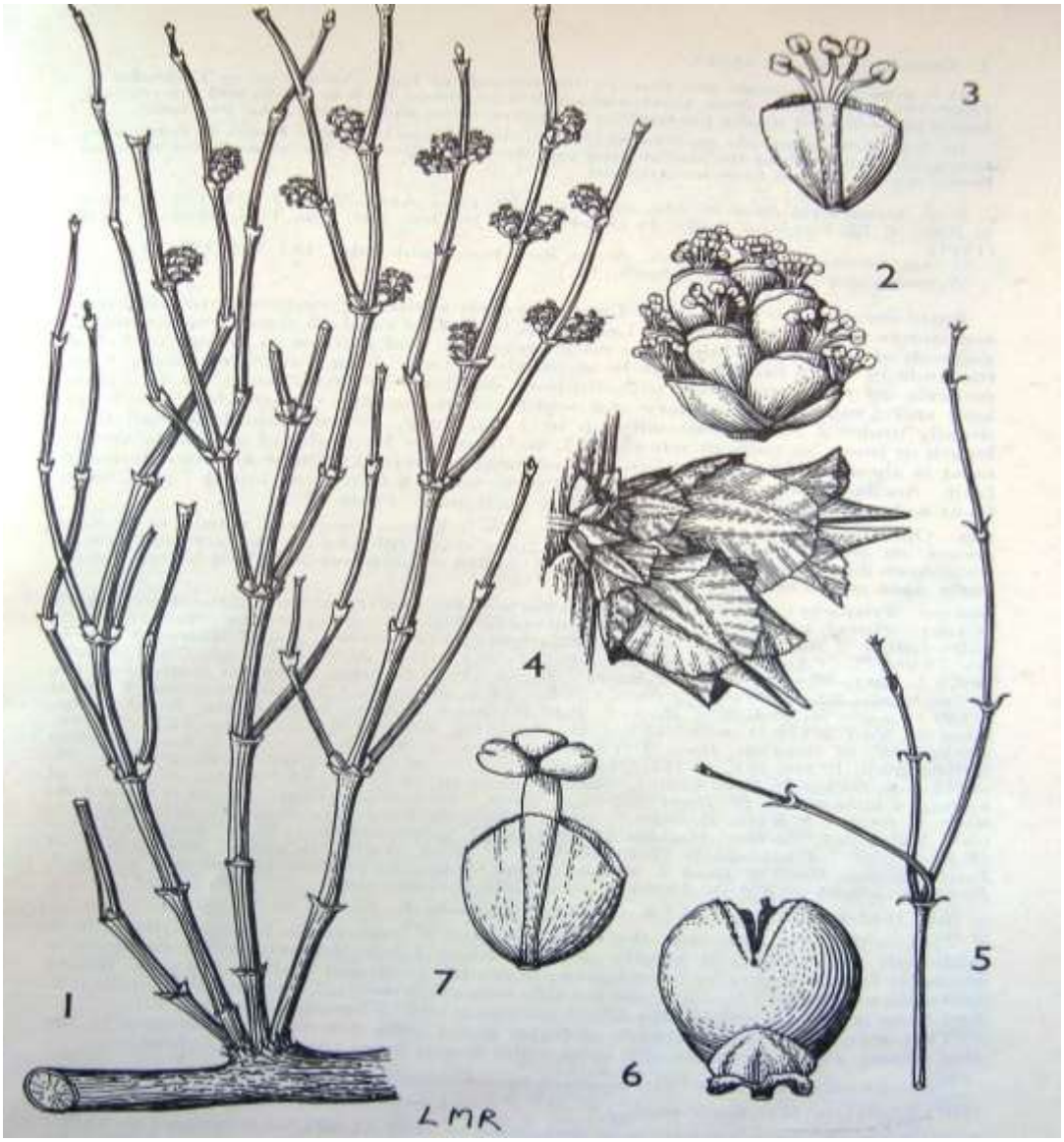

Plate 20: ***Ephedra alata*** Decne:Fig. 1- Branchlet showing male cones and 2- Male cones, 3-Male flower, 4- female cone, 5- Branches with leaves,6- Fruit, 7- Male flower. ,[2].

*Ephedra transitoria*Riedl (Pl. 21, Figs. 1-6)

Small shrub about 50 cm tall twigs minutely scribed, grey-green, the narrowest sometimes under1mm wide. Leaves up to 3,4 or rarely 5mm. long including a sheath of 1-2mm. male cones or sessile I leaf axils or in groups of 1-3 at the ends of short branches rarely as much as 1 cm long; anther usually 4 on pedicle up to 1mm long. female cones up to 7 mm long and 5mm wide, axillary and sessile or at the tips of branches usually 2- 3 in number; bracts united in pairs or whorls of 3-4 -5 capsules. Seeds oblong, obtuse about 2.5mm wide, 6mm long, angled but not winged at each side. (Townsend et. al, 1966; P. 86, Pl. 11, Figs. 1-6, edited by Townsend and Guest, ,[2]).

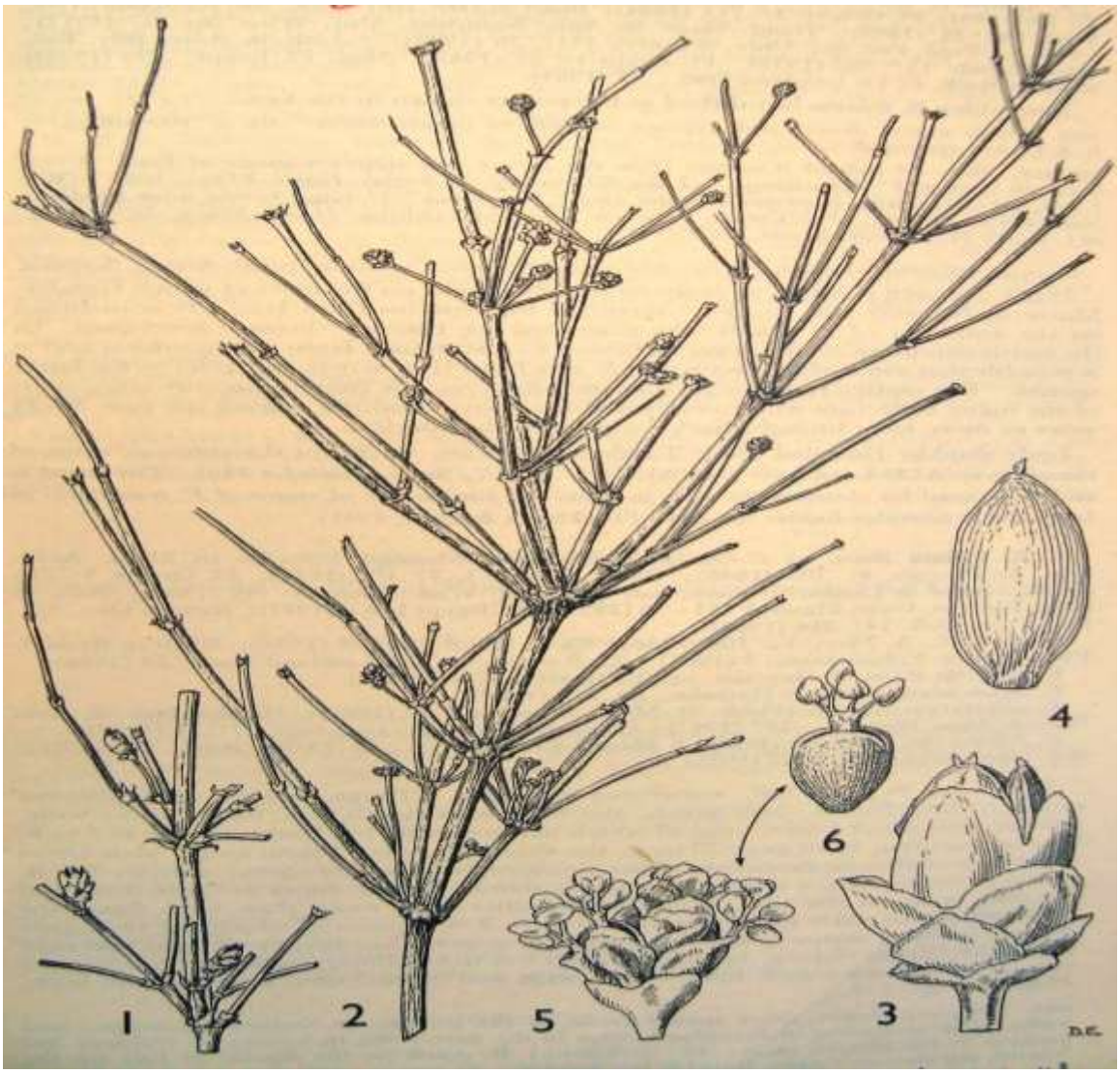

Plate 2١: ***Ephedra transitoria*** Riedl: Fig.,1- Branchlet showing female cone, 2- Branchlet showing male cone, 3- Female cone, 4-Seed, 5- Male cone, 6- Male flower,[2].

Janipperus polycarpos L. Koch in linnaae (PL.2, Figs.).

Trees are 1.2 -2mm high, hard. Leaves opposite, appressed, decussate, rhomboidal, scale-like , with resin-gland sunk in middle of lower surface,opyuse,1mm long; on vigorous young shoot leaves sometimes linear to lanceolate, flattened, spreading in pairs or in whorls very acute, up to 7mm long- brown, terminal, ovoid-globose 4 mm long Male cones greenish .Female cones,8-10mmbroad,terminale, globose, when ripe brownish- purpule, forming 4-8 scales, each ending in transverse line and a small prominence. Female cone ripening in second year. Very rare once collected in forest zone in Kurdistan in Qaradagh range, Slemani MSU only two trees found in rocky summit areas in Iraqi Kurdistan mountains .

Plate 22. ***Janipperus polycarpos*** L. Koch in Fig1.https://commons.wikimedia.org

Janipperus 0xycedrus L.(PL. 23, fig.: 1-8)

Spreading or compact, ever green shrub, occasionally small tree up to 9 m. tall. Twigs angular. Leaves in whorls of 3 stiff, apex acuminate or very acute, spine-like, 2 white stomatic bands on upper surface, margin and midrib green, lower surface convex, keeled, green, 6-22 mm. long. Male cones are solitary in leaf-axils, brown, ovoid, sessile, 3-6 mm. long. Female cones solitary in leaf-axils, on stalks 1mm long, globose, when ripe reddish-brown, formed from 3-6 bracts each ending in minute prominence. Female cones are ripening in the second year.

HAB. Found atmountain slope, in pine and oak forest, sometimes on rocky limestone crags; alt. 450-1750 m.; male cones in Apr.-May.

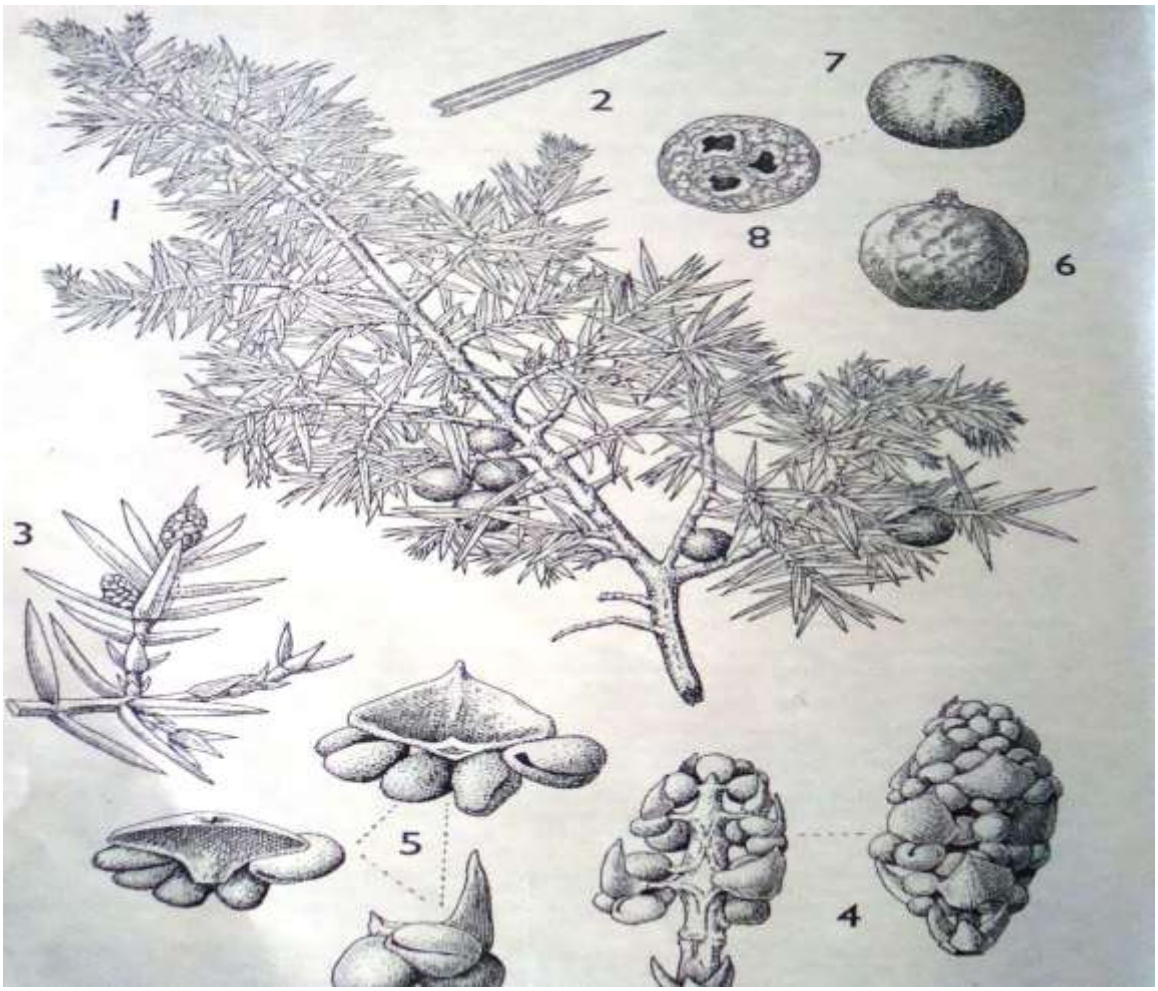

Plate 22: ***Janipperu spolycarpos* L**. Koch in linnaae: Sperrnatopyta: Fig.1- Branch showing habit. 2- Lower surface of leaf, 3- Branch with cones. 4- Cones enlarged, 5- scale of cones. 6- Male fruit. 7- Female fruit, 8- t.s. of female fruit. (Townsend and Guest, ,[2]). And Fig. 2- Our specime

Pinus halepensis var. ***brutia*** (Ten) Henry ex Elwes and Henry (Pl.23. Figs. 1-3)
Tree up to 18m tall, bark smooth at first, then become reddish- brown, fissured and scaly. Winter buds with scales, refluxed at apices, not resinous on surface. Long shoots with woody deccurent bases to scale leaves. Short shoots each with leaves. Leaves needle- like, twisted, dark green, semi circular in transverse section, margin minutely serrulate. Male cones7-20 mm long. Female cones solitary or 2-6 in a whorl, sub sessile, ovoid- conic, reddish-brown when ripe, 305-7cm long, 2.5-4- 6.5cm wide afterseedshave been shed; bracts and scales not united. Seeds winged. As a native plant distributed in Zawita and along main road between Zawita and Amadiya. Growing on limestone rock and soil. ***Pinus halepensis*** var. ***halpinensis***: Leaves 5-9 cm long, about1mm wide, light green. Cones pointing backwards toward base of twigs.(See Townsend et. al, [2]; P.97-99, Pl. 13, Figs. 1-6,edited by Townsend and Guest, 1966) ***Pinus halepensis*** var. ***brutia*****:** Leaves 8.5-20cm long,1mmwide, dark green, cones spreading or pointing forward toward apex of twigs. (See Townsend et. al, [2]; P.93-94, P. 96- 99 Pl. 13, figs. 1-. 6, edited by Townsend and Guest, ,[3]).

Plate 23: ***Pinus halepensis*** var. ***brutia*** **(**Ten) Henry ex Elwes and Henry. leavesFig., 1-Branch with leaves and young cones, 2- Female cone, 3-Male cone,4- Male scale dorsal surface, 5- Male scale ventral surface, 6- seed. (Townsend and Guest, ,[2]),7-General plant feature, 8-Male cones,9- Female cones. **[6] (**https://www.wikimedia.org)

Cupressus L (Saru)
C. sempervirens L.
C. arizonica L.*(* PL.24-, Fig.1)

- It is trees, rarely sharps. Leaves ever green, opposite, in 4ranks, closely apressed and scale-like in mature specimens, needle- like- seedlinks. Flowers monoecious. Male cones with pelate scales with 2-6 microsporangia (pollen sacs). Female cones sub globose with 4-7 pairs of peltate scales, facets irregularly pentagonal fitting closely together with a central prominence; scales becoming woody and separating when ripe; cones remain on tree for indefinite period after ripening in the second year.. Mediterranean sypres(***C. sempervirens***). In Iraq distributed as a native genus in Baghdad, Basra, Rawi; and widely cultivated in gardens and in main roads in Iraq as ornamental trees. It is a water deficiency resistance plant. Grown in mountain are assuccefully. (See Townsend et. al, ,[2]; P.93-94, Pl. 12, Figs. 1-8,edited by Townsend and Guest, ,[2]).

(Plate 24, fig.1): ***Cupres susarizonica*** L. [7] http://www.uniprot.org/taxonomy/49011

Thjua L,

T. orientalis L. (3 afas 0r Afas in Arabic) (Pl.25, Fig.1)

Trees, 9-12m tall, divided into several stems, twigs flattened, and arranged in a vertical plane from near the base; branchlets deciduous with leaves after several year. Leaves are ever green, opposite, in 4 ranks, scale- like. Flowers are monoieous. Male conesglobose,2 mm in diam. with 3-6 pairs of scales. Female cones ovoid, 20- 25mm long,with 6-8 pairs of scales,imbrecate, not pletate,scales, each with a thickened prominence ofridge at its apex. Seeds winged or un winged. It is tolerate to climatic conditions, but not well tolerate to salinity and drought conditions. Distributed in Zafaraniya inBaghdad. Atimber suitable for furniture.(See Townsend et. al, [2]; P.94-95, edited by Townsend and Guest, ,[2]).

(Plate:25, fig.:1)*Thjua orientalis* L. (3afas 0r Afas in Arabic) [8].

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