A SYSTEMATIC STUDY OF THE GENUS MERREMIADISSECTA (JACQ.) HALLIER F.IN IRAQ

ASEEL K. AL ANBARI

Biology Dep., Education College for Pure Sciences, Diyala University
E-mail:aseelalanbari@yahoo.com

Abstract - A critical taxonomic study of the genus Merremiadissecta (Jacq.)Hallier f. in Iraq. The present revision treats with taxonomic determinations based on a phenological characteristics, leaf anatomy, and palynologicalstuded by light microscope and scanning electron microscope, the results showed that climber plant with lobed leaf, cymose flower, and capsule fruit, anatomic study notes Bifacial leaf, paracytic stomata on abaxial and adaxial surface, with cross section of blade and margin, homogeneous cells composed of parenchyma cells in midrib, circular petiole, containing anguler collenchyma with cortex surrounded one central vascular bundle and two lateral bundles, palynology study by light microscope appears pollen grain monad, , radial symmetry and isopolar, tricolporate, medium in size, while the study of the scanning electron microscopy has shown that the surface decoration in a small grid microreticulate. This research could be provided a taxonomical key for Merremiadissecta plant in Iraq.

Keywords - Merremiadissecta, Merremia Iraq, SEM systematic studyز

I. INTRODUCTION

Merremiadissecta (Morning glory) recorded as a member belonging to Convolvulaceae family , grown in tropical and subtropical area around the world, discovered in 1700 DC in Caribbean, Florida, and Mexico as cultivated [1]-[2], Although it was a climber the species was only known as a perennial decorative herb with flowers, but it Historically and currently, has been used in folk medicine in some cultures [3]and ornamental propose in another cultures duo the almonds smell and taste of the seeds because presence of amygdalin and associated compounds particularly this character made it wider recognition and more study [4].Merremiadissecta has highly characteristics intertwined with the of the sweet potato plant leading to confusion [5], so it have been controversial because of intraspecific variability in many of the characters used to date, however, M. dissecta widely cultivated [3] It is worth mentioning that M. dissecta recorded as a new alien record for the flora of Yemen [6]. As pollen of Convolvulaceae species, there are some attempts to use the pollen features in the delineation. [7]explained the first part of the family based on the characteristics of pollen into two groups, Echinoconiae and Psiloconiae. [8]-[9] they separated the Convolvulaceae family pollen into two groups. But it is rarely grown in Iraq, may be because species is too abundant in wild area, this conduct to no taxonomical, anatomical palynological studies about this plant, moreover there are no report of this species in flora of Iraq. The research included a phenological characteristics, leaf anatomy, and palynological studies by light microscope and scanning electron microscope

II. MATERIAL AND METHODS

A. Specimens Collection: Fresh leaves of Merremiadissecta were collected from several field trip Encompassing of Iraq in 2014-2017. The specimen was collected into flowering and fruiting stages and was processed into dried and mounted on herbarium sheet and deposited in the herbarium of Biology department, faculty of Education, Dyiala university (Iraq). The identification of plant species were confirmed using standard literature such as [10]-[11].

B. Prepare the epidermis:

According to [12] the epidermis prepared by washing with distilled water, followed with 10% KOH, then alcohol for 10-15 minutes, stained by 1% safranin for 30-45 minute. eventually, specimens slides mounted by cover slides with Dextrin Plasticizer Xylene (D.P.X) artificial mounting medium.

C. Prepare cross section of stem, petiole and leaf:

Fresh material of stem, leaves and petioles was fixed in formalin acetic acid (F.A.A.) for 24 hours pursued with ethanol (70%). Paraffin's samples were sectioned on a rotary microtome and stained with safranin and fast green stain and mounted with (D.P.X). The prestaining and staining procedure was performed according to [13].To find the stomata index owing to [14] as:Stomata index = (S.N.)/(S.N.+O.N.)×100Were S.N. stomata number, O.N. ordinary cells number All permanent slides were examined by Novel light microscope and photographed using light microscope Novex B-RANGE, EUROMEX- HOLLAND, and sony camera.

D. Prepare the pollen grains

Pollen grains of M. dissecta were acetolysed as mention [15] . The measurements and observations were carried out using both light microscope (LM) and scanning electron microscope (SEM). For LM analysis, the acetolysed pollens were mixed with 5-7 drops of silicone oil then mounted on a glass slide and observed under light microscope. The measurements of polar axis (P), equatorial diameter (E) and exine thickness of pollen were done using 25

reading samples for each specimen. For SEM investigation, the acetolysed pollen was deal with 100% ethanol, then on an aluminum stub, coated with gold and observed using LEO 1450VP Electron Microscopy. The terminology and pollen size pursuing to [16]. All measurement under 40x magnification power with 25 samples.

III. RESULTS AND DISCUSSION

Taxonomic Merremiadissecta(Jacq.)Hallierf.in Bot. Jahrb. Syst. 16(4-5): 552 (1893).Fig. 1,2,3, and 4.
Synonyms: Convolvulus dissectusJacq., Obs. Bot. 2: 4. 1767.;Ipomoeasinuata Ortega, Hort. Matr. Dec. 7: 84. 1789.
Type: Jacquin herb [6].

Botanical description

Perennial climbers, with tap root descends to the soil depths about 12 - 10 cm.herbaceous stem, consists of several branches from the base with convolute tenders covered by long yellow hairy trichomes (unicellular)as in Figs. 2, 4. The leaves are alternately arranged, helical, simple and articulated (Figs. 2, 4), ranging between 2.5 - 7.6 cm and width between 2 - 5.5 cm. margins are sinuate to dentate with an acuminate apex. the upper leaves are relatively smaller than the basal leaves. Long petiolate up to 7-10 cm long with sparsely long yellow as in Fig. 4, Leaf-blades palmately with 5 lobed, the two basal lobes forked unequally, 8 cm long, 9-10.5 cm wide; the lobes sinuate to sinuate-dentate, glabrous on both sides. Flowers habitually actinomorphic symmetry, cymose, bisexual, and characterized by softness and color white with purple center, solitary an axillary or lateral, occasionally 2-flowered Figure 3, peduncles 3-7.5 cm long with long yellow hairs at the base; pedicels gradually thickened towards . Calyx: Consisting of five oblong sepals united from base, about 2.5 cm long. The widths of the sepals are 0.9 - 1.3 cm long, as shown in Fig. 4. Corolla campanulate, composed of four to five parts, semi-tubular and may appear white to pale yellow with dark purple center as in Fig. 4, length from 3.5 - 4.5 cm. Androecium: unequal five stamens epipetalous, filaments narrow basically connat and contain trichomes , with 12-17 mm long;, glandular; anthers sagittate as in Fig. 4. Gynocium : Pistils glabrous, 2.4-2.5 cm long; ovary is superior with 2 locules and 5 seeds. glabrous, 2 mm long; style 20 mm long; stigma biglobular. Fruit capsular, enclosed by the persistent calyx, globose or depressed-globose, smooth, become dry and black woody.

Anatomical study

A. Blade of leaf

1. Stomata

The results of LM , and SEM microscope shown in "Figs. 6, 7 and 8", Table 1 that M. dissecta's leaf amphistomatic(contains stomata in both the abaxial and adaxial) , this result agree with [17] , paracytic stomata complexes were in each surface but differed in the length of the stomata between 17.5 - 30 µm with average 25 µm in abaxial, but 17.5 - 25 µm with average 22.5 µm in adaxial. The width of the stomata also exceeded the lower surface with the highest rate comparing with the upper surface where the rates were 17.5 , 15 respectively, and the average length/ width of the stomata was the highest of the adaxial where it was1. 5 while the abaxial was 1. 42. This result is normal due to the lower surface being transpiration more than the upper surface. It may also be due to the environment which the plant lives. The Stomata index was in adaxial more than abaxial in the area 0.26%. Anatomical study has an important role in taxamony, development, and evolution of plant, the most attempts in this line cover different aspects of leaf qualities but there are still unplanned convolvulaceae varieties, [18]-[19]-[20]-[21]-[22].

2. Cross section of blade and margin

Bifacial leaf, mesophyll covered by 1-2 µm cuticle layer, elongated, uniserate epidermis cells contenting crystals, underneath epidermis mesophyll system was appeared as heterogeneous, differentiated into two zones, palisade and spongy parenchyma. While 2-3 palisade parenchyma with 20-50 µm with average 40 µm with numerous chloroplasts, irregular spongy parenchyma set under it with thickness 50-120 µm with average 70 µm"Fig.9, 10" tiny vascular bundles among the two types of parenchyma tissues, rounded margin shape covered by thick cuticle compering with midrib region with one layer of epidermial cells as common but the palisade parenchyma was one layer and random spongy parenchyma, on the other hand we can recognize the crystals as common in mesophyll, abaxial and adaxial surface in margin. notrichomes of any type on the blade or margin.

3. Cross section of midrib

Homogeneous cells, being composed of parenchyma cells in midrib uniseriate epidermal cells surround ed the cortex, the mesophyll consists of cells that are varied as form and size, composing a spongy parenchyma. Trichomes were absent in midrib region, the vascular system of the midrib apparently consisted of a large vascular bundle,The general shape shows the midrib in a half-circle shape with thickness 125-315 µm with average 210 µm (Fig. 11). The leaf characteristics in systematic study is common [14].

4. cross section of petiole:

The anatomical study of petiole showed that the epidermis was one layer with thickness 12.5-16.5 µm with average 14.5 µm, with long non-glandular single-cell hair with average 20 µm , as shown in "Fig. 12". Anguler collenchyma 20-30 µm with average 25 µm Thickness "Fig.12" , thick cortex

rounded between 120-320 µm with average 275 µm, and bith 40-55 µm with average 50 µm, The general shape of the petiole is circular, containing one central vascular bundle and two lateral bundles "Fig. 12" Surrounded by parenchyma cells.

B. Palynological study

light microscope study appears pollen grain monad, radial symmetry and isopolar, The pollen grains generally were tricolporate this results agree with [23], medium in size, according to [16], the polar view rating between 30-52.5 µm where it was The mean was 43.6 µm, the equatorial view was ranged between 37.5 - 55µ and the average 51.3 µm, P/E have average 1.15µm. The results showed that the layer of axin, at a rate of 1.9 µm, while the study of the scanning electron microscopy has shown that the surface decoration in a small grid microreticulate as in the "Fig. 13 14, 15,and 16" under the microscope Resized under 40x magnification power.This result agree with [24] that menshined the pollen gran of Merremiawas non-spinulose.



Figure 1.whole plant

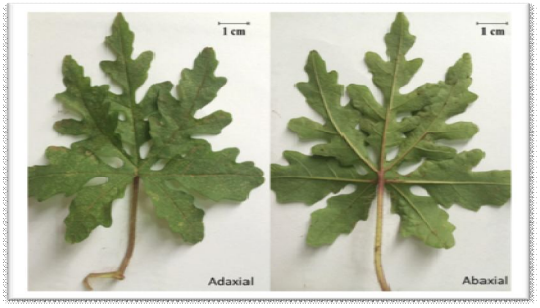


Figure 2.M.dissectaLeaf



Figure 3..M.dissectaFlower

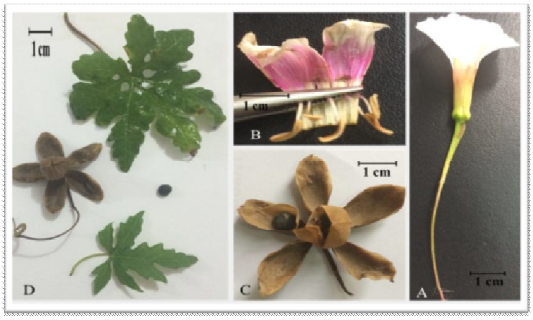


Figure 4.M. dissectaparts, A= Calyx, B= Petals and Androcium, C= Fruit and seeds , D= leaf, Fruit, and seed

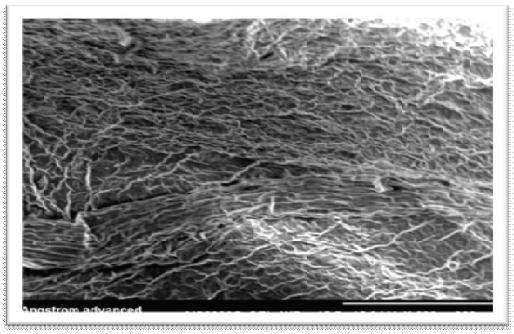


Figure 5 . Surface of leaf (cuticle by SEM)

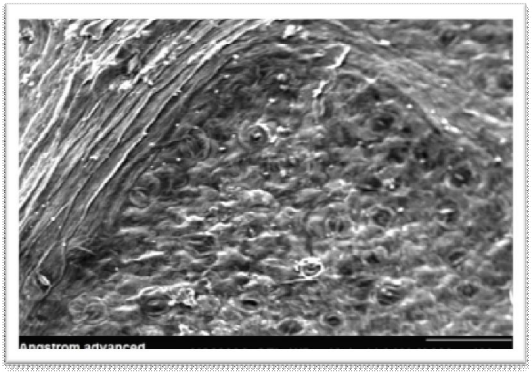


Figure 6 .stomata in abaxial by SEM

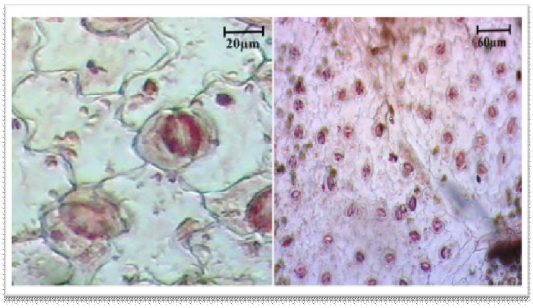


Figure 7 .stomata in abaxial

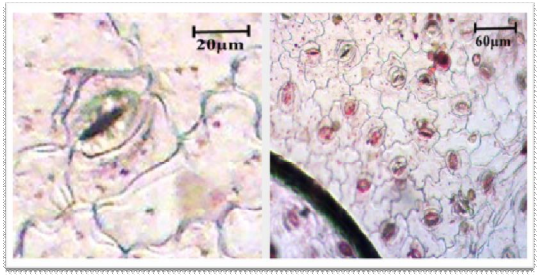


Figure 8 .stomata in adaxial

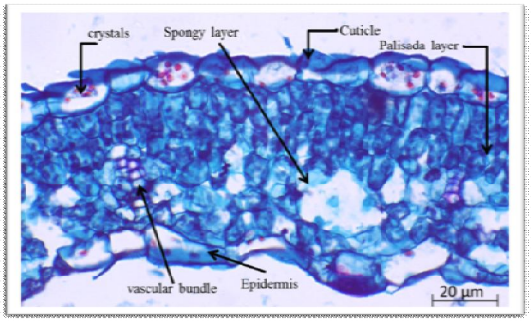


Figure 9. Blade of leaf

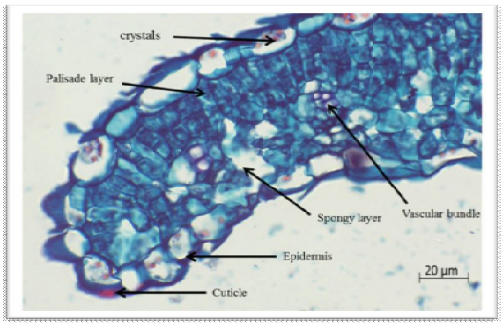


Figure 10. Margin of leaf

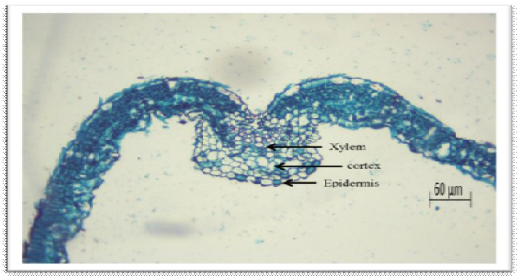


Figure 11. Midrib

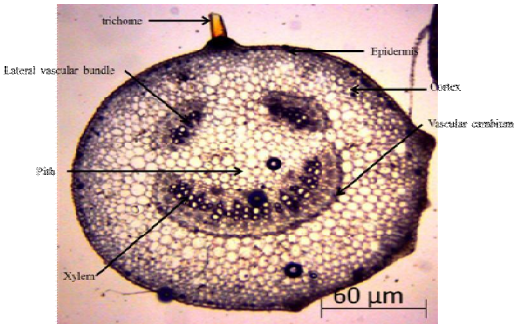


Figure 12.Petoile

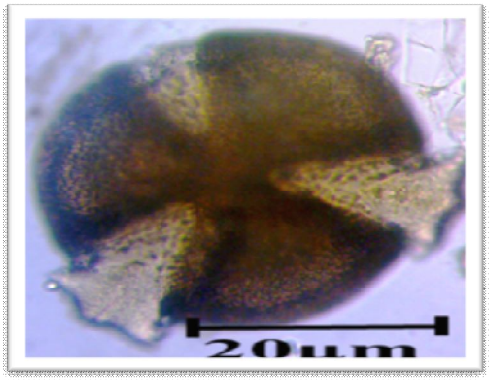


Figure 13. . Polar view



Figure 14 . Equatorial view of pollen grain by LMof pollen grain by LM

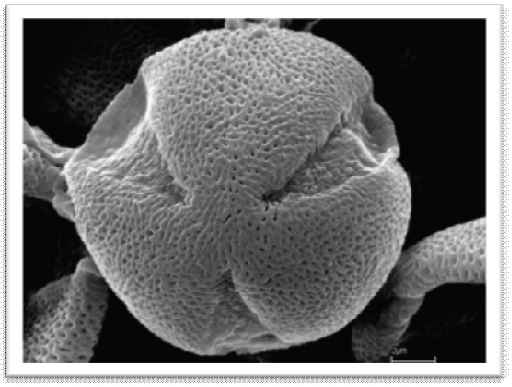


Figure 15. . Polar view

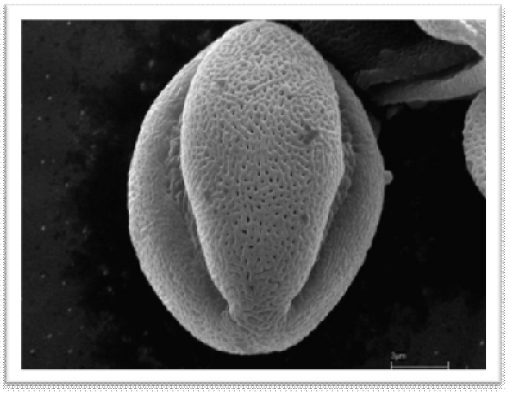


Figure 16 . Equatorial view of pollen grain by SEM of pollen grain by SEM

Table 1. Stomata characters of abaxial and adaxial by peeling measure by µm

	shape	Stomata Length(L)	Stomata width (W)	Rate L/W	Frequency of stomata /mm²	Stomata index
Abaxial	Paracytic	**(25) 30 -17.5	**(17.5) 20 -12.5	1.42	*(0.26) 0.43 -0.19	(0.20) 0.30 -0.16
Adaxial	Paracytic	(22.5) 25 17.5	(15) 20-10	1.50	(0.34) 0.42 -0.26	(0.26) 0.30 -0.20

- Mean of 25 replicates (closed stomata not measured)
*Under (X10)
** Under (X40)

REFERENCES

[1] A. Weakley," Flora of the Carolinas, Virginia,and Georgia, and surrounding areas", University ofNorth Carolina, Chapel Hill. http://www.herbarium.unc.edu/flora.htm.

[2] R. P. Wunderlin, and B. F. Hansen," Guide to theVascular Plants of Florida", Second Edition. UniversityPress of Florida, Gainesville, FL, 2003.

[3] D. F. Austin, "Merremiadissecta (Convolvulaceae): Condiment, Medicine, Ornamental, and Weed—A Review1", Economic Botany, vol.61(2), pp.109–120, 2007.
[4] N. L. Etkin, "Edible medicines: An ethnopharmacologyof food", The University of Arizona Press,Tucson, AZ. 2006.
[5] M. Mansur, "Merremia. in VanValkenburg, J. L. C. H. and N. Bunyapraphatsara,eds., Plant Resources in South-East AsiaMedicinal and Poisonous Plants 2. Prosea Foundation,Backhuys Publishers, Leiden", The Netherlands, vol. 12(2), pp.366–373, 2001.
[6] O. S.Al-Hawshabi, "A New Alien Record for the Flora ofYemen: MerremiaDissecta (Jacq.) Hallier F.(Convolvulaceae) ", IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS) vol. 11,(2), pp. 01-03, 2016.
[7] H. Hallier," VersucheinernaturlichenGliederung der Convolvulaceen auf morphologischer and anatomischerGrundlage", Bot. J.ahrb, vol. 16, pp. 453-591, 1893.
[8] JS. Gamble," Flora of the Presidency of Madras" , London: Adlard& West Newman. Pp. 769-962 ,1923.
[9] G. Erdtman,"Pollen Morphology and Plant Taxonomy".Angiosperms. Stockholm: Almqvist and Wiksell, p:539,1952.
[10] D.F. Austin, and S. Ghazanfar, " Convolvulaceae" . In: E. Nasir, and S.I. Ali, (ed.) Flora of West Pakistan.,pp. 52-55,1979.
[11] A. Al-Farhan, and J. "ThomasConvolvulaceae. In: S.A. Chaudhary, (ed.) Flora of the Kingdom of Saudi Arabia illustrated". National Herbarium, National Agriculture and Water Research Center, Ministry of Agriculture and Water, Riyadh, Kingdom of Saudi Arabia, vol. 2, (2), pp. 156- 218, 2001.
[12] C. A. Foster, "Slender: an accelerated extension growth mutant of barley. Barley" , Genetics Newsletter , vol. 7, pp. 24–27,1977.
[13] A. Thammathaworn," Handbook by paraffin method", Department of biology, Faculty of science, KhonKaen Universality, Thailand, 1996.
[14] CA. Stace," The taxonomic importance of the leaf surface. In: Heywood VH and Moore DM (Eds.)", Current Concept in Plant Taxonomy Academic Press, London and Orlando, pp. 67-94,1984.
[15] G. Erdtman," The acetolysismethod(arevised description)" SvenskBotaniskTidskrift , vol. 54(4), pp. 561-564,1960.
[16] A.K. Al-Anbari, "Micro morphological leaf epidermis characters and palynological studies in four taxa of Convolvulaceae by scanning electron microscope (SEM)", Diyala journal for pure sciences, vol:12, no:4; pp:16-31, 2016.
[17] J.W. Walker, and J. A. Doyle," The Basis Of Angiosperm Phylogeny: Palynology ", Ann. Mo. Bot. Gard, vol. 62, pp. 666- 723, 1975.
[18] S.V.Jain, and M. Sharma, "Epidermal studies in Ipomoea (Convolvulaceae)", Bangladesh J. Bot, vol. 3(2), pp.31–36, 1974.
[19] Y.Y. Karatela, and L.S. Gill,"Epidermal morphology and stomatal ontogeny in some West African Convolvulaceaesps", Herba .Hung, vol. 24(2/3), pp.11-18,1985.
[20] M. Leela, and S. Raja ShanmukhaRao,"Structure, distribution, development and taxonomic importance of stomata in some Ipomoea L. (Convolvulaceae) Beitr", Biol. Pflanzen, vol. 68, pp. 329-342,1994.
[21] S. K. Tayade and D. A. Patil," Foliar epidermal features and their taxanomic significance in the genus ArgyreiaLour (Convolvulaceae). J. Swamy", Bot.Cl, vol. 20, pp.15-18 ,2003.
[22] S. K. Tayade and D. A. Patil," Leaf anatomical studies in some species of convolvulaceae" . life sciences leaflets, vol. 3,pp. 64-74, 2012.
[23] I. K. Ferguson, B. Verdcourt and M. M. Poole," Pollen Morphology in the Genera Merremia and Operculina (Convolvulaceæ) and Its Taxonomic Significance", Kew Bulletin ,vol. 31 (4), pp. 763-773, 1977.
[24] S. G. W. Staple,"A Checklist of Merremia (Convolvulaceae) in Australasia and the Pacific" , Gardens' Bulletin Singapore, vol. 61 (2), pp. 483-522, 2010.

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