



Identification of *Groenlandia densa* (L.) Fourr. (Potamogetonaceae) as a New Genus and Species For The Flora of Iraq

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Article information

Article history:

Received: June 26, 2024

Revised: August 30, 2024

Accepted: September 05, 2024

Available online: December 01, 2024

Keywords:

Groenlandia densa

Potamogetonaceae

Pollen grains

Aquatic herbs

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Abstract

During the field trips to collect plant specimens, an aquatic plant was found in Gali-Sherana, near Deraluk (north-east Duhok) of Iraq. After the identification, it appeared that it belonged to the genus *Groenlandia* Gay and the species *G. densa* (L.) Fourr., and after reviewing all the available references involving the plant lists of Al-Rawi with Ridda and Daoood and Flora of Iraq, the plant *G. densa* (L.) Fourr is considered a new genus and species added to the Flora of Iraq within the Potamogetonaceae family, collected from Gali-Sherana, near Deraluk (north-east of Duhok) in Mountainous Amadiya District (MAM). The features of *G. densa* are Rhizomatous aquatic perennial herbs; leaves submerged, opposite or sometimes in whorls of 3, somewhat recurved, acute-obtuse, margin undulate and minutely denticulate; inflorescence shortly pedunculate emergent spike, flowers 2-3 in a single inflorescence, anthers sessile, carpels 4, free. The identification of the specimens was done by helping the keys in the existing references involving Flora of Turkey, Flora Iranica, and Flora Europaea; vegetative and reproductive parts were described and reinforced by clarified photos. Pollen grain characteristics, such as color, shape, size, number, and surface configurations, have been mentioned, along with photos for polar and equatorial views. The map of Iraq has also been used to clarify the collection region, which is monotypic.

DOI: [10.33899/edusj.2024.148277.1441](https://doi.org/10.33899/edusj.2024.148277.1441), ©Authors, 2024, College of Education for Pure Science, University of Mosul.

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1. INTRODUCTION

Potamogetonaceae is one of the monocotyledon families with three genera and 90 species around the world [1]. The plant *Groenlandia* Gay is a monotypic genus in the world, and its single species is *G. densa* (L.) Fourr., [2], [3], [4], [5], [6]. [7] described the plant *G. pescheri* Uhl and Posch. as a new species from the Late Oligocene Fossil. All the Iraqi references dealt with the family Potamogetonaceae did not state the presence of the genus *Groenlandia* in Iraq [8] in the plants of Mesopotamia, [9] in his notes about Iraqi plants, and he mentioned that the family Potamogetonaceae consists of only one genus which is *Potamogeton* and called pond weed, [10] in the Flora of Iraq, [11] in his Systematic List for the Iraqi plants, [12] in the low land of Iraq, he pointed that the genus *Potamogeton* has 6 species, [13] in his List about wild plants of Iraq, [14] in his dictionary of economic plants of Iraq, [15] in plants of Jabal Sinjar, [16] in their List about wild vascular plants of Iraq, [17] in their List about aquatic plants of Iraq, also they mentioned that the genus *Potamogeton* has 6 species pointing to their environments and distribution, [18] in plants of Pira Magrun mountain, [19] in the Flora of Iraq, and he stated that the genus *Potamogeton* called JAR AN-NAHR and has 7 species, also he mentioned that the other genus is the monotypic *Groenlandia*, which is restricted to Europe, W. Asia and N.W. Africa, occurring in Syria and Turkey but not yet found in Iraq, [20] in plants of Haibat Sultan mountain, [21] in plants of Darband Gomaspan, [22] in plants of Hawraman Region, [23] in plants of Hujran Basin, [24] in plants of Choman, and [25] in plants of Sakran Area. The researchers who worked on the family Potamogetonaceae in Iraq are [26] who studied the ecology of the invasive *Potamogeton* species in the Tigris River stretch within Nineveh province and [27]

who studied the invasive *Potamogeton* species in the Tigris River below Mosul dam. The present study aims to confirm the presence of the new plant genus and species of *G. densa* in Iraq and in addition to the Flora of Iraq.

2. MATERIALS AND METHODS

The plant was collected on a trip to Amadiya district (MAM), in Gali-Sherana, near Deraluk (north-east Duhok) of Iraq in 2021. Using the keys in Flora Iranica, the Turkey's Flora, and Flora Europaea, the plant was identified and then preserved in the herbarium at the College of Education, Salahaddin University-Erbil (ESUH). For the pollen grains, anthers fixed by FAA, an anther separated and placed in a drop of 50% glycerol to prevent drying). The anther opened by a scalpel. A coverslip was then slipped onto the pollens after adding some amount of safranin to the grains [28]. A mobile camera (Samsung-A5) was employed to capture the plant parts. The scientific words were obtained from [29], [30], [31].

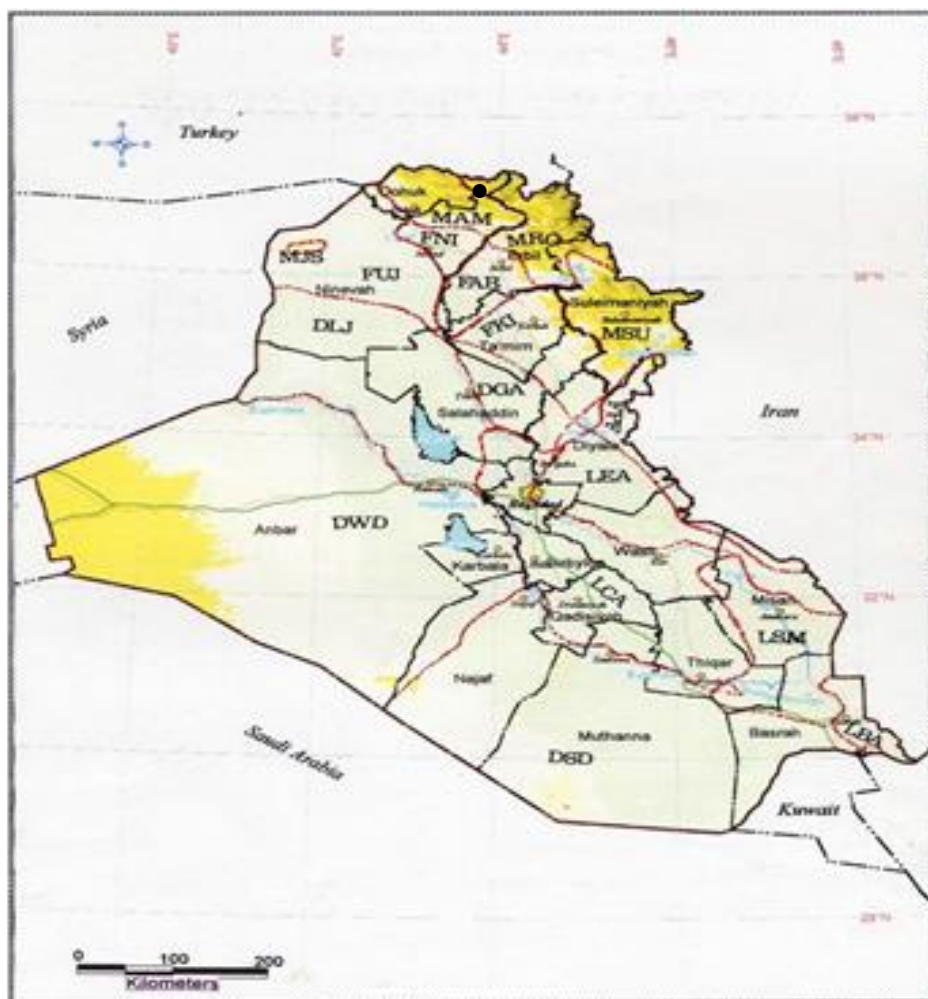


Fig (1): Iraq's map showing the regions and districts depending on [33] and [34]
● Gali-Sherana

3. RESULTS

3.1. Morphological Study

G. densa (L.) Fourr. in Ann. Soc. Linn. Lyon, n.s. 17:169 (1869); Fl. Iranica, Dandy, 78-86: 8 (1971); Fl. Europaea, Tutin & Heywood, 2: 11 (1980); Fl. Turkey, Uotila, 8: 28 (1984). Syn: *Potamogeton densus* L., Sp. Pl. 126 (1753). Ic: Reichb., Ic. Fl. Germ. 7: t. 28 (1845); Ross-Craig, Draw. Brit. Pl. 31: t. 37 (1973).

Rhizomatous aquatic perennial herbs, glabrous, height (16-31) cm. Roots adventitious, yellow-brown, (2-7)x(0.25-0.50) cm. Stem erect-ascending, costate, green, (14-24)x(0.1-0.2) cm. Leaves submerged, simple, sessile, opposite or sometimes in whorls of 3, somewhat recurved, ovate-lanceolate, margin undulate and minutely denticulate, apex of leaf acute-obtuse, base amplexicaul, dark green; basal leaves (2.5-7.0)x(2.0-3.0) mm; lower cauline leaves (14-18)x(4.5-6.0) mm; upper cauline leaves (16-22)x(4.0-8.0) mm. Inflorescence emergent or submerged, axillary, simple spike, (2-3)x(1.5-3) mm, peduncle costate, short, yellow, (6-9)x(0.3-0.7) mm, flowers 2-3, undifferentiated, actinomorphic, bisexual, hypogynous, 4-merous, tepals broadly ovate, margin entire, apex acute-obtuse base truncate, dark green-dark yellow, (0.8-1.5)x(0.8-1.3) mm. anthers sessile, anti-tepalous, dithecal, extrorse, ovoid, white, (0.8-1.0)x(0.20-0.25) mm, Pistils 4, free, alternate with tepals, dark yellow, ovary ovoid, (0.5-0.7)x(0.35-0.4) mm; style single, filiform, (0.25-0.30)x(0.12-0.15) mm; stigma capitate-discoïd, (0.20-0.23)x(0.20-0.23) mm. (Plates 1-4).

Type: Described from France (Hb. Linn. 175/4!).

Studied plants:

Geographical distribution: Amadiya district (MAM): Gali-Sherana, near Deraluk (North-East of Duhok), 635 m, 29.6.2021, 8072.

Habitat: Grow as populations in freshwater streams, usually in running water; altitude: 635 m.

Phenology: June-July

General distribution: W. & C. Europe, Mediterranean area, Caucasia, N.W. Iran. Euro-Sib. element.

3.2. Palynological Study

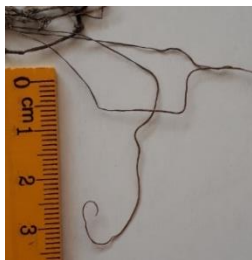
The pollens are white, monads, inaperturate, ellipsoid in the equatorial view, spheroidal or semi-spheroidal in the polar view, small depending on [32], equatorial axis (12.5-22.5) μm , polar axis (12.5-17.5) μm , finely reticulate surface configurations, numerous. (Plate 5).



Plate (1): Field photograph of *G. densa* from Gali-Sherana



Plate (2): Photographs of *G. densa*



A



C

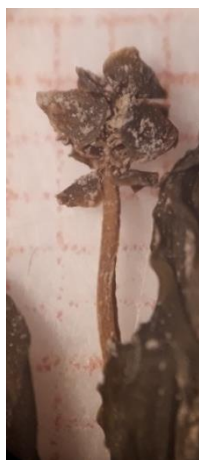
Plate (3): *G. densa*: A. Rhizome; B. Roots; C. Leaves



B



5



A



B

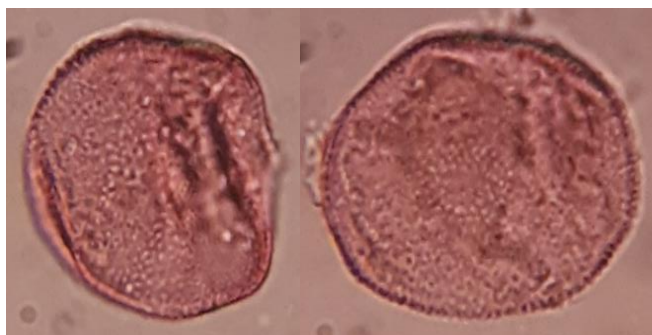


C

Plate (4): *G. densa*: A. Inflorescence with peduncle; B. Opened flower showing an anther with pistils; C. Pistil



5



A



B

Plate (5): *G. densa*: Pollen grains: A. Polar view; B- Equatorial view; A, B=100x

4. DISCUSSION

The current work studied and identified the plant *G. densa* from the Potamogetonaceae family, which is regarded as a new species for the Flora of Iraq; this research possesses some features, including the morphological description and the habitat, as some characteristics of the pollen grains. By reviewing all the present references about the family Potamogetonaceae in Iraq, involving the specimens of National Herbarium of Iraq (BAG), College of Science Herbarium, University of Salahaddin - Erbil, Iraq (ARB) and College of Education Herbarium, University of Salahaddin - Erbil, Iraq (ESUH), the researcher has not been found any plant belongs to *G. densa*, therefore, the studied plant suggested as a new species in Iraq. The main differences between the genus *Potamogeton*, the alone genus within the family in Iraq, and the present genus appear in the leaves where they are alternate, sessile, or petiolate. The fruitless are drupaceous, while they are opposite (sometimes in whorls of 3), sessile, and the fruitless are drupaceous achenial [5]. [2] mentioned some characteristics of the plant *G. densa*, which are Perennial; rhizomatous; leaves all alike, submersed, with a broad amplexicaul base, tapering upward, acute to obtuse, spike small, 2-8-flowered; and all these characteristics present in the species under study. He also mentioned that this plant finds application in fish culture in Germany and Switzerland, and its growth is artificially encouraged to provide spawning space for fish and protection for the fry. The researchers who worked on the family Potamogetonaceae in Iraq are [26] who studied the ecology of the invasive *Potamogeton* species in the Tigris River stretch within Nineveh province and [27] who studied the invasive *Potamogeton* species in the Tigris River below Mosul dam. [35], mentioned that the pollen grains of the family are inaperturate but with an elongated vestige of a sulcus, and this is similar to the results of the pollen of the plant under study.

5. CONCLUSIONS

The plant *G. densa*, belonging to the Potamogetonaceae family, was identified in the investigation as a new species for the Flora of Iraq. It was obtained in Gali-Sherana, close to Deraluk (northeast of Duhok), and morphology and palynological investigation were done on the subject plant.

6. REFERENCES

- [1] G. Singh, "Plant Systematics: An integrated approach," Science Publishers, Enfield, NH, USA, 3 ed., pp. 449, 2010.
- [2] V. L. Komarov, "Flora of the U.S.S.R.," vol.1, Izdatelstro Akademii Nauk SSSR, Moskva-Leningrad, pp. 205, 1968.
- [3] J. E. Dandy, "Flora Iranica," no. 78-86, Akademische Druck-u, Verlagsanstalt, Graz-Austria, pp. 8, 1971.
- [4] T. G. Tutin and V. H. Heywood, "Flora Europaea," vol. 5, Cambridge Univ. Press, pp. 11, 1980.
- [5] P. Uotila, "Flora of Turkey," vol. 8, Edinburgh at the University press, pp. 28, 1984.
- [6] A. Ghahreman and F. Attar, "Biodiversity of Plant Species in Iran," Central Herbarium, Tehran Univ., Tehran, Iran, pp. 134, 1999.
- [7] D. A. Uul and M. Poschmann, "*Groenlandia pescheri* sp. nov. (Potamogetonaceae) from the Late Oligocene Fossil-Lagerstätte Enspel (Westerwald, Germany)," *Acta Palaeobotanica*, vol. 58, no. 1, pp. 61-72, 2018, doi: [10.2478/acpa-2018-0001](https://doi.org/10.2478/acpa-2018-0001).
- [8] H. F. Handel-Mazzetti, "Pteridophyta und Anthophyta aus Mesopotamien und Kurdistan Sowie Syrien und Printipo," II, Wissen Schaftliche Ergebnisse der Expedition nach Mesopotamien, pp. 14, 1910.
- [9] Guest, E., "Notes on plants and plant products with their colloquial names in Iraq,," Government Press: 111 pp. 1933
- [10] M. Zohary, "The Flora of Iraq and its Phytogeographical Subdivisions," Iraq, Bull., no. 3, Dep. Agri, pp.17-18, 1946.
- [11] R. A. Blakelock, "The Rustum Herbarium, Iraq: Systematic List (continued), " part 1, kew Bull., 553 pp., 1948.
- [12] K. H. Rechinger, "Flora of low land Iraq, " Weinheim verlag von. J. Cramer, wein, pp. 25-31, 1964.
- [13] A. Al-Rawi, "Wild plants of Iraq with their distribution, " Ministry of Agriculture & Irrigation, State board for agricultural & water resources research, National Herbarium of Iraq, Baghdad, pp. 80, 1964.
- [14] H. L. Chakravarty, "Plant Wealth of Iraq: A Dictionary of Economic Plants," vol.1, Botany Directorate, Ministry of Agriculture & Agrarian Reform, Baghdad-Iraq, 505 pp., 1976.
- [15] M. K. Khalaf, "The Vascular Plants of Jabal Sinjar," M. Sc. Thesis, Baghdad University, Baghdad, Iraq, 213 pp., 1980.
- [16] T. J. Ridda and W. H. Daood, "Geographical distribution of wild vascular plants of Iraq," National Herbarium of Iraq, pp. 103-104, 1982.
- [17] H. A. Al-Saadi and A. A. Al-Mayah, "Aquatic Plants of Iraq," Univ. of Basrah press, Iraq, pp.118, 1983.
- [18] Y. S. Faris, "The Vascular Plants of Pira Magrun mountain," M. Sc. Thesis, Salahaddin University, Erbil, Iraq, 191 pp., 1983.
- [19] C. C. Townsend and E. Guest, "Flora of Iraq," vol. 8, Ministry of Agriculture and Agrarian Reform, Baghdad-Iraq, pp.19, 1985.
- [20] H. U. Fatah, "The Vascular Plants of Haibat Sultan mountain and the Adjacent Areas," M. Sc. Thesis, University of Sulaimani, Sulaimaniya, Iraq, 130 pp., 2003.

- [21] K. H. Ahmed, "The Vascular Plants of Darband Gomaspan and the Adjacent Areas in Erbil Province," High Diploma Thesis, Salahaddin University, Erbil, Iraq, 38 pp., 2010.
- [22] S. A. Ahmad, "Vascular Plants of Hawraman Region in Kurdistan Iraq," Ph.D. Dissertation, University of Sulaimani, Sulaimaniya, Iraq, pp. 199-200, 2013.
- [23] M. A. H. Hameed, "Vascular Plant Taxa of Hujran Basin-Erbil/Iraq," M. Sc. Thesis, Kahramanmaraş Sütçü İmam University, Graduate School of Natural and Applied Sciences University, Kahramanmaraş, Turkey, 110 pp., 2016.
- [24] D. T. D. Darwesh, "Plant Biodiversity and Ethnobotanical Properties of Various Plants in Choman (Erbil-Iraq)," M. Sc. Thesis, Kahramanmaraş Sütçü İmam University, Graduate School of Natural and Applied Sciences University, Kahramanmaraş, Turkey, 130 pp., 2017.
- [25] A. M. K. Galalaey, "The Plant diversity of Sakran Area in Northern Iraq," Ph.D. Dissertation, Kahramanmaraş Sütçü İmam University, Graduate School of Natural and Applied Sciences University, Kahramanmaraş, Turkey, 294 pp., 2021.
- [26] B. A. Al-Ni'ma and M. T. Al-Wattar, "Ecological study for invasive *Potamogeton* species in Tigris River Stretch within Nineveh Province-Iraq," The 3rd international symposium on Environmental weeds and Invasive Plants, Monte Verita, Ascona, Switzerland, 2011.
- [27] B. A. Al-Ni'ma and M. T. Al-Wattar, "The Invasive *Potamogeton* species in Tigris River Below Mosul Dam," LAP LAMBERT Academic Publishing, pp. 72, 2018.
- [28] M. G. Simpson, "Plant Systematics," Elsevier Academic Press, USA, pp. 462, 2006.
- [29] J. G. Harris and M. W. Harris, "Plant Identification Terminology: An Illustrated Glossary," 2 ed., Spring Lake Publishing, Spring Lake, Utah, United States, 206 pp., 2001.
- [30] S. N. Agashe and E. Caulton, "Pollen and Spores: Applications with Special Emphasis on Aerobiology and Allergy," Science Publishers, Enfield, NH, USA, 400 pp., 2009.
- [31] M. Hesse, H. Halbritter, R. Zetter, M. Weber, R. Buchner, A. Frosch-Radivo & S. Ulrich, "Pollen Terminology: An illustrated handbook," Springer-Verlag/Wien, Austria, pp.219, 2009.
- [32] G. Erdtman, "Pollen Morphology and Plant Taxonomy," Angiosperms, Hafner publishing company, New York, pp. 301-302, 1971.
- [33] E. Guest, "Flora of Iraq," vol. 1, Ministry of Agriculture of Iraq, 213 pp., 1966.
- [34] Fao. Yearly report of Food and Agriculture Organization of the United Nations, Agricultural production department, Erbil-Iraq. 2002.
- [35] A. Cronquist, "An Integrated System of Classification of Flowering Plants," Columbia Univ. Press, New York: pp.1065, 1981.

تشخيص النبات *Groenlandia densa* (L.) Fourr. من العائلة (Potamogetonaceae) كجنس ونوع جديد للموسوعة النباتية العراقية

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المستخلص:

خلال الجولات الحقلية لجمع العينات النباتية تم العثور على نبات ملثي في مضيق شيرانة قرب ديرلوك الواقعة في شمال شرق محافظة دهوك من العراق وبعد التشخيص ظهر بانها تعود للجنس *Groenlandia* Gay والنوع *G. densa* (L.) Fourr. وعند مراجعة جميع المصادر المتوفرة ومنها القوائم النباتية للراوي مع رضى وداود والموسوعة النباتية العراقية اعتبر كجنس ونوع جديد يضاف الى الموسوعة النباتية العراقية ضمن العائلة (Potamogetonaceae)، حيث جمعت عيناته من مضيق شيرانة قرب ديرلوك (شمال شرق دهوك) ضمن مقاطعة العمادية الجبلية (MAM: Mountainous Amadiya District). يتصف النبات *G. densa* بامتلاكه للصفات التالية: اعشاب مائية رايزومية معمرة، الاوراق مغمورة، متقابلة او احيانا في حلقات من ثلاثة اوراق، نوعا ما منحنية نحو الاسفل، القمة حادة-مستديرة، الحافة متموجة ومسنة دقيقة، النورة سنبلية، مغمورة، منعقة قصيرة. الازهار 2-3 في النورة الواحدة، المتوك جالسة، الكريبات 4، حرة. تمت عملية التشخيص للعينات النباتية بمساعدة المفاتيح الموجودة في المصادر ومنها الموسوعة النباتية التركية والايرانية والاورية ووصفت الاجزاء الخضرية والتكاثرية وعززت بالصور التوضيحية للاجزاء المختلفة. اضافة الى ذلك، تمت دراسة صفات حبوب اللقاح مثل اللون والشكل والحجم والعدد وتضاريس السطح ووضعت الصور لهذه الحبوب في المنظرين القطبي والاستوائي وكذلك استخدمت خارطة العراق لتوضيح منطقة الجمع. الجنس احادي النوع.