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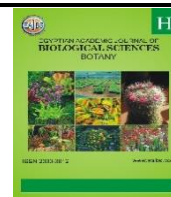
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The First Record of *Leptophascum leptophyllum* (Müll.Hal.) J. Guerra & M.J. Cano from Gharbia Governorate

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ABSTRACT

Leptophascum (Müll.Hal.) J. Guerra & M.J. Cano a monospecific Pottiaceae genus, represented by *L. leptophyllum* J. Guerra & M.J. Cano, is recorded for the first time from Gharbia governorate and for the second time from Nile Delta in Egypt. This raised the number of identified moss genera from this governorate to nine and the identified moss taxa to 11. Description, illustrations, and comments with map of geographic distribution are given.

INTRODUCTION

Leptophascum (Müll.Hal.) J. Guerra & M.J. Cano is a monospecific genus represented by only *Leptophascum leptophyllum* J. Guerra & M.J. Cano (Guerra and Cano, 2000). It belongs to family Pottiaceae which is one of the largest families of mosses in Egypt represented by 90 species belonging to 27 genera (El-Saadawi *et al.*, 2015; Abou Salama *et al.*, 2021; Lashin *et al.*, 2022).

Also, Pottiaceae is the largest family in the Nile Delta territory represented by 27 moss taxa belonging to 14 genera (El-Saadawi *et al.*, 2015; Abou Salama *et al.*, 2021; Lashin *et al.*, 2022). Where it is represented by 20 species (sp.) and 12 genera (gen.) in Dakahlia (Abou Salama *et al.*, 2021; Lashin *et al.*, 2022), 20 sp. and 9 gen. in El-Sharkyia (Taha, 2010), 17 sp. and 8 gen. in Qaleobiya (Ibrahim, 2006), 15 sp. and 7 gen. in Menoufiya (Ibrahim, 2010), 8 sp. and 5 gen. in Kafr El Shaikh (Taha and Ibrahim, 2023), 4 sp. and 2 gen. in Beheira (El-Saadawi *et al.*, 1986), Gharbia 4 sp. and 3 gen. (El-Saadawi *et al.*, 1986) and 3 sp. and one gen. in Damietta (El-Saadawi *et al.*, 1986).

According to the last moss study on Gharbia governorate by El-Saadawi *et al.* in 1986, Pottiaceae in Gharbia is represented by only three genera and four species namely; *Barbula indica* (Hook.) Spreng., *B. unguiculata* (Hedw.), *Didymodon tophaceus* (Brid.) Lisa and *Tortula muralis* (Hedw.).

Recently, *Leptophascum leptophyllum* was recorded in the Dakahlia governorate by Lashin *et al.*, 2022. During the study of moss flora in Gharbia governorate, *Leptophascum leptophyllum* has been found as a new record from the governorate. Consequently, this paper aims to describe, illustrate, and comment on this species.

MATERIALS AND METHODS

Study Area:

Gharbia governorate is located in the middle of the Nile Delta occupying an area of 1942 km². It's limited by Kafr El Shaikh governorate southward, and Menoufiya governorate northward. Its eastern and western borders are the Damietta and Rosetta branches of the Nile. Gharbia lies between longitudes 30° 45' and 31° 15' E, and latitudes 30° 35' and 31° 10' N (Fig 1) (Armanuos *et al.*, 2023). Gharbia governorate is divided into 8 administrative regions namely; Basyoun, Kotoor, El Mahalla El Kubra, Samanoud, Kafr El Zyat, Tanta, Elsunta, and Zefta (Bakr and Bahnassy, 2019).

In Gharbia, the mean annual temperature is a maximum of 24-37 °C in summer and a minimum of 13-23 °C in winter (Egyptian Meteorological Authority, 2024). Rainfall is irregularly spread through the rainy season. The mean annual precipitation is 3.8 mm/year, with most falling during the winter. The humidity in Gharbia governorate ranges from 49 to 68% (www.worldweatheronline.com, 2021).

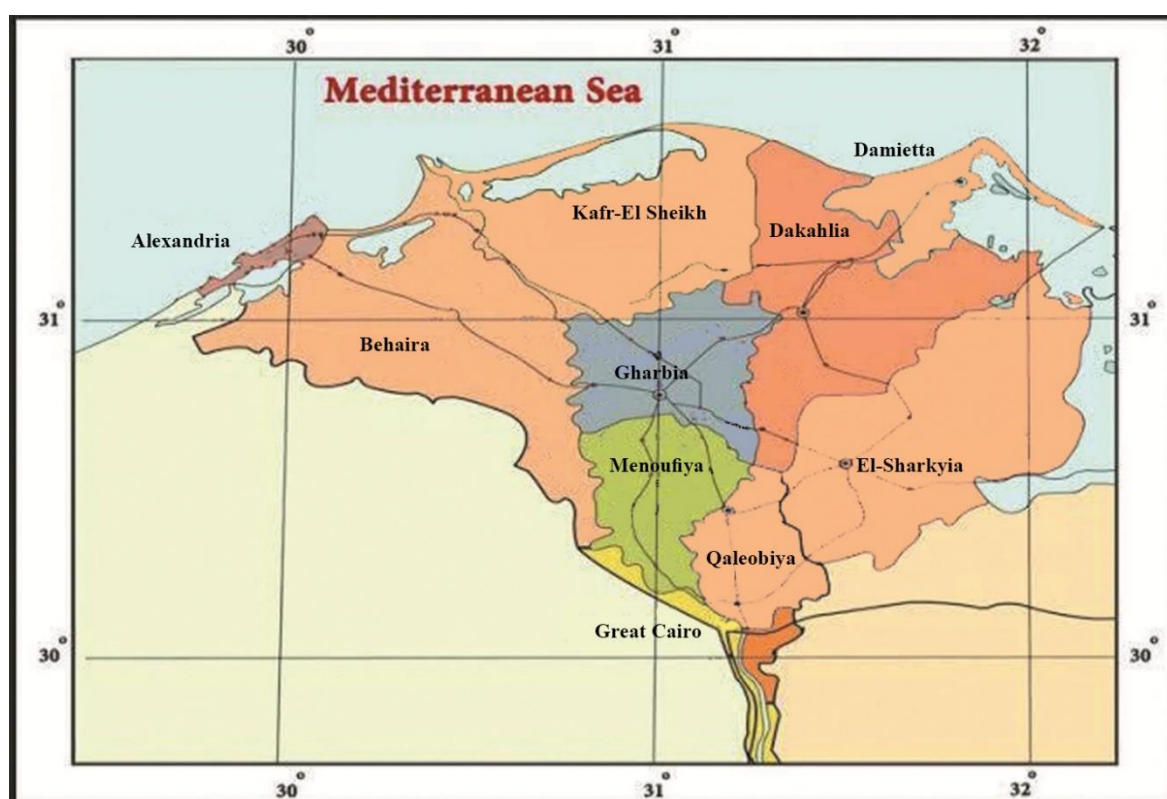


Fig 1: A map showing the location of Gharbia governorate in the Nile Delta, Egypt.

Material:

The first author carried out a field trip in November 2017. The sample was collected from Tafahna Elazab, Baraka Ghashm Basin, Zefta region, Gharbia governorate at latitude 31°14' 22" N and longitude 30° 36' 22" E, growing on inner walls of the water basin, in shade, voucher specimens: AS 61.

The plant has been identified depending on different publications e.g. Crum and Anderson 1981; Magill 1981; Mishler 1994; Casas *et al.* 2006; Guerra 2006, and by comparing it with previously published samples (their descriptions and illustrations) from Saudi Arabia by Taha *et al.*, 2020 and from Dakahlia by Lashin *et al.*, 2022 and two herbarium samples that have similar traits (unpublish, identified in Ph. D. Thesis by Ibrahim in 2010, leg. Manal Ibrahim: M.I. 22, M.I. 33)

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which were collected from Menoufiya (Shibin El-koom and Birket El-Sab) by the second author in May 2007 and were grown on red-brick walls of a water reservoir or canal.

RESULTS AND DISCUSSION

After careful examination, the studied sample has been identified as *L. leptophyllum* which raised the total number of identified Pottiaceae genera from Gharbia governorate to four and Pottiaceae taxa to five. Description, illustrations, and map of geographic distribution are given below.

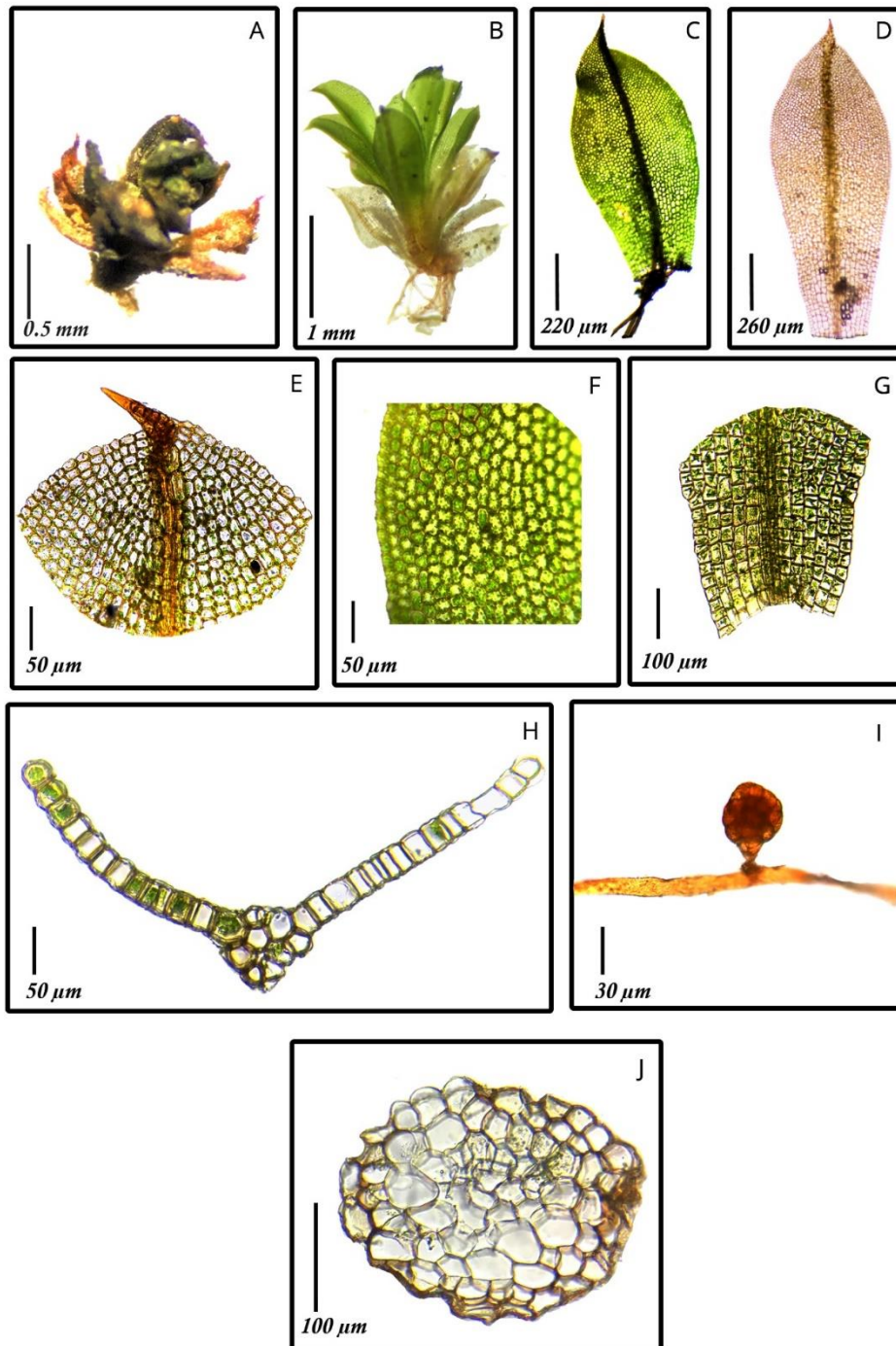


Fig. 2. *Leptophascum leptophyllum* (Müll.Hal.) J.Guerra & M.J.Cano.: A, dry plant; B, moist plant; C, leaf with basal rhizoids; D, another leaf; E, upper part of leaf; F, middle part of leaf; G, basal part of leaf; H, leaf cross-section; I, rhizoidal gemma; J, stem cross-section.

Description:

Leptophascum leptophyllum (Müll.Hal.) J. Guerra & M.J. Cano (2000) Fig. 2

Chenia leptophylla (Müll.Hal.) R.H.Zander, (1993)

Phascum leptophyllum Müll.Hal., (1888)

Physcomitrium rhizophyllum (Sakurai), (1938)

Tortula rhizophylla (Sakurai) Z.Iwats. &K.Saito, (1972)

Tortula evanescens Broth., (1916)

Plants rosette shape, small, green at apex, yellowish brown at base, 2.7-5 mm long. Stem unbranched, round to oval in transverse section, central strand absent. Leaves contorted when dry, patent with reflex apex when wet. Leaves spatulate to obovate, apex acuminate, 1-1.3 mm long, 0.45-0.75 mm wide at mid, 0.2-0.35 mm wide at base; margins plane usually crenulate, entire at the base; costa excurrent in short reflexed apiculus; stereid bands absent. Upper lamina cells hexagonal to quadrate, incrassate, usually bulging on both surfaces, smooth, 25-30 μm long \times 25-30 μm wide; middle lamina cells, quadrate, 20-25 μm long \times 25-30 μm wide; basal lamina cells quadrate or slightly longer, 35-40 μm long \times 30-35 μm wide, usually hyaline and lax. Rhizoids showed from the back of costa, at leaf base, or along leaf. Rhizoidal gemmae present, brown, rounded to slightly oval, multicellular, 45 μm long, 35 μm wide.

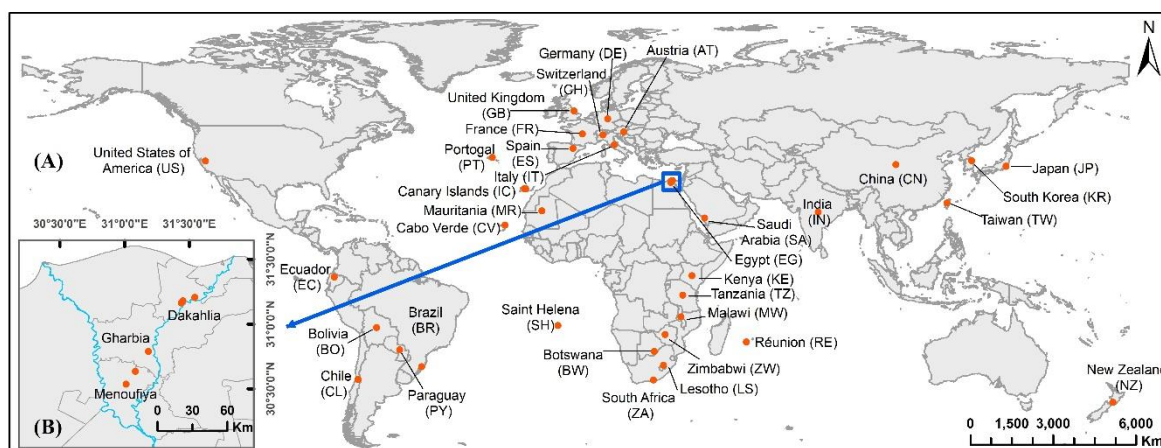
Distribution:

Fig. 3. The map showing the distribution of *Leptophascum leptophyllum* in different countries of the world, (ArcGIS 10.8) Magill 1981; Arts and Sollman 1991; Crum and Eckel 1994; Lüth 2006; O'Shea 2006; Ros *et al.* 2013; www.tropicos.org 2024; Taha *et al.*, 2020; Lashin *et al.*, 2022.

Comments:

Leptophascum leptophyllum is a cosmopolitan species recorded in different regions of the world. It has been observed that it prefers to grow on shaded mud, stone, rock, and moist soil at altitudes ranging from 81m to 1080m above sea level (Hill *et al.*, 2023). Although the studied sample was found in similar habitats i.e. on the inner walls of a water basin, in shade, it was found at an altitude of about 13m above sea level which is considered a record for a wider range of altitudes.

L. leptophyllum is a distinctive species where distinguished by its fragile leaves that break along their insertion (possibly as a mechanism of reproduction via fragmentation), rhizoids appearing attached to the base of leaves, and crenulate laminal margin (Taha *et al.*, 2020). All of these traits were found in the current studied sample.

Comparing the studied sample collected from the Gharbia governorate with its counterpart from Menoufiya and Dakahlia governorates, it was revealed that there is a great similarity between the Gharbia and Menoufia samples in terms of cell dimensions, lengths

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of plants and leaves, the presence of clavate rhizoidal gemmae and rhizoids at the bases of the leaves. However, it has a larger dimension of gemmae 35-45 µm, while the gemmae recorded from the Menoufiya sample ranged from 12-16 µm. On the other hand, the Dakahlia sample was different from the studied sample, as it was larger in cell dimensions, longer in plant and leaves, absence of rhizoidal gemmae, and the presence of rhizoids at the tips of leaves (Lashin *et al.*, 2022).

By comparing the studied sample with descriptions reported in available floras i.e. South Africa and Saudi Arabia. It was found that the studied sample is similar to that recorded from South Africa in cell dimensions, and plant and leaf lengths, however, in South Africa plants lack rhizoidal gemmae (Magill, 1981). On the other hand, the studied plant differed from the Saudi Arabian plant in terms of plant height and the size of the rhizoidal gemmae, which was longer and larger than the studied ones (Taha *et al.*, 2020).

Generally, these differences may be attributed to changes in ecological factors e.g. soil thickness, humidity, water supply, and mineral nutrition which affect cell dimensions, plant lengths, and the production of propagules in the mosses (Kürschner 1985; Shabbara, 1990, Proctor, 2008).

Declarations:

Ethical Approval: No plant, animal model(s) or human subjects were recruited directly for the current study. Consequently, no ethical considerations are necessary.

Conflict of interest: The authors declare no conflict of interest.

Authors Contributions: I hereby verify that all authors mentioned on the title page have made substantial contributions to the conception and design of the study, have thoroughly reviewed the manuscript, confirm the accuracy and authenticity of the data and its interpretation, and consent to its submission.

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Availability of Data and Materials: All datasets analysed and described during the present study are available from the corresponding author upon reasonable request.

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ARABIC SUMMARY

***Leptophascum leptophyllum* J. Guerra & M.J. Cano تسجيلاً جديداً على محافظة الغربية.**

احمد شريف احمد ، منال إبراهيم خليل، مي أحمد طه
 قسم النبات، كلية العلوم، جامعة عين شمس، العباسية، القاهرة (مصر)

تم تسجيل جنس *Leptophascum* (Müll.Hal.) J.Guerra & M.J.Cano، الذي يعد جنساً منفرداً من الفصيلة البوتياوية والممثل بـ *L. leptophyllum* J.Guerra & M.J.Cano، للمرة الثانية في مصر، وذلك من دلتا النيل. تم تسجيل عشرة أنواع حزازية من محافظة الغربية، ويعتبر *L. leptophyllum* تسجيلاً جديداً للغربية. مما يرفع عدد الأجناس المعروفة في هذه المحافظة إلى تسعة أجناس وإحدى عشر نوعاً. تم تقديم الوصف والتوضيحات والتعليقات مع خريطة توضح التوزيع الجغرافي للنبات حول العالم.