



पश्चिम बंगाल पश्चिम बंगाल WEST BENGAL

77AB 684009

MEMORANDUM OF UNDERSTANDING (MoU)

BY AND BETWEEN

VIDYASAGAR METROPOLITAN COLLEGE

39, Sankar Ghosh Lane, Kolkata-700006. | 8A, Shibnarayan Das Lane, Kolkata-700006
West Bengal, India

AND

Charuchandra College

22 Lake Road, Kolkata-700029, Kolkata

West Bengal, India

(Affiliated to University of Calcutta)

This Memorandum of Understanding (MoU) is made on 25th Day of May, 2023 between Vidyasagar Metropolitan College and Charuchandra College for mutual cooperation witnesseth in academic exchanges, program development and research. This document establishes the guiding terms and principles of collaboration between the two organizations:

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Sl. No.....Date.....
Name.....
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20 APR 2023

20 APR 2023



Soumitra Chanda
Licensed Stamp Vendor
8/2, K. S. Roy Road, Kol-1

V. SPECIAL PROVISIONS

1. Each party will take approval from the other party in writing prior to using the latter's name and logo for the activities hereunder on a case-by-case basis.
2. All parties hereto shall do their utmost to ensure the smooth and efficient implementation of the programs.
3. The parties will consult with each other for any subsequent associated agreement informally and attempt to resolve disputes or misunderstandings that may arise in the administration of this MoU or any subsequent associated agreement informally.
4. Neither party can misuse this MoU by involving the name of the other without the written consent of the other party.
5. There will be no financial involvement by either of the parties.

VI. DISPUTES

If any disputes arise in respect to the MoU, in that case, both organizations will discuss and settle the matter amicably.

For

Charuchandra College

Anuradha Ghosh
25.5.23

Name: Prof. Anuradha Ghosh
Designation: Teacher-in Charge
Date: 25.5.23

Teacher-in-Charge
Charuchandra College



Suparna Sen
25/5/23

WITNESS:

Name: Dr. Suparna Sen
Designation: Co-ordinator IQAC

Coordinator
IQAC, Charuchandra College

For

Vidyasagar Metropolitan College

Arghya Sarkar

Name: Dr. Arghya Sarkar
Designation: Principal
Date: 25/05/2023

Principal
Vidyasagar Metropolitan College
Kolkata-700 006

WITNESS: Dr. Debasish Joddar 25/5/23
Name: DR DEBASISH JODDAR
Designation: Bursar & Asso. Prof. Econ.

BURSAR
Vidyasagar Metropolitan College
Kolkata-700 006

I. Purpose of the Agreement

Both the Parties are pleased to enter into an agreement to establish ties of academic cooperation in order to contribute to the achievement of their overall goals as institutions through the following, but not limited to:

1. Joint teaching-learning and internship
2. Collaboration in the area of research, publications, project work, etc.
3. Joint field trip, excursion, and education tour,
4. Joint training, add-on, certificate and vocational courses.
5. Joint extension activities, consultancy.
6. Joint faculty and staff development programmes.
7. Co-hosting and participation in conferences, seminars, symposiums, and workshops, book fairs etc.
8. Collaborative programmes in Capacity building and skills enhancement initiatives like Soft skills, Language and communication skills,
9. Collaborative programmes in Life skills (Yoga, physical fitness, health and hygiene),
10. Collaborative programmes in ICT/computing skills,
11. Collaborative programmes in competitive examinations, career counselling, sports and cultural events,
12. Any other activity that is mutually agreed upon and is beneficial to both.

II. Execution of the Agreement

The specific activities to be carried out under this agreement will be stated in corresponding specific sub-agreements. Such specific sub-agreements, once approved by both parties, will be attached as annexes to this agreement.

The specific sub-agreements between both Parties will specify their objectives, conditions and ways of execution, financial support, the period the sub-agreement will be in effect, and administrative responsibility within each institution.

III. Term and Expiration of the Agreement

It is understood that this agreement will come into effect after being signed by both Parties and will be established for a period of five years. After these five years, it will be mutually extended for the same period, unless one of the Parties expresses an intention (by written notification) to cancel the agreement at least 90 days before the expiry date. The amendment, termination, and expiration of this MoU will not affect the terms of activities ongoing at the time of notification of amendment, termination, or expiration unless otherwise agreed upon between the Parties.

Any additions, changes, or deletions to this document must be approved by the representatives of both Parties. All notices shall be in writing and shall be directed to these representatives.

IV. NON-EXCLUSIVITY:

This Agreement is a non-exclusive agreement, and both parties remain free to enter into similar agreements with third parties.

TO WHOMSOEVER IT MAY CONCERN

This is to certify that the following activities were conducted as per collaboration and the MoU signed between Vidyasagar Metropolitan College and Charuchandra College.

S. No.	Name of the Teachers	Nature of activity	Outcome
1.	Dr. Priyanka Khanduri (Vidyasagar Metropolitan College) & Dr. Sudip Kumar Roy (Charuchandra College)	Collaboration in research publication	Priyanka Khanduri & Sudip Kumar Roy (2023) <i>Functions and Prospects of Melatonin During Pre-fertilization Reproductive Stages in Plants</i> In book: <i>Melatonin: Role in Plant Signaling, Growth and Stress Tolerance</i> ; Springer ISBN: 978-3-031-40172-5
2.	Dr. Priyanka Khanduri (Vidyasagar Metropolitan College) & Dr. Sudip Kumar Roy (Charuchandra College)	Collaboration in research publication	Priyanka Khanduri & Sudip Kumar Roy (2024) <i>Global Warming and Sexual Plant Reproduction: Impact on Crop Productivity</i> In book: <i>Food Production, Diversity, and Safety Under Climate Change</i> , Springer ISBN: 978-3-031-51646-7
3.	Dr. Priyanka Khanduri (Vidyasagar Metropolitan College) & Dr. Sudip Kumar Roy (Charuchandra College)	Co-participation in national/ international conferences	Presented two papers at State Science Congress 2022-23. 1) Central Cell Degeneration, Expression of <i>FERTILIZATION INDEPENDENT ENDOSPERM</i> and Single Fertilization in Podostemaceae, a Unique Family of Angiosperms 2) Effect of Elevated [CO ₂] and [N ₂] on Quality of Grain and Ultrastructure of Leaf in <i>Oryza Sativa</i> L. Awarded Outstanding paper

4.	Dr. Priyanka Khanduri (Vidyasagar Metropolitan College) & Dr. Sudip Kumar Roy (Charuchandra College)	Faculty exchange (Practical session)	Students of Semester VI of Charuchandra College visited Vidyasagar Metropolitan College on 28.06.24 to attend a day long Practical session on Pharmacognosy and medicinal botany
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Amal Saha

Principal
Vidyasagar Metropolitan College

Principal
Vidyasagar Metropolitan College
Kolkata-700 006



Anon

Teacher-in-charge
Charuchandra College
Teacher-in-Charge
Charuchandra College

Zeylanidium manasiae, a new species of Podostemaceae based on molecular and morphological data from Kerala, India

Remya Krishnan¹, Priyanka Khanduri², Rajesh Tandon¹

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Academic editor: *Marco Pellegrini* | Received 29 January 2019 | Accepted 15 May 2019 | Published 10 June 2019

Citation: Krishnan R, Khanduri P, Tandon R (2019) *Zeylanidium manasiae*, a new species of Podostemaceae based on molecular and morphological data from Kerala, India. *PhytoKeys* 124: 23–38. <https://doi.org/10.3897/phytokeys.124.33453>

Abstract

We present the description of *Zeylanidium manasiae* (Podostemaceae), a new species from Kerala, India, which is proposed based on molecular, macro- and micromorphological data. This species is characterised by its ribbon-like dichotomous thallus, floriferous shoots produced along the margins and dichotomy of the thallus, inflorescence with two bracts, unequal stigmatic lobes, ellipsoid fruits and large seeds.

Keywords

Internal transcribed spacer, Malpighiales, Podostemoideae, rheophyte, taxonomy

Introduction

Podostemaceae represents a very distinct family of fresh water aquatic angiosperms, with unique evolutionary, ecological, morphological, developmental and embryological attributes (Cook and Rutishauser 2007, Katayama et al. 2016, Khanduri et al. 2014). It is the most diverse family of fresh water aquatic flowering plants, comprising ca. 54 genera and ca. 300 species (Koi et al. 2012, Cheek et al. 2017) distributed worldwide, but with most species presenting restricted distribution and a high degree of endemism (Philbrick et al. 2010). Podostemaceae is subdivided into three monophyletic subfamilies: Podostemoideae, Tristichoideae and Weddellinoideae (monogeneric and monospecific) (Koi et al. 2012). Southern Asia is one of the main centres of diversity for the podostemads, ac-



Floral biology, pollination mechanism and embryo development in *Zeylanidium maheshwarii* (Podostemaceae)

Remya Krishnan¹ · Priyanka Khanduri² · Rajesh Tandon¹

Received: 25 March 2019 / Revised: 6 May 2019 / Accepted: 9 May 2019 / Published online: 5 June 2019
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Abstract

Zeylanidium maheshwarii is one of the 23 endemic species of Indian Podostemaceae, the largest family of fresh water aquatic plants in the world. The family is unique in many ways, be it their habitat, plant body or the reproductive attributes. We looked into some of the reproductive attributes of the species encompassing floral biology, mechanism of pollination and embryo development. The flower is highly reduced, and the species can be easily identified from the rest of the *Zeylanidium* clade by two features—the presence of a gynophore and the multi-lobed stigma. The pollen grains are released in units of two—the acalymmate dyads. The exine ornamentation is microechinate with discernible apertural and interapertural regions. Pollination is accomplished by autonomous self-pollination, which occurs above the water level. The formation of three-celled embryo sac in the species is the result of precocious degeneration of the central cell prior to syngamy. Absence of central cell before fertilization leads to absence of double fertilization and endosperm in the species, and this features reiterates the general cause of usual absence of double fertilization among the podostemads.

Keywords Autogamy · Single fertilization · Aquatic angiosperm · Three celled/three nucleated embryo sac

Introduction

Podostemaceae is the largest family of fresh water angiosperms with pan-tropical distribution. The plants of this family grow on the rocks and boulders in cataracts, river rapids and waterfalls (Gupta and Sehgal 2009). There are nearly 50 genera and 280 species (Cook and Rutishauser 2007) worldwide. India harbours around 28 species of which 23 are endemic to Western Ghats, especially Kerala (Sanavar et al. 2005). The seasonal and cyclic occurrence of alternate dry and wet periods determines the phenology of the plants. The plants begin to flower upon getting exposed during the dry period, which otherwise remain in vegetative phase under the submerged condition (Mohan Ram and Sehgal 2007).

Podostemaceae is marked by characteristic deviations from the usual developmental pattern of angiosperms in terms of its overall morphology and certain reproductive

features. The plants lack double fertilization event, endosperm formation, antipodal cells, and there is no concrete distinction between stems, roots and leaves. The family is considered to be an embryological one for having four-celled/four-nucleated condition of the mature embryo sac, and presence of a nutritive tissue termed nucellar plasmodium instead of biparental endosperm (Cook and Rutishauser 2007; de Sá-Haiad et al. 2010; Khanduri et al. 2014).

The genus *Zeylanidium* (Tul.) Engler belongs to the subfamily Podostemoideae, and the plant body is characterized by a crustose or ribbon-shaped thallus. The caduous leaves and flowering shoots are present either in the sinuses of the thallus lobes or are scattered on its dorsal surface. Solitary flowering shoots of the genus bears a single terminal flower, subtended by bracts, and these shoots are horizontally appressed to the thallus. The other features include persistent spathella, anisolobous ovarian locules, and many-seeded and ribbed capsules. Some of the earlier works on *Zeylanidium* include female gametophyte development (*Z. lichenoides* Engl., Choudhary et al. 2014; Sehgal et al. 2014); shoot development (*Z. lichenoides* Engl., Katayama et al. 2013), and seedling biology of *Z. lichenoides* Engl., *Z. olivaceum* Engl. and *Z. maheshwarii* (Suzuki et al. 2002). *Zeylanidium*

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