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Student: MGR. Galin Gospodinov

Dissertation Thesis Title: Taxonomic and genetic investigation on sect. *Ricciella* genus *Riccia* in Europe with emphasis on *R. fluitans* and *R. rhenana*

Reviewer: Prof. Dr. Marko S. Sabovljević (Dr. rer. nat.), University of Belgrade, Serbia

The student investigated taxonomical, genetic and reproductive features of the selected species from the section *Ricciella* within the genus *Riccia*. Genetical, phylogenetical, molecular and cytogenetical approach to hardly accessible and delimiting taxa give interesting results and novel views of the species within the section.

The results of this thesis are separated in various manuscripts some of which are already in press in different international journals. The dissertation itself is clearly written and well structured. The candidate guides through his scientific achievements with simple language and clarifies with ease the results obtained.

Thus, the dissertation written in English has in total 118 pages and consists of Summaries, both in English and Polish, following by Declaration of the author Galin Gospodinov, both in English and Polish, Preface, Acknowledgements, Contents, List of Figures, List of Tables and further on it is divided in chapters. There are six main Chapters and additionally main concluding remarks both in English and Polish, Glossary, Bibliography, Funding, Examined Material and Supplementary Data.

Chapter 1 is a general part, where the student makes an introductory on bryophytes, their common features with special emphasis on liverworts. Candidate also makes overview of Ricciaceae family, genus *Riccia*, and section *Ricciella* which is in focus of this thesis. The problems of species delimitation and separation by characters are emphasized.

Further on the clear aim, significance and objectives of the thesis is given. The candidate makes literature review, both for taxonomic and genetic approaches to *Ricciella*.

Chapter 2. brings some aspects of *Riccia* biology and main strategies of reproduction and the candidate considers various aspects of reproductive biology known up to date.

Chapter 3. considers the results of extensive studies in ploidy level on Bulgarian accessions and makes comparison on reports from Europe. The results achieved suggest the opposite patterns of selected species distribution Europe-wide made on Bulgarian accession and extrapolated to overall European distribution, based on cytogenetic tests in species delimitation. Moreover, the candidate suggests the correlation with life form and habitat types.

In chapter 4. genome sizes of various *Riccia* accessions are compared and the main conclusion out of it is that hardly delimited species from section of *Ricciella* can be rather easily distinguished based on 1C values i.e. confirming haplotypes or diplotypes combined with basic morpho-anatomy.

In chapter 5. Candidate finds out allopolyploid origin of *Riccia rhenana* and confirms its good species status based on the isozyme analysis and DNA barcoding technics.

Chapter 6. gives insights into candidate taxonomic investigations of section *Ricciella*, and gives the results of phylogenetic relationships among the species within this section. The two main grouping suggest two separate sections, namely *Fluitans* and *Canaliculata*. According to candidate results subgenus *Ricciella* is not supported as regarded by previous authors.

Finally the candidate easily linked the main achievements and makes the main conclusions out of more detailed results obtained in own various studies.

The major outcomes of the dissertations are highlighted as follow:


- *Riccia rhenana* is confirmed to be good species and further studies on biology of this species are needed.
- The distribution patterns of *Riccia rhenana*/*R. fluitans* in Europe seem to be the opposite to that previously believed when it comes to confirmation of accessions by cytogenetics.
- Within the *Riccia fluitans* s. str., there seems to be more genotypic variations, suggesting cryptic speciation
- *Riccia rhenana* is a species of allopolyploid origin
- Monophyletic position of subgenus and section *Ricciella* is not supported by new results.

Candidate showed theoretical knowledge of the posed problem in this thesis, and skills to do multidisciplinary approach to scientific works in bryology. Integrative

work on problem ignored by many researches also stressed original and hardworking solution search.

I do believe, the candidate, by working on the dissertation thesis, has demonstrated creative abilities in the relevant research area, and I recommend the defence of the doctoral thesis.

The dissertation meets the conditions specified in Article 187(1–2) of the Act of 20 July 2018 – Law on Higher Education and Science (Journal of Laws 2024, item 1571, as amended).


Belgrade, 01.02.2026
Marko Sabovljević

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