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Ref.: Supervisor's evaluation of Ms Nermeen Ashraf's PhD thesis "Beneficial and toxic effects of REE in algae and plants"

Dear Ladies and Gentlemen,

I am writing this evaluation as the main supervisor of Ms Ashraf's PhD studies, which she performed in my research group from July 2017 until the thesis submission in May 2022. She joined my lab based on my OPVVV (Operační program Výzkum, vývoj a vzdělávání) grant "Metals, Plants and People" (Kovy, rostliny a lidé, KOROLID) on a theme that was established as collaboration with Prof. Milada Vitová (Třeboň) and Prof. Hudson W.P. Carvalho (Sao Paulo, Brazil). Prof. Vitová became co-supervisor of the thesis, and Prof. Carvalho became host of Ms. Ashraf's foreign internship.

My following evaluation is based on teaching her in my lab, discussions about the project, her attendance of my advanced course "Bioinorganic chemistry and biophysics of plants", later reading and correcting the drafts of her manuscripts for journals and her thesis (in the journal manuscripts, I also corrected language errors etc., in the thesis I gave advice but asked her to do it to see her abilities).

As her most important strength, I would highlight her dedication to do the PhD and to work hard for reaching her aim. She has shown determination to do her PhD far from her home and family, on a topic that was rather new for her, and in a research collaboration which also led to her travel to Brazil for her university-required internship.

However, while she has a good theoretical knowledge on general plant biology, her experience in laboratory work turned out to be less than most of my previous PhD students could build on for their PhD, and most of the analytical techniques in my department were really new for

her. Also, she seems not to have had much previous training in solving scientific problems by independent thinking rather than following protocols. While I have been investing intensive teaching into her work from its beginning, these deficits slowed down progress and sometimes my help in overcoming them was not appreciated.

Despite all difficulties, the core part of Ms Ashraf's thesis led to a good publication in the renowned journal *Aquatic Toxicology* with her as first author, about effects of lanthanum toxicity under environmentally relevant conditions. The main highlights in this work were the analysis of La effects on photosynthesis biophysics, measured by microscopic in vivo chlorophyll fluorescence kinetics, analysis of La binding to proteins via size exclusion chromatography coupled online to sector-field ICP-MS, and analysis of subcellular La distribution via X-ray fluorescence tomography. While the former two measurement types were developed and performed in my group (so that she also became co-author on the publication about the HPLC-ICPMS method), nano XRF tomography was performed in the synchrotron beamline ID 16A in at the ESRF facility in Grenoble (France), where we travelled together for this purpose.

Her internship in Brazil led to her second first-author publication (currently published online ahead of print), despite many problems in which the COVID-19 pandemic played a decisive role: As a result, finally she could go to Brazil only once, while originally two stays of 1.5 months each had been planned.

As a conclusion after supervising her PhD for the past five years, I think that her thesis should be admitted to the oral defence.

With best regards, yours sincerely,

Prof. Dr.
Hendrik
Küpper

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