

Supervisor's Assessment of the Bachelor Thesis

Title: Sequence features indicate a positive net charge is influential for the sub-cellular localization of proteins in organisms with complex plastids

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Fuad Sarker Jeem prepared his thesis under my supervision in the last semester. I know Fuad Sarker Jeem already from his bioinformatics project, for which he worked with me in from October 2021 until February 2022, the project report at that time was reviewed by Miroslav Oborník. One of the conclusions of the initial project was, that the analyses performed within the project, need to be expanded to larger datasets, which, at that time were not available.

I was therefore happy to hear that Fuad Sarker Jeem continued to work in this field, as a part of his bachelor studies. In his bachelor work, Fuad Sarker Jeem analysed targeting pre-sequences of nucleus encoded plastid proteins of diatoms, and of two organisms that are photosynthetic relatives of the Apicomplexa, *Chromera velia*, and *Vitrella brassicaformis*, collectively called the chromerids. Diatoms, and the chromerids, share similarities in their plastid ultra-structure, which are also reflected in similarities of plastid protein targeting signals and mechanisms. These similarities are to the exclusion of targeting pathways and signals found in plants and green algae, which are much better known and investigated at this time, but which have a less complex plastid ultra-structure, making it impossible to simply transfer the knowledge about plastid protein targeting in these organisms, to diatoms or chromerids.

Fuad Sarker Jeem started his work with the assembly of a reference dataset that by far exceeds the existing diatom and chromerid datasets. In another novelty compared to his previous project work, he designed regions of the sequences, termed sequence windows, which he analyzed comparatively, in order to identify heterogeneity in the distribution of the investigated features, along the sequence.

As a result of his work, Fuad Sarker Jeem was able to show that a positive net charge is present in a certain region of the plastid targeting pre-sequences, the n-terminal part of the transit peptide (which itself is downstream of an ER-type signal peptide). The statistical significance identified here by Fuad Sarker Jeem, is in line with experimental work performed and published by others researchers, via mutations of otherwise identical sequences. This correspondence of experimental and sequence-analysis results has been recognized by Fuad Sarker Jeem, who discussed this result, in comparison to the properly identified relevant work of others, in his written thesis.

Fuad Sarker Jeem worked on his bachelor project in a highly self reliant way, and it should be mentioned that a large part of his bachelor studies, including much of the project work preceding his bachelor thesis, had to be conducted online due to the Covid-19 pandemic. I was often impressed by the completeness of individual sub-parts of the work, which Fuad Sarker Jeem presented after initial discussions of these sub-aspects. This ability to proceed through a topic in big chunks is a particular strength of Fuad Sarker Jeem. On the downside of this, Fuad Sarker Jeem was sometimes less enthusiastic

about improving aspects of the project that he had already worked on, compared to adding new parts. In general, scientific progress is many times achieved by iterative approaches, in which discussions and critical evaluation of the results, lead to adjustments in the study design, followed by, sometimes extensive, re-analysis of the data. Similarly, also scientific writing includes editing of draft versions, which is a mandatory part of the process. Here, Fuad Sarker Jeem's work could have further profited from revision or editing steps, especially according to input that was provided to him from others. That said, the strengths of Fuad Sarker Jeem's work, namely his independence, and his ability to explore a topic in depth, that was totally new to him at the beginning of the project, certainly make up for this. I therefore recommend the committee to accept the thesis, and I wish Fuad Sarker Jeem all the best for his future.

České Budějovice, January 20 2023

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