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Small RNA biogenesis in Duckweeds

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Small RNA silencing pathways in plants play crucial roles in development, antiviral resistance, and transposon control. There are two types of silencing: transcriptional gene silencing (TGS) and post-transcriptional (PTGS). TGS acts via the RNA-directed DNA methylation pathway and 24nt-long small interfering RNAs (siRNAs). PTGS functions at the mRNA level, where viral or transgene RNA transcripts trigger the formation of 21nt- and 22nt-long siRNAs that target AGO proteins toward these transcripts leading to their cleavage and degradation.

Duckweeds have simplified their silencing pathways and challenge the current model of PTGS in several ways. Dicer-like protein 2 (DCL2), the protein responsible for the production of 22nt siRNA, conserved among plants, is lost in duckweeds, yet we observe 22nt siRNA in all three species studied in our lab. Transgenic silencing in *Lemna minor* is characterised by the equal presence of both 21nt- and 22nt-long siRNAs; transient expression of an inverted repeat (IR) in *Spirodela polyrhiza* and in *Wolffia brasiliensis* results in the production of both 21nt and 22nt siRNA derived from this IR. These 22nt siRNAs, in turn, do not seem to trigger transitivity, the silencing amplification process, despite the presence of all the necessary elements that we know of.

The goal of our project is to understand the biogenesis of 22nt-long siRNA and find the mechanisms responsible for the difference in PTGS functioning in duckweeds, including transitivity — a phenomenon that is not well understood even in conventional models such as *Arabidopsis*.

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Scientific Session

Keywords

small RNA, PTGS, silencing

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