



Title	Regulation and evolution of chloroplast division in the bryophyte <i>P. patens</i> : Mechanisms and molecular pathways
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Description	この博士論文の全文は利用可能日以降に公開されます。
Degree Grantor	北海道大学
Degree Name	博士(生命科学)
Dissertation Number	甲第16601号
Issue Date	2025-09-25
DOI	https://doi.org/10.14943/doctoral.k16601
Doc URL	https://hdl.handle.net/2115/98211
Type	doctoral thesis
File Information	Thi_Huong_Do_abstract.pdf, 論文内容の要旨 https://creativecommons.org/licenses/by/4.0/



Abstract of Doctoral Dissertation

Degree requested Doctor of Life Science Applicant's name DO THI HUONG

Title of Doctoral Dissertation

Regulation and evolution of chloroplast division in the bryophyte *P. patens*: Mechanisms and molecular pathways

コケ植物ヒメツリガネゴケにおける葉緑体分裂の制御と進化:
そのメカニズムと分子経路

Chloroplast replication is essential for maintaining plastid populations in plant cells, a process initiated by the formation and positioning of the FtsZ ring (Z-ring) in the stroma. The Min system ensures the Z-ring assembles at the chloroplast's midpoint. In angiosperms, key regulators such as ARC6 and PARC6 modulate Z-ring dynamics at the division site. However, non-vascular plants like *P. patens* lack PARC6, raising questions about how Z-ring assembly is controlled. This study reveals that *P. patens* ARC6 has dual functions: it shares conserved roles with *Arabidopsis thaliana* ARC6 while also assuming a novel function similar to *A. thaliana* PARC6. Additionally, MinC, a known bacterial inhibitor of FtsZ, is present in *P. patens* but does not regulate chloroplast division, suggesting the presence of a novel regulatory factor. In parallel, environmental factors, particularly the stress hormone abscisic acid (ABA), and hypergravity were found to modulate chloroplast proliferation and chloroplast size in *P. patens*, revealing divergent evolutionary mechanisms for chloroplast regulation under stress conditions. These findings contribute to understanding chloroplast division regulation and its adaptation to environmental stresses in early land plants.