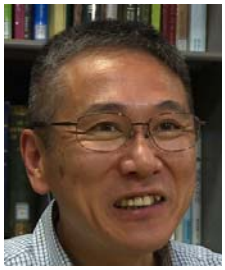
【Grant-in-Aid for Scientific Research (S)】

Biological Sciences (Biology)



Title of Project : Spatiotemporal regulation of cell division axis as a grand plan of plant developmental evolution

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Research Project Number : 16H06378 Researcher Number : 40237996
Research Area : Evolutionary Biology
Keyword : Cell division axis, Evolution and Development, Cell Evolution, Physcomitrella, Closterium

【Purpose and Background of the Research】

Cell division axis has to be properly regulated during development in both metazoans and land plants. Genetic changes in the regulation of cell division axis caused the evolution of development in the multicellular organisms. Since land plants do not have centrosomes and asteroid bodies, both of which are involved in the axis formation of metazoans, land plants should have different regulatory mechanisms. This study aims to investigate the connecting factors between microtubules and GRAS transcription factors that regulate periclinal cell divisions in the moss *Physcomitrella patens*. In addition to identify the factors, the spatiotemporal regulatory mechanisms will be studies to understand the basis of body plan evolution with comparison to those in the flowering plant *Arabidopsis thaliana* and the green algae *Closterium peracerosum–strigosum-littorale*.

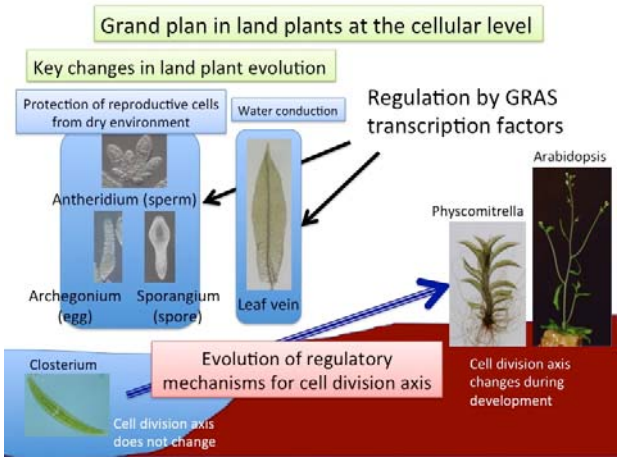

Figure 1 Evolution of the regulatory mechanisms for cell division axis appears to be the basic change for subsequent divergence of land plants

【Research Methods】

This study aims to investigate the molecular mechanisms to spatiotemporally regulate the cell division axis in representative land plants, which enables us to infer the evolutionary significance of the difference of cell division axis regulation.

[Research 1] We investigate target genes of GRAS transcription factors that regulate periclinal cell divisions in Physcomitrella especially focusing on factors connecting the transription factors and microtubules.

[Research 2] Spatiotempral regulation of the GRAS transcription factors during leaf vein development in Physcomitrella.

[Research 3] Based on the results in Researches 1 and 2, functions of orthologous genes to cell division axis regulators in Phsycomitrella will be studied in Arbidopsis and Closterium to investigate their common and different functions and to infer evolutionary significance in body plan evolution.

【Expected Research Achievements and Scientific Significance】

This study will reveal the factors and mechanisms to connect transcription factors and cytoskeleton to spatiotemporally regulate cell division axis in Physcomitrella, Arabidopsis, and Closterium. These results will give new insight on cell biology, developmental biology, as well as evolutionary biology.

【Publications Relevant to the Project】

・Fukushima, K., Fujita, H., Yamaguchi, T., Kawaguchi, M., Tsukaya, H., and Hasebe, M. (2015) Oriented cell division shapes carnivorous pitcher leaves of *Sarracenia purpurea*. Nat. Commun. 6 , 6450
・Kofuji, R. and Hasebe, M. (2014) Eight types of stem cells in the life cycle of the moss *Physcomitrella patens*. Curr. Opin. Plant Biol. 17 , 13-21.

【Term of Project】 FY2016-2020

【Budget Allocation】 150,100 Thousand Yen

【Homepage Address and Other Contact Information】

http://www.nibb.ac.jp/evodevo