

Abstract:

During the course of evolution the early land plants gained extensive innovations that can be seen in modern day plants. The polar growth is an ancient feature of eukaryotic cells and is one of preadaptations that helped plants in successful colonization of land. The polar growth in plants regulates not only the direction of cell expansion and structural properties of cell wall but especially also the orientation of cell division, and is governed by various factors, including the exocyst complex. The exocyst is a well conserved vesicle tethering multi-subunit complex involved in tethering of secretory vesicles to the target membrane.

The essential role of the exocyst complex in regulation of various cellular processes in Angiosperms is now well documented. Here I present results of a doctoral project that contributed to phylogenetic analyses of the land plant exocyst complex and especially to uncovering functions of three moss exocyst subunits, namely EXO70 (isoform *PpEXO70.3d*), SEC6 and SEC3 (isoforms *PpSEC3A* and *PpSEC3B*) in the model organism *Physcomitrella patens*.

Various knock-out (KO) mutants in several moss exocyst subunits (*Ppexo70.3d*, *Ppsec6*, *Ppsec3a* and *Ppsec3b*) show pleiotropic defects directly or indirectly linked to the cell polarity regulation. Cell elongation and differentiation, cytokinesis, cuticle formation, response to auxin (phytohormone) are impaired in these mutants, resulting in different strength of developmental deviations ranging from inability to develop gametophores to more subtle morphologic deviations linked to different degree of dwarfism in gametophores. Importantly, the exocyst genes are required for completion of the full moss life cycle including sexual reproduction. While a KO mutation in the single-copy subunit PpSEC6 results in lethality, KO mutants of multi-member subunit families are not lethal – *Ppexo70.3d* (one of thirteen *EXO70* paralogs) is sterile due to defective egg cell development, and *Ppsec3* mutants (three *SEC3* paralogs) show partial defects in sporophytes and spore development.

These results show that the exocyst complex function in cellular morphogenesis is not only conserved in moss *P. patens*, and that the exocyst has a crucial role in the moss life cycle, but they also indicate a functional importance of the multiplication of exocyst genes in this representative of basal land plants.

This work was supported by EU Marie Curie Network (No. 238640 PLANTORIGINS), MSMT (NPUI LO1417) and GACR/CSF (15-14886S).