論文内容の要旨

論文題目：**Studies of plant unique post-Golgi membrane traffic pathways regulated by ARA6 and VAMP7s**

（**ARA6** と **VAMP7** が制御する植物ユニークな

ポストゴルジ輸送経路の研究）

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Post-Golgi organelles play fundamental roles in various plant functions of higher order, where RABs and SNAREs play crucial regulatory roles in membrane tethering and fusion. Each organism has distinct set of RAB and SNAREs, and each molecule is expected to regulate a specific transport pathway. This suggests that plant unique RABs and SNAREs regulate specialized membrane traffic pathways to plants.

Arabidopsis thaliana has two types of RAB5 members, conventional RAB5 and plant unique ARA6. Distinct subcellular localization of ARA6 from conventional RAB5 suggested functional differentiation between these two RAB5 groups, but their precise functions remained unknown.

On the other hand, plant VAMP7-like R-SNAREs are diversified to formation in different post-Golgi trafficking pathways. VAMP727 is characterized by an insertion of 20 amino acids in its longin domain. VAMP727

homologs are conserved only in plants, and its molecular function of VAMP727 was unclear.

To gain insight into the plant post-Golgi trafficking pathways, I first studied post-Golgi SNARE complex formation with a special focus on VAMP7-like R-SANREs. By genetic, bioimaging and biochemical analyses, I revealed that VAMP727 forms a SANRE complex with VAM3, VTI11, and SYP51 on a subpopulation of PVCs closely associated with the vacuolar membrane. On the other hands, VAMP71, which localized on the vacuolar membrane, also formed a SNARE complex with VAM3, VTI11 and SYP51. These results indicated that two different SNARE complexes are involved in vacuolar membrane fusion. *rab7* mutants showed similar defect to *vamp71* mutants, which suggested that RAB7 and VAMP71 could regulate the same membrane fusion event.

I also found that VAMP727 forms a complex with PEN1, a Qa-SNARE localized on the plasma membrane (PM), on the punctate domains near the PM through coimmunoprecipitation and bioimaging analyses. The amount of this SNARE complex was reduced in *ara6* mutant, and ARA6 also colocalized with VAMP727 and PEN1 on the PM. These results indicate that ARA6 and VAMP727 coordinately act on the plant unique membrane traffic pathway from the endosome to the PM, which is distinct from known secretory pathway. *Physcomitrella patens* ARA6 and an ARA6-like protein of *Toxoplasma gondii* also localized on the PM, which could indicate that ancestral ARA6 also regulated transport to the PM.