A Giant COPII Vesicle Population Orchestrating Plant Hormone Responses

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Higher plants live as sessile organisms with large-scale gene duplication events and subsequent paralog divergence during evolution. Notably, plant paralogs are expressed tissue-specifically and fine-tuned by phytohormones during various developmental processes. The coat protein complex II (COPII) is a highly conserved vesiculating machinery mediating protein transport from the Endoplasmic Reticulum (ER) to Golgi apparatus in eukaryotes. Intriguingly, plant COPII paralogs greatly outnumber those in yeast and mammals. However, the functional diversity and underlying mechanism of distinct COPII paralogs in regulating protein ER export and coping with various adverse environmental stresses are poorly understood. Here, we characterized a novel population of COPII vesicles produced in response to abscisic acid (ABA), a key phytohormone regulating abiotic stress responses in plants. These hormone-induced giant COPII vesicles are regulated by a plant specific COPII paralog and carry stress-related channels/transporters for alleviating stresses. This study thus provides a new mechanism underlying ABA-induced stress responses via the giant COPII vesicles, and answers a long-standing question of the evolutionary significance of gene duplications in higher plants.