

In vivo analysis of the calcium signature in the plant Golgi apparatus reveals unique dynamics

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The Golgi apparatus is thought to play a role in calcium homeostasis in plant cells. However, the calcium dynamics in this organelle is unknown in plants. To monitor the $[Ca^{2+}]_{Golgi}$ in vivo, we obtained and analyzed *Arabidopsis thaliana* plants that express aequorin in the Golgi. Our results show that free $[Ca^{2+}]$ levels in the Golgi are higher than in the cytosol ($0.70\ \mu M$ vs. $0.05\ \mu M$, respectively). Stimuli such as cold shock, mechanical stimulation and hyperosmotic stress, led to a transient increase in cytosolic calcium; however, no instant change in the $[Ca^{2+}]_{Golgi}$ concentration was detected. Nevertheless, a delayed increase in the $[Ca^{2+}]_{Golgi}$ up to $2-3\ \mu M$ was observed. Cyclopiazonic acid and thapsigargin inhibited the stimuli-induced $[Ca^{2+}]_{Golgi}$ increase, suggesting that $[Ca^{2+}]_{Golgi}$ levels are dependent upon the activity of Ca^{2+} -ATPases. Treatment of these plants with the synthetic auxin analog, 2,4-dichlorophenoxy acetic acid (2,4-D), produced a slow decrease of free calcium in the or