

10

Accumulation of phenolic compounds in vacuoles of young appendages during the early development of epiphytes

InSun Kim *, Ji-Eun Yim

Biology Department, Keimyung University, Taegu
704-701, Korea

The formation of phenolic compounds was examined in tissues taken from the meristematic area of the shoot and from appendages at various stages of development in mature plants of epiphytic Boston Ivy. In particular, the study focused on the localization and pattern of phenolic compound accumulation. Electron microscopy revealed no phenolic compounds in the meristem and leaf primordia, but intracellular deposits of electron-dense phenolic compounds very early in appendage development. The deposits were restricted to the vacuoles, which took different forms, and appeared to accumulate on the inner periphery adjacent to the tonoplast or in the center of the organelles, possibly next to vacuolar invagination. It was formed first in the vacuoles of discrete cells of the abaxial epithelial layer when the appendage was barely recognizable, but still undifferentiated in morphology. Enormous amount of electron-dense deposits were detected in both small immature and young developing appendages exhibiting the abaxial cell vacuoles filled with the deposits. The deposits appeared most concentrated in the epithelial layers. As the appendages expanded, the amount of deposits were increased in the vacuoles of small, discrete cells in the adaxial layer, while the deposit-containing cells in the abaxial layer began to decrease in content. Such an increase in the adaxial layer continued until typically enlarged electron-dense idioblasts or sacs were formed in the epiphytic appendages. By this stage, the vacuoles in the abaxial layer had become nearly empty. In senescent appendages collected from the node near the base of the shoot, the cells in both epithelial layers lost the majority of the compound that had originally formed. At senescence, all cells that had once contained deposits appeared to be empty shells. We speculated that a finite amount of phenolic compound was formed in the epithelial layers of new appendages at early development, without increase but decrease during the mature phase, and was catabolized in maturing and senescent appendages for the functional adaptation.

Keywords: epiphytes, phenolic compounds, vacuolar accumulation, adaptation