

Expression of *IbVPE1* from Sweet Potato in *Arabidopsis* affects Leaf Development, Flowering Time and Chlorophyll Catabolism

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Extended Abstract

Leaf development is controlled by complex networks of hormones, enzymes, transcription factors, and microRNA. Plant senescence is a major and essential process for plant development, and leaf senescence is a visible indicator of plant aging. Vacuolar processing enzymes (VPEs) are cysteine proteinases with functions in the processing of vacuolar proteins and the maturation of seed storage proteins. Since their discovery, VPEs have consistently been investigated as programmed cell death (PCD) initiators and participants in plant development and responses to biotic or abiotic stresses, in part due to similarities with the apoptosis regulator caspase-1. However, recent studies show additional functions of VPE in tomatoes, specifically in sucrose accumulation and fruit ripening, but little is known about PCD-unrelated functions of VPE during plant growth. Herein, we evaluated the functions of VPE from sweet potato, initially in expression pattern analyses of *IbVPE1* during development and senescence. Subsequently, we identified physiological functions by overexpressing *IbVPE1* in *Arabidopsis thaliana*, and showed reduced leaf sizes and numbers and early flowering, and elucidated the underlying molecular mechanisms. The results showed that *IbVPE1* affects leaf development and flowering times by regulating several TCP transcript factors and *API1*. *IbVPE1* accelerates chlorophyll breakdown during dark-induced senescence. The present data demonstrate functions of the VPE gene family in development and senescence and in regulation of flowering times, leaf sizes and numbers, and senescence phenotypes in *Arabidopsis thaliana*.

Keywords: Vacuolar processing enzymes (VPEs), *Arabidopsis thaliana*, Sweet potato, Leaf development, Flowering, Senescence.

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