

Arabidopsis plants lacking plastid phosphoglucose isomerase respond to microbial volatiles through GLUCOSE-6-P/PHOSPHATE TRANSLOCATOR2 action

Samuel Gámez-Arcas¹, Ángela María Sánchez-López¹, Adriana Ricarte-Bermejo¹, Marouane Baslam², Edurne Baroja-Fernández¹, Francisco José Muñoz¹, Abdellatif Bahaji¹, Lydia Ugena³, Goizeder Almagro¹, Nuria De Diego³, Lukás Spíchal³, Karel Dolezal³ and Javier Pozueta-Romero*⁴

¹Instituto de Agrobiotecnología (CSIC// Gobierno de Navarra), Mutilva, Navarra, Spain.
samuel.gamez@csic.es, angela.sanchez@csic.es, adriana.bermejo@csic.es, e.baroja@csic.es, francisco.munoz@csic.es, abdellatif.bahaji@csic.es, goizeder.almagro@csic.es.

²Graduate School of Science and Technology and Department of Applied Biological Chemistry, Niigata University, Japan.
mbaslam@gs.niigata-u.ac.jp

³Department of Chemical Biology and Genetics, Centre of the Region Haná for Biotechnological and Agricultural Research, Faculty of Science, Palacky University, Olomuc, Czech Republic.
lidia.ugenagarciacsuegra@upol.cz, karel.dolezal@upol.cz, lukas.spichal@upol.cz, nuria.de@upol.cz.

⁴Instituto de Hortofruticultura Subtropical y Mediterránea “La Mayora”, Málaga, Spain.
javier.pozueta@csic.es

Abstract: Recent studies have shown that PGI1 is an important determinant of photosynthesis, growth and starch production, likely as a consequence of its involvement in the synthesis of plastidial isoprenoid compounds such as hormones and photosynthetic pigments (Bahaji et al. 2015; Bahaji et al. 2018). We have shown that volatile compounds (VCs) emitted by microbes promote growth, photosynthesis, and accumulation of cytokinins (CK) and starch (Sánchez-López et al. 2016a). This response was PGI1-independent, as fungal VCs exposed PGI1 null *pgi1-2* plants grew faster and accumulated exceedingly higher levels of starch and CKs than plants not exposed to VCs (Sánchez-López et al. 2016b). The most up-regulated gene in leaves of fungal VCs exposed plants was At1g61800, encoding the plastidial GPT2 glucose-6-phosphate (G6P)/phosphate translocator. Whether the response of *pgi1-2* to fungal VCs could be due to the GPT2-mediated transport of cytosolic G6P into the chloroplast was investigated by characterizing *pgi1-2/gpt2-2* PGI1- and GPT2-null double mutants cultured in the presence or absence of VCs emitted by the fungal phytopathogen *Alternaria alternata*. We found that photosynthesis, active CKs content, growth and leaf starch content in *pgi1-2/gpt2-2* plants exposed to fungal VCs were lower than in VCs exposed WT, *gpt2-2* and *pgi1-2* plants. Proteomic analyses revealed that fungal VCs strongly up-regulate the expression of proteins involved in photosynthesis in WT, *gpt2-2* and *pgi1-2* plants, but in much lower extent in *pgi1-2/gpt2-2* plants. The overall

data show that the combined action of PGI1 and GTP2 is an important determinant of the plant's response to microbial VCs. The possible involvement of these functions in the production of growth- and foliar metabolism-regulating isoprenoid hormones in heterotrophic organs is discussed.

Key words: starch, growth, volatile compounds.

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