

Title Plants as biofactories: glyphosate-induced production of high-commercial value chemical compounds in wounded-carrot tissue

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Abstract

The use of genetically modified organisms to produce chemical compounds of high pharmaceutical and nutraceutical value has intensified in recent years. However, growing genetically modified plants is still very limited since they are considered potential biological hazards that may produce an ecological unbalance. The application of postharvest abiotic stresses on fruits and vegetables induces the accumulation of secondary metabolites and thus can be used as an alternative to genetic modification. Wounding-stress activates the shikimic acid (SA) and phenylpropanoid pathways. The SA pathway produces SA, which serves as carbon source for the production of aromatic amino acids. Those aromatic amino acids are then used by the phenylpropanoid metabolism to produce phenolic compounds (PC). Shikimic acid (SA) and phenolic compounds (PC) are chemical compounds of major interest for the pharmaceutical and nutraceutical markets. SA is used as substrate for the production of Tamiflu® whereas PC are considered the bioactive compounds with the highest antioxidant activity. Therefore, the present project objective was to evaluate the feasibility of producing SA and PC in carrots (*Daucus carota*) treated with wounding stress in combination with glyphosate (an herbicide that induces the accumulation of SA in plants). To prepare the carrot cuts, whole carrots were wounded with a food processor to produce shreds. Shredded-carrots treated with glyphosate were prepared by spraying 100 mL of the glyphosate solution (0, 100, 200, 300, 400 y 482 g/L) to 300 g of the wounded-tissue. Results indicated that wounding stress increased the concentration of SA and PC by 77% and 170%, respectively, after 24 h of storage at 25°C. Likewise, shredded-carrots treated with glyphosate showed a 1700% and 355% of increase in the concentration of SA and PC after storage, respectively. The application of postharvest abiotic stresses in carrots can be used as a simple and effective strategy to induce the accumulation of SA and PC.