

The flavonols kaempferol and quercetin increase in response to wounding in tomato leaves

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The wounding response in plants generates reactive oxygen species (ROS), which can irreversibly damage plant macromolecules and lead to cell death. Plants maintain ROS homeostasis using both enzymatic and specialized metabolites, including flavonol antioxidants. However, the degree to which flavonols are synthesized or transported in response to wounding is not well understood. Here, we characterize the temporal dynamics of flavonol biosynthesis in wounded tomato leaves to better understand the underlying mechanisms by which plants respond to damage from mechanical injury or insect herbivory. We have studied the wounding response in tomato mutants, transgenics, and natural accession that have differences in flavonol biosynthetic capacity: VF36 (wild-type), *are* (a flavonone 3-hydroxylase (*F3H*) mutant), and VF36-*F3H*-T3 (an *F3H* overproducer). The leaves of these genotypes were wounded, stained with the flavonol specific dye, diphenylboric acid 2-aminoethyl ester (DPBA) and the hydrogen peroxide selective dye, peroxy-orange 1 (PO1), visualized by laser scanning confocal microscopy and quantified via FIJI. We found that wounding increased the accumulation of two flavonols, quercetin and kaempferol around the wounding site. Additionally, the accumulation varies according to the time after wounding and the genotype. Wounding also leads to localized accumulation of PO1 fluorescence. Current experiments are asking whether the levels of wounding-induced hydrogen peroxide are modulated by the levels of flavonols across these genotypes. This research could lead to the generation of genetically modified tomatoes which can may effectively defend against wound-induced damage. (Supported by USDA NIFA 2024-09661).