THE CONSTITUTIVE PRODUCTION OF SYSTEMIN IN TOMATO PLANTS MODIFIES THE EXPRESSION OF GENES INVOLVED IN THE VOC PATHWAY

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Plants and insects have coexisted since very long time and have developed several relationships that concern the organisms at all levels, from basic biochemistry to population genetics. Although some of these relationships between the two phyla are mutually beneficial, such as pollination, the most common interactions are antagonistic and involve insect predation of plants and plant defences against herbivorous insects. The latter may be carried out by chemical and physical defences that influence pest performance and attract natural enemies of herbivores. These mechanisms are termed direct and indirect defence, respectively. Direct defence includes the production of anti-nutritive and poisonous compounds for plant-feeding insects, while indirect defence typically involves the production of Volatile Organic Compounds (VOC), which are used by parasitoids and predators to localize their victims. After herbivore attack, plants release complex bouquets of volatile that include terpenes and C6-volatiles playing a key role in tritrophic interaction. Great interest is presently oriented to the identification of major genes involved in VOC production in response to herbivores attacks. We focused our attention on genes involved in terpenoid biosynthetic pathway. In order to study gene expression we used transgenic tomato plants that were transformed to constitutively express the tomato prosystemin gene as these plants in the absence of herbivores attacks, accumulate defence proteins similarly as occurs in control plants damaged by larvae feeding (McGurl et al., PNAS: 1994; 91:9799-802). The results of the expression analysis, carried out by SYBR-Green Real Time PCR, indicated that herbivory up-regulates genes involved in late steps of the VOC pathway such as FPS1, responsible of the production of Farnesyl pyrophosphate and LeSST1-2 possibly involved in the production of b-caryophyllene in planta, while downregulating LeCCD1A and LeCCD1B genes involved in carotenoid cleavage that produces volatile terpenoid such as b-ionone and geranylacetone. No differences were observed in the expression of early genes of the biosynthetic VOC pathway (DXS and DXR). These results encouraged the production of transgenic tomato plants in which LeSSTI-2 genes were silenced through PTGS approach in an attempt to identify the role of such genes in the indirect defence mechanism.