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TOMATO TRANSCRIPTOME IS REPROGRAMMED FOLLOWING PROSYSTEMIN OVER-EXPRESSION

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In tomato plants, the response to insect attacks and mechanical wounding is mediated by systemin (Sys), an 18-aminoacid signaling peptide derived from the precursor protein called prosystemin (ProSys). Sys is considered the primary wound signal that, once induced, triggers the production of jasmonic acid (JA) via the octadecanoid pathway. JA activates, locally and sistemically, the expression of defensive genes, such as proteinase inhibitors and polyphenol oxidase that prevent uptake of essential amino acids in insect gut, thus causing negative effect on pest development. To study the impact of prosystemin expression on tomato transcriptome, transgenic plants over-expressing ProSys were produced (RSYS) and analysed by microarray. RSYS plant population was screened to assess transgene presence, its expression and protein production.

Two transgenic genotypes, differing in ProSys expression level, were chosen and each one was used in three biological replicates. A two colour-labeling strategy was used for a competitive hybridization of samples and controls on tomato Agilent 4x44k array. Image data were processed using Agilent Feature extraction software and data analyses were performed using GeneSpring GX 10. Blast2GO software (CIPF, Valencia) was used for the functional annotation of differentially expressed sequences. Most of them are classified in "stress responses" and "signaling": ProSys was found to affect the expression of genes related to defence against herbivores and pathogens, including genes involved in the reinforcement of physical barriers, and environmental stresses. Moreover, the expression of genes related to the emission of volatile compounds, associated with indirect defence mechanisms, such as phenylpropanoid and terpenoid, was also affected. Interestingly genes involved in jasmonic acid, salicylic acid, ethylene and auxin-regulated pathways were differentially expressed, suggesting that Sys could influence the defence networks controlled by different plant hormones. Overall our results indicate that tomato Sys plays a key role in plant defence against different stressors.