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THE TOMATO SEROTONIN PATHWAY: IN SEARCH OF BIOLOGICAL ROLES FOR FRUIT INDOLAMINES

NEGRI S.*, COMMISSO M.*,**, GECCHELE E.*, PERDUCA M.*, ZENONI S.*, VITULO N.*, PIRRELLO J.***, GUZZO F.*, AVESANI L.*

*) Università degli Studi Di Verona, Dipartimento di Biotecnologie, Verona (Italy)
**) R&d, Demethra Biotech Srl, Camisano Vicentino (Italy)
***) Gbf, Universitè De Toulouse, Inra, Castanet Tolosan (France)

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About a hundred of plant species, including some common fruits and vegetables, are able to produce and accumulate tryptamine and serotonin, two neuroactive tryptophan-deriving indolamines whose biological roles in plants are still controversial. Beyond being intermediates in various biosynthetic pathways (e.g. indole alkaloids and melatonin), these molecules could be involved in important physiological processes such as pathogen defence and leaf senescence, as recently demonstrated for serotonin in rice. Nonetheless, little is known about their functions in the **fruits** where they accumulate up to several tens of µg/g of fresh weight.

This project aims to unravel the role of tryptamine and serotonin in the model fruit of tomato (*Solanum lycopersicum* cv. Microtom), a natural producer of these indolamines. We identified and characterized *in-vivo* three tomato genes codifying for the entry enzyme of their biosynthetic pathway (tryptophan decarboxylase, *TDC*) that catalyzes the synthesis of tryptamine and one gene (tryptamine-5-hydroxylase, *T5H*) responsible for its conversion to serotonin. Following the expression analysis of these genes, we selected a fruit-specific *SlTDC* to target through a metabolic engineering approach in order to produce knock-out and overexpressing mutants that will be subjected to phenotypical analysis along the whole ripening process and tested for their ability to respond to abiotic and biotic stress. Moreover, the bioinformatics analysis of promoter regions of *SlTDCs* co-expressed genes and the study of the accumulation pattern of tryptamine and serotonin by UPLC-ESI-MS in different organs and developmental stages of wild-type tomato plants added further details to the comprehension of their functions in plants.