Napoli 2019

12-14 Giugno

Riunione annuale dei gruppi di lavoro *SBI*

Biologia Cellulare e Molecolare

Biotecnologie e Differenziamento

Venerdì 14 Giugno 2019

Session 4: Development and Differentiation

Moderatore: Lucia Colombo

9.30 **Limitations of photosynthesis in *Selaginella martensii* acclimated to different light regimes.** Lorenzo Ferroni, Marian Brestic, Riccardo Cantelli, Alex Zeri, Simonetta Pancaldi

9.45 **MADS-box genes expressed in floral buds of *Trithuria submersa*.** Silvia Moschin, Sebastiano Nigris, Leonardo Bruno, Adriana Chiappetta, Maria Beatrice Bitonti, Giorgio Casadoro, Barbara Baldan

10.00 **Genetic and molecular pathways regulating *Ginkgo biloba* ovule development: preliminary results.** Sebastiano Nigris, Chiara Tessari, Cheyenne Dell'Aquila, Silvia Moschin, Giorgio Casadoro, Barbara Baldan

10.15 **Deep insights on woody roots response to mechanical constraints.** Dalila Trupiano, Elena De Zio, Antonio Montagnoli, Donato Chiatante, Karin Ljung, Andrea Rossi, Gabriella Stefania Scippa

Moderatore: Stefano Castiglione

10.30 **GUN1 controls the accumulation of NEP-dependent transcripts and chloroplast protein import in *Arabidopsis* cotyledons.** Luca Tadini, Carlotta Peracchio, Andrea Trotta, Monica Colombo, Ilaria Mancini, Nicolaj Jeran, Franco Faoro, Milena Marsoni, Candida Vannini, Eva-Mari Aro, Paolo Pesaresi

10.45 **The MADS-box transcription factor SEEDSTICK (STK) acts through CYTOKININ OXIDASE/DEHYDROGENASE 7 (CKX7) to guide fruit elongation.** Maurizio Di Marzo, Humberto Herrera-Ubaldo, Elisabetta Caporali, Ondrej Novak, Ignacio Ezquer, Marta A. Mendes, Stefan de Folter, Lucia Colombo

11.00 **Vacuolinos coexist with the central vacuole and contribute to the shape of conical epidermal cells.** Martina Cerri, Shuangjiang Li, Yanbang Li, Cornelis Spelt, Mattijs Bliek, Michiel Vandenbussche, Enric Martínez Calvó, Biao Lai, Ronald Koes, Francesca M. Quattrocchio, Lara Reale

11.15 **Effect of cytokinins on adventitious shoot regeneration from leaves of peach cultivars growing *in vitro*.** Gaia Urbinati, Adele Gentile, Emilia Caboni

11.30 *Coffee break*

Moderatore: Flavia Guzzo

11.50 **In search of tryptamine and serotonin biological roles in tomato.** Mauro Commisso, Stefano Negri, Linda Avesani, Martino Bianconi, Stefania Ceoldo, Flavia Guzzo

12.05 **Transcriptional control of fruit development.** Chiara Mizzotti, Carolina Cozzi, Sara Forlani, Simona Masiero

In search of tryptamine and serotonin biological roles in tomato

Mauro Commisso[1], Stefano Negri[1], Linda Avesani[1], Martino Bianconi[2], Stefania Ceoldo[1], Flavia Guzzo[1].

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Tryptamine and serotonin are two indolamines which presence was recently reported in many plant species and emerging reports suggest the ubiquity of these molecules in the whole plant kingdom. The occurrence of these metabolites obviously reflect the existence of a biosynthetic route involved in their production and the first gene codifying for a tryptophan decarboxylase (TDC), able to convert the amino acid tryptophan into tryptamine, was characterized from *Catharanthus roseus*. In this plant species, tryptamine is sequestered into the vacuole and there directed in the biosynthesis of indolalkaloids. On the other hand, tryptamine can be directed in the production of serotonin in other plant species, as demonstrated for *Oryza sativa* plants. Indeed, tryptamine is turned into serotonin through the action of a Tryptamine 5-Hydroxylase (T5H) enzyme. In rice, both tryptamine and serotonin are believed to be directed in the production of melatonin through the action of other two enzymes. *N*-acetyltransferase (SNAT) and *N*-acetylserotonin methyltransferase (ASMT) are indeed responsible for the conversion of serotonin into N-acetylserotonin and finally melatonin, respectively. However, the occurrence of high levels of tryptamine and serotonin and their derivatives, especially esters linked with hydroxycinnamate moieties, in rice and other plant species suggest that these two indolamines might be final product rather than mere precursors of indolalkaloids or melatonin. Moreover, it has been reported that *O. sativa* plants has three genes coding for TDCs and this arises the hypothesis that TDC product might display multiple biological roles.
Beside the well-known neurotransmitter activity exerted in animals, serotonin was demonstrated to be involved in the protection of rice leaves against biotic stressors, such as the fungus *Bipolaris oryzae* and *Magnaportea grisea*. On the contrary, little is known about the role of tryptamine in plants, except for some evidences derived from experiments on plants overexpressing *C. roseus TDC*, where the high presence of tryptamine in the leaves negatively affected insect reproduction.
During a previous project focused in the metabolome characterization of fruits from several plant species and cultivars, we found high levels of tryptamine and serotonin in methanolic extracts of *Actinidia* spp. and *Solanum lycorpesicum*. Since the previously mentioned roles were observed in plants that mainly accumulate tryptamine and serotonin in leaves, we focused about the biological role played by these indolamines in fleshy fruits. In this project, *S. lycopersicum* L. cv MicroTom plants were used as model plant species and the transient heterologous transformation of *Nicotiana benthamiana* plants, which do not usually accumulate tryptamine nor serotonin, allowed us to characterize three different tomato *TDCs* and one *T5H* genes. Moreover, we observed a specific and precise spatial distribution of tryptamine and serotonin in different tomato tissues and organs, including a gradient of accumulation along the plant stem, suggesting a fine regulation of metabolite production and/or translocation.
Acknowledgements: this project was funded by Regione Veneto.

Indice degli Autori

Ringraziamenti

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Si attesta che il/la Dott./Dott.ssa

COMMISSO MAURO

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"Biologia Cellulare e Molecolare" & "Biotecnologie e Differenziamento"
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Prof. Adriana Basile

Dott.ssa Viviana Maresca

(Membri del Comitato Organizzatore)