

ABSTRACT FORM

Proposal for oral presentation

New insights into aphid isoprenoid pathway

VANDERMOTEN Sophie¹, CUSSON Michel², HAUBRUGE Eric¹, FRANCIS Frédéric¹

¹ University of Liege, Gembloux Agro-Bio Tech, Functional and Evolutionary Entomology, Passage des Déportés 2, B-5030 Gembloux, Belgium.

² Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre, 1055 du PEPS, P.O. Box 10380, Stn. Ste-Foy, Quebec, QC G1V4C7, Canada.

Isoprenoids form an extensive group of natural products involved in a number of important biological processes. In insects, they serve among other as hormones and pheromones. Their biosynthesis proceeds through sequential 1'-4 condensations of isopentenyl diphosphate (C5) with an allylic acceptor, the first of which is dimethylallyl diphosphate (C5). The reactions leading to the production of geranyl diphosphate (GPP; C10), farnesyl diphosphate (FPP; C15) and geranylgeranyl diphosphate (GGPP; C20), which are the precursors of mono-, sesqui- and diterpenes, respectively, are catalyzed by a group of highly conserved enzymes known as short-chain isoprenyl diphosphate synthases or prenyltransferases. In recent years, the sequences of many new prenyltransferases have become available, revealing novel mechanisms of product chain-length selectivity and an intricate evolutionary path from a putative common ancestor.

We characterized an aphid prenyltransferase producing both GPP and FPP in similar amounts under in vitro conditions. In an effort to identify the mechanism responsible for this dual activity, we assessed the product selectivity of several aphid prenyltransferase site-directed mutants, designed to effect substitutions in amino acid residues seen to be in close proximity to the GPP or FPP ligand in a homology model. Our analyses pointed to two amino acid residues, Gln107 and Leu110, likely to play a key role in conferring dual GPP/FPP synthase activity to the aphid enzyme. Our research is now focusing on the study of the implication of aphid GPP/FPP synthase in juvenile hormone, alarm and sexual pheromones biosynthesis using qRT-PCR and RNAi methods.

