

GRAL MSc RESEARCH SCHOLARSHIP 2020-2021 RESEARCH INTERNSHIP PROPOSAL

Institute / Group

IRIG / PCV – StrucDev 3

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Research Project Title

Determining the function of SEPALLATA3 oligomers in flower development

Description of the project

MADS transcription factors (TFs) are master regulators of floral organ development. By forming different heterotetramers with others MADS partners, they regulate expression of specific sets of genes and trigger the formation of either sepals, petals, stamens or carpels. SEPALLATA3 (SEP3) is a key MADS TF in flower organ development and SEP3, or one of its sister clade members, is required in all tetrameric complexes. We hypothesize that the dynamics of complex formation and the competition for SEP3 binding partners are determining factors in floral organ development. In vitro, SEP3 is able to form homodimers/tetramers, although the function of these complexes in planta is unknown. Plants that overexpress SEP3 show specific leaf and flower phenotypes, indicating that SEP3, independently of other MADS partners, is able to modify molecular processes. By taking advantage of the availability of the 3-D structure of the dimer and tetramer of SEP3, novel SEP3 mutants will be engineered that enhance homodimer/tetramer formation while reducing heterodimer/tetramer formation. Electrophoretic mobility shift assays will be used to test the SEP3 variants' ability to bind DNA and interact with partners. Promising variants will be selected for plant transformation to determine in vivo function. These studies will reveal how binding affinities of homo versus heteromeric complexes impact function at both the molecular and phenotypic level. Experience in molecular and plant biology is a plus but not required.

Keywords

MADS transcription factors, protein-protein complex, protein assembly, DNA binding, flower development

Relevant publications of the team

V. HUGOUVIEUX*, C.S. SILVA, A. JOURDAIN, A. STIGLIANI, Q. CHARRAS, V. CONN, S.J. CONN, C.C. CARLES, F. PARCY, C. ZUBIETA*. Tetramerization of MADS family transcription factors SEPALLATA3 and AGAMOUS is required for floral meristem determinacy in Arabidopsis. *Nucleic Acids Res.* (2018) 1;46(10):4966-4977.

V. HUGOUVIEUX, C. ZUBIETA MADS transcription factors cooperate: complexities of complex formation. *J Exp Bot.* (2018) 9;69(8):1821-1823

V.M. CONN, V. HUGOUVIEUX, A. NAYAK, S.A. CONOS, G. CAPOVILLA, G. CILDIR, A. JOURDAIN, V. TERGAONKAR, M. SCHMID, C. ZUBIETA, S.J. CONN. A circRNA from SEPALLATA3 regulates splicing of its cognate mRNA through R-loop formation. *Nat Plants.* (2017) 18;3:17053.
