PROMETEUS

Project title: PRi Optimizination by dna MEthylation and Transposable Elements studies: Unraveling their persistance and performance modulation by environmental constraints; an apple case Study

Acronym: PROMETEUS

Project duration: 36 months – Start date: 01-11-2018 End date: 31-10-2021

Key-words: Plant resistance inducers, epigenetics, transposable elements, immune memory, heat stress

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Summary:

Healthy apple production requires an important number of chemical pesticide treatments. Our team showed that repeated PRI (Plant Resistance Inducer) applications significantly reduces the number of pesticide treatments required to protect the trees against apple scab, a fungal disease responsible for the half of the treatment frequency index of apple orchards. In order to optimize this new protection method, we propose to deepen the knowledge on the mode of action of two PRI by studying two aspects: (i) plant ability to memorize PRI treatments and (ii) plant ability to respond more or less efficiently to PRI applications when facing environmental constraints. First of all, the effect of two PRIs will be monitored by DNA methylation assays, transposable elements (TE) activation and gene expression analysis at the genome scale. Regarding memorization, the hired PhD will study by focused analyses the maintenance/inheritance of DNA methylation at different timescales: week, months and from one generation to the other. Regarding environmental constraints, the PhD project will focus on the effect of high temperatures on apple PRI response ability. Global analyses of gene expression, DNA methylation and TE activation of PRI-treated apple plants facing heat stress will therefore be performed and compared to those obtained with either PRI-only treated plants, either heat-only treated plants. Heat stress is the chosen environmental constraint because it (i) significantly reduces apple response to PRI and (ii) is known to activate transposable elements in other plant models. This study will allow to identify memorization and plant-receptivity processes and markers which will hopefully contribute to optimize application frequency and identify favorable conditions for successful PRI treatments.