# ROSAPEPS

Project title: Rosa miPEPs and miRNAs: new friendly-environmentally tools to control branching?

Acronym: ROSAPEPS

Project duration: 36 months - Start date: 01/10/2018 End date: 30/09/2021

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

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**Summary:**

**Context:**
In ornamental horticulture, well branched plants with many flowers are a guarantee of quality. However, the development of new branches by a plant is highly sensitive to environmental factors: adverse temperature or light conditions can induce an inhibition of buds growth causing thus the absence of new branches. This problem is critical in dense culture conditions and leads to the downgrading of the horticultural products. In gardens and especially in urban conditions, very fluctuating climatic conditions such as hot spots, prolonged shading by buildings, etc ... also negatively impact aesthetic quality of ornamental plants by a poor branch renewal. This problem is further heightened by the current climate disruption. Varieties better adapted to these stressful environmental conditions are therefore sought.

**Goals:**
In this context, ROSAPEPs project aims to evaluate, for the first time, the potential of microRNAs (miRNAs) and of micropeptides (miPEPs) to enhance branching of ornamental species under environmental stress conditions, low light here. miRNAs are a class of small RNAs (20-24 nucleotides) recently discovered that is largely disseminated in the genome and emerged as major regulators of plant development regulation in response to environmental factors. They act by cleaving their mRNAs target or by repressing their translation into proteins. The miPEPs are, on their side, the small regulatory peptides encoded by the primary transcripts of the miRNAs that enhance specifically their expression. To-date, very few is known on plant branching regulation by miRNA/miPEP, and even less in response to adverse light conditions. However, the use of these small regulatory molecules, either through varietal selection (for miRNAs) or by direct application on plants (for miPEPs) could offer powerful and friendly-environmentally tools to address these problems.

**Methods:**
The work will be conducted on rose bush, a major ornamental plant in France and particularly for production in the Pays de Loire. Rose bush will be grown under light-limiting conditions and their buds and nodes harvested to determine miRNAs involved in the control of branching in response to the light environment (thanks to rose genome sequence availability and to new high throughput miRNAs sequencing technologies). Potential target genes for these miRNAs will be identified by searching for their cleavage site along the annotated genome. The spatio-temporal expressions of some of the identified miRNAs/target gene module will be studied (in situ hybridization, qPCR) and their function validated through Arabidopsis thaliana transformation. This work will, therefore, on the one hand, contribute to better understand miRNAs mode of action in the control of branching and on the other hand, open innovative avenue for breeding based on the most relevant miRNAs/target gene module.
In addition, miPEPs will be synthesized from the miRNAs most active in branching control and will be applied to rosebush to evaluate the potential of these molecules as new friendly-environmentally tools in the control of branching in production.