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Transcriptomics towards flowering in fruit trees

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Statement of the Problem: Global warming is threatening the production of more than 40 million tons of stone fruit from the *Prunus* genus (*e.g.* cherry, almond, apricot, peach, etc.). The main reason for this is the decrease in the winter chill which is necessary for the flowering process. Hence, the ability to control dormancy release and flowering in perennial plants is extremely desirable. In the past, different cyanide-based products *e.g.* hydrogen cyanamide (Dormex®, AlzChem, Germany) have been used in agriculture to compensate for missing winter chill and to advance flowering, suggesting cyanide as a key player in dormancy release. Interestingly, cyanogenic glucosides, which constitute one component in an ancient plant defense system, are also known to release cyanide. The cyanogenic glucoside prunasin is present in flower buds of *Prunus* plants. Cyanide-based inhibition of antioxidant enzymes like catalase leads to increasing ROS levels, which are known to be important messengers in various cellular processes, like seed germination, a process related to bud dormancy release. Therefore, the purpose of this study is to show how Dormex® is advancing flowering time in fruit tree species like cherry.

Methodology: Dormant sweet cherry flower buds were treated with Dormex® and water as a control, sampling flower buds at different time points up to 18 days after treatment. The effects of Dormex® were assessed using RNA sequencing, metabolite profiling and enzyme assays.

Findings: Transcriptome analysis revealed more than 6000 Dormex®-responsive genes, among them jasmonate (JA)-, cytokinin-, ethylene- and hydrogen cyanide-associated transcripts. These results were supported on the metabolite level, where a significant increase in JA-Ile and different cytokinins was observed.

Conclusion & Significance: These results suggest a complex mechanism of action for hydrogen cyanamide-induced endodormancy release in sweet cherry.

Biography

Raquel Sánchez-Pérez, currently teaches Biochemistry at Copenhagen University, where she is employed and funded by the Villum Foundation, under the Young Investigator Program. Her research work focuses on the study of important agronomic traits within Prunus species, with a desired practical output both for food production and farmer economy. Her aim is to develop molecular markers for application in breeding programs that will help to obtain new improved cultivars that are more resistant to the negative effects of climate change. In the last years, she has supervised three PhD theses on secondary metabolites, i.e. cyanogenic glucosides, in flower bud dormancy, seed germination and fruit development.

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