

INFORMATIONS

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POSTER COMMUNICATION

Using gene editing to improve the hydraulic properties of grapevine roots under water stress conditions

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ABSTRACT

Context and purpose of the study. Epidermal Patterning Factors are a family of small peptides that are highly conserved in the plant kingdom and are involved in several physiological and developmental processes. While EPFL9 has been shown to positively regulate leaf stomatal formation in many crops, including grapevine, its role in other organs remains to be fully elucidated. The aim of our study is to investigate whether VviEPFL9-2 may have a specific biological function in grapevine roots.

Material and methods. To this end, *epfl9-2* knock-out (KO) lines of the genotype Kober 5BB (*Vitis berlandieri* x *Vitis riparia*) were generated using CRISPR/Cas9 technology, and their root morphological traits were evaluated under both well water and water stress conditions, in conjunction with shoot physiological characterization. A transcriptomic analysis was also performed for the root tissues. Finally, grafting experiments were carried out with all possible combinations of WT and *epfl9-2* mutants using Syrah as scions and Kober 5BB as rootstock.

Results. Phenotypic evaluation in the greenhouse showed that the root system of the mutants was less expanded than that of the wild type, with a significant reduction in the geotropic angle and root length. Interestingly, the secondary roots of the mutants were quantitatively less than those of the WT, but had a larger diameter, similar to that of the primary roots. In addition, grafting showed that the different root phenotype of Kober *epfl9-2* KO persisted even in the presence of the unaltered shoot apparatus of the WT scion. Furthermore, RNAseq data from edited Kober roots revealed a strong activation of the lignin pathway compared to WT. Our results demonstrate for the first time that VviEPFL9-2 has a specific role in roots and suggest the existence of a mechanism regulated by EPFL9 that may lead to increased lignin deposition in root tissues. Since lignin is a valuable component of the secondary cell wall

that contributes to the improvement of the hydraulic properties of roots under drought, VviEPFL9-2 appeared to be an interesting target for the application of new genomic techniques to make rootstocks better adapted to cope with drier soil environments.