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Genomic technologies for generating abiotic stress tolerance grapevine (*Vitis vinifera* L.) plants

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Grapes are one of the economically most important crops, which ranks first in the world in terms of production among fruit and berry crops and seventh among all agricultural crops. Significant changes have taken place in the field of molecular breeding in recent years: genetic plants modification has become a practical technology, and transgenic plant cultivars now occupy more than 170 million hectares of agricultural land. At the same time, such an important crop for world agriculture as grapes turned out to be practically unaffected by modern trends in genomic modifications. The regeneration of individual transgenic plants from single transformed cells is a requisite for stable genetic transformation. In grapevine, a reliable method to accomplish this is through the induction of somatic embryogenesis. However, due to the high genetic diversity, the physiological aspects of the induction of somatic embryogenesis in different grape varieties can vary significantly. To date, most work on genetic transformation or CRISPR/Cas9 genome editing is based on a reliable and simple protocol for the regeneration of Thompson Seedless grape variety. With regard to vine grape varieties, most publications report about of transformation of the Chardonnay cultivar. Despite decades of work by scientists around the world, there is still no universal protocol or stably reproducible individual embryogenesis protocols even for the main commercial grape varieties. Our research team has made significant progress in the somatic embryogenesis and bioengineering of a number of commercial grape varieties of importance to the global wine industry. The developed transformation system appears to be suitable for application to other *V. vinifera* cultivars.

16 transgenic lines of grapevine containing genes encoding proteins with a cold shock domain (*CspA* and *EsCSDP3*) were obtained as a result of useng of developed transformation system. As a result of the studies, it was shown that the expression of the gene *Escsdp3* from the plant of *Eutrema salsugineum* is able to increase the cold and frost resistance of plants as effectively as the *cspa* gene from *E. coli*, which is classically used for this purpose. The cold resistance of transgenic lines was increased by 4 °C compared to the control cultivar.

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