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Heterologous expression of β-alanine betaine biosynthesis gene increases *Nicotiana tabacum* resistance to abiotic stresses

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Plant genetic modification in order to increase their tolerance to various abiotic stresses has been of exceptional importance in recent years. Heterologous expression of glycine betaine (GB) biosynthetic genes leads to increased salt and drought tolerance in various plant species by maintaining the osmotic balance with the environment and stabilizing the quaternary structure of complex proteins. However, GB biosynthesis in transgenic plants is limited by choline availability. Members of the *Plumbaginaceae* family accumulate β-alanine betaine (βAB) instead [1]. The synthesis of βAB is not limited by the availability of choline, as it follows the methylation pathway of the aproteinogenic amino acid β-alanine.

For the first time, we have generated *Nicotiana tabacum* plants expressing the β-alanine N-methyltransferase (*LlBANMT*) gene of *Limonium latifolium*. Transgenic plants were much less affected by such abiotic stresses as increased salinity, excessive illumination, and low temperature. The experimental *Nicotiana tabacum* lines had lower rates of chlorophyll degradation under stress conditions compared to the control plants. *LlBANMT* expression also resulted in less biomass loss under stress conditions, which was associated with higher activities of reactive oxygen species detoxification systems and healthier cell membranes. The presented data demonstrate for the first time the protective properties of *LlBANMT* heterologous expression and shed light on the mechanisms of its action.

REFERENCE

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