The jasmonate pathway mediates salt tolerance in Grapevines

Ahmed Ismail\textsuperscript{1,2,*}, Michael Riemann\textsuperscript{1} and Peter Nick\textsuperscript{1}

\textsuperscript{1} Molecular Cell Biology, Botanical Institute 1, Karlsruhe Institute of Technology, Kaiserstr. 2, D-76128 Karlsruhe, Germany

\textsuperscript{2} Department of Horticulture, Faculty of Agriculture, Damanhour University, Damanhour, Egypt

* To whom correspondence should be addressed. E-mail: ahmed.ismail@bio.uni-karlsruhe.de

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Abstract

Salt stress is a major constraint for many crop plants, such as the moderately salt-sensitive economically important fruit crop grapevine. Plants have evolved different strategies for protection against salinity and drought. Jasmonate signalling is a central element of both biotic and abiotic stress responses. To discriminate stress quality, there must be cross-talk with parallel signal chains. Using two grapevine cell lines differing in salt tolerance, the response of jasmonate ZIM/tify-domain (JAZ/TIFY) proteins (negative regulators of jasmonate signalling), a marker for salt adaptation Na+/H+ EXCHANGER (NHX1), and markers for biotic defence STILBENE SYNTHASE (StSy) and RESVERATROL SYNTHASE (RS) were analysed. It is shown that salt stress signalling shares several events with biotic defence including activity of a gadolinium-sensitive calcium influx channel (monitored by apoplastic
alkalinization) and transient induction of JAZ/TIFY transcripts. Exogenous jasmonate can rescue growth in the saltsensitive cell line. Suppression of jasmonate signalling by phenidone or aspirin blocks the induction of JAZ/TIFY transcripts. The rapid induction of RS and StSy characteristic for biotic defence in grapevine is strongly delayed in response to salt stress. In the salt-tolerant line, NHX1 is induced and the formation of reactive oxygen species, monitored as stress markers in the sensitive cell line, is suppressed. The data are discussed in terms of a model where salt stress signalling acts as a default pathway whose readout is modulated by a parallel signal chain triggered by biotic factors downstream of jasmonate signalling.

Key words: Grapevine (V. rupestris, V. riparia), Harpin, jasmonic acid, JAZ/TIFY, salt stress.

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