STRESS INDUCED PRODUCTION OF HYDROXYL RADICALS LEADS TO ACTIVATION OF CATION CHANNEL MEDIATED K^+ EFFLUX FROM PLANT CELLS

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Potassium (K^+) is essential macronutrient which is directly involved in regulation of enzyme activities, osmotic phenomena and generation of transmembrane electrical potential. The loss of K^+ by plant cells is central to stress reactions and also observed in signalling, development, mineral acquisition, and other physiological processes. Generation of reactive oxygen species is known to accompany these processes. Here, we propose a new mechanism of induction of K^+ loss from plants cells, which is activation of K^+ efflux channels by hydroxyl radicals (most chemically-active ROS and a major damaging factor under stress conditions). Using electron paramagnetic resonance spectroscopy, we have shown that hydroxyl radicals are produced in *Arabidopsis thaliana* roots in response to NaCl, pathogen elicitors, heavy metal copper and osmotic shock. K^+ efflux was induced by same stress factors in this system (as measured by ionselective vibrating microelectrodes, MIFE^{TM}). This efflux was sensitive to K^+ channel blockers and scavengers of free radicals. *Gork1-1* plants lacking major root K^+ efflux channel did not respond to stresses (via K^+ efflux). Patch-clamp electrophysiological analyses showed that 16-pS K^+-selective channel was activated by hydroxyl radicals in root cell plasma membrane. This channel had slow kinetics, was outwardly rectifying and inhibited by classical antagonists of K^+ channels. Thus, K^+ efflux GORK1-1 was shown to be activated by hydroxyl radicals that are generated in stress conditions by plant cells. Phenotyping studies are now in progress to test effects of gork KO on plant stress sensitivity and productivity under stress conditions.