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THE *IN VIVO* ACTIVATION OF THE ALTERNATIVE OXIDASE PATHWAY MEDIATES THE SYNTHESIS OF OSMOTIC STRESS-RELATED METABOLITES IN *ARABIDOPSIS THALIANA*

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Abstract: Salt and drought stress induce plants to accumulate stress-related metabolites such as free polyamines (PAs) putrescine, spermidine and spermine, however, the precise molecular mechanism underlying PAs protective effects against stress is not fully understood (Alcázar et al., 2020). Their metabolism is tightly linked to tricarboxylic acid (TCA) cycle intermediates (Chen et al., 2019), which in turn, are involved in respiration. Under drought and salt stress, respiration can be restricted at the level of the ubiquinone pool, however, the activity of the alternative oxidase pathway (AOP) is thought to prevent this from occurring (Del-Saz et al., 2018). Moreover, the AOP activity is associated to a better photosynthetic performance under osmotic stress (Del-Saz et al., 2018; Vanlerberghe et al., 2020). The present research is based on the hypothesis that the accumulation of TCA cycle intermediates and stress-related metabolites under osmotic stress will depend on the response of the leaf AOP activity. To test this, the oxygen isotope-fractionation technique was used to study the *in vivo* respiratory activities of the cytochrome and the alternative oxidase pathways (COP and AOP) in leaves of wild-type *Arabidopsis thaliana* plants and of *aox1a* mutants under sudden severe drought and salt conditions (1 day, 300 mM of mannitol or salt). In addition, the levels of leaf primary metabolites and PAs were determined in parallel to photosynthetic analyses. Our results show that the lack of *in vivo* AOP response in the *aox1a* mutants coincided with lower accumulation of TCA cycle intermediates and stress-related metabolites with consequences for photosynthetic performance.

Key words: osmotic stress, alternative oxidase, primary metabolism, *Arabidopsis thaliana*

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