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Summary of PhD thesis entitled: **Molecular aspects of the abscisic acid effect on the alternative respiratory pathway in *Arabidopsis thaliana***

The goal of this research was to determine whether the use of ABA in combination with changes in irradiation lead to the modification change in leaf senescence. Second goal was to verify the hypothesis that ABA-dependent preparation of plants for winter season is associated with activation of the alternative respiratory pathway. To illustrate the seasonal summer-autumn change, the light intensity was altered from HL to LL. The transfer of plants from HL to LL caused a visible signs of senescence, illustrated by the loss of chlorophyll. In contrast, ABA treatment inhibited the progression of leaf senescence. In turn, DIS (dark-induced leaf senescence) analysis did not show a significant difference in the rate of plant aging. The HL → LL change led to a decrease in the maximum quantum efficiency of PSII as well in the quantum efficiency of light-adapted PSII. However, no changes was found in the proportion of both photosystems (PSI/PSII). It was verified that AOX activity was mainly affected by the change in irradiance, not by ABA application. In contrast, SOD activity was changed due to application of ABA but not to the change in irradiance.

Gene expression analysis revealed that ABA stimulated the expression of *AOX1A* and *AOX1D*. It was found that both plant transfer to LL and treatment with ABA activate the *ANAC017* gene, a positive MRR regulator, with stronger activation observed in the latter case. In addition, to verify the modifying role of ROS (reactive oxygen species), HL was mimicked by spraying plants grown in LL with hydrogen peroxide. This approach revealed that *AOX1A* was stimulated only by ABA and not by ROS. In contrast, *AOX1D* appears to be stimulated by ROS under LL conditions. Although the differences in *ANAC017* expression were not significant between H_2O_2 and H+A plants, its expression pattern was similar to the *AOX1A* pattern and was slightly higher for H+A plants. These results support the thesis that ABA may, under certain conditions, act as an inhibitor of leaf aging. However, this effect seems not to be dependent on the induction of AOX activity, despite the stimulation of selected AOX genes. Light-dependent changes in AOX activity might be explained by the participation of

the alternative respiratory pathway in the oxidation of excess reducing molecules generated by photosynthetic electron transport.

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