



Abstract

Short-Term Reaction of *Dionaea muscipula* J. Ellis Photosynthetic Apparatus after UV-A Radiation Treatment [†]

Karolina Miernicka ^{1,*} , Barbara Tokarz ¹ , Wojciech Makowski ¹ , Rafał Banasiuk ², Aleksandra Królicka ³
and Krzysztof Michał Tokarz ^{1,*}

¹ Department of Botany, Physiology and Plant Protection, Faculty of Biotechnology and Horticulture, University of Agriculture in Krakow, 31-425 Krakow, Poland; barbara.tokarz@urk.edu.pl (B.T.); wojtek.makowski.1305@gmail.com (W.M.)

² Institute of Biotechnology and Molecular Medicine, 80-180 Gdansk, Poland; banasiuk@herbiopharm.pl

³ Laboratory of Biologically Active Compounds, Intercollegiate Faculty of Biotechnology UG and MUG, University of Gdansk, 80-307 Gdansk, Poland; aleksandra.krolicka@biotech.ug.edu.pl

* Correspondence: karolina.km.miernicka@gmail.com (K.M.); km.tokarz.ipbb@gmail.com (K.M.T.)

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Abstract: *Dionaea muscipula* J. Ellis is a South and North Carolina carnivorous endemic plant with medicinal properties. Its natural habitat is characterized by low availability of nutrients and poor plant cover, resulting in Venus flytrap exposure to various stress factors (especially UV-A radiation). To evaluate the response of *Dionaea muscipula* photosynthetic apparatus to increased levels of UV-A radiation, plants cultivated in controlled conditions (30–40 % air humidity, temperature 23 ± 1 °C, light intensity $290 \mu\text{mol m}^{-2} \text{s}^{-1}$, 16 h light/8 h dark) (Control) were treated additionally with $50 \mu\text{mol m}^{-2} \text{s}^{-1}$ UV-A radiation for 24 h (Treated). Measurements of gas exchange, chlorophyll fluorescence and photosynthetic pigment content were conducted immediately after the exposure, both in the Control and Treated plants. Additionally, the same parameters were evaluated in the next 24 hours (Recovery). UV-A treatment (Treated) did not change chlorophyll *a* + *b* content and chlorophyll *a/b* ratio. Furthermore, an increased level of electron carriers (Area, Sm) and increased efficiency of electron transport between Q_A and PSI (ΦR_0 , δR_0 , ρR_0) was observed. Further, PSI and electron acceptors demonstrated an increased ability to oxidize reduced plastoquinone pool (V_I decrease). As a consequence, the rate of net photosynthesis increased significantly. After 24h from the exposure (Recovery), the chlorophyll *a* + *b* content declined but the ratio of chlorophyll *a/b* did not alter, which indicates a decrease in the size of photosynthetic antennae and the number of active PSII centers. Additionally, inactivation of the reaction centers (F_0 decrease, V_J and V_I increase) and a decrease in the amount of electron carriers, especially PQ pool (Sm), was observed. Moreover, a decrease of electron flux and efficiency of electron transport between Q_A and PSI occurred (decrease of: ΦE_0 , ψE_0 , ET_0/RC , ET_0/CS_0 , ΦR_0 , ρR_0). These results may indicate the decrease of PSII photochemical efficiency. Simultaneously, PSI reactions remained unchanged and the rate of net photosynthesis increased significantly. This can be connected with the activation of alternative pathways of electron transport. Activation of these pathways leads to the limitation of NADPH synthesis and an increase in ATP synthesis, what enables the plant's effective acclimatization to stress conditions.

Keywords: *Dionaea muscipula*; photosynthesis; photosynthetic apparatus; UV-A radiation; alternative electron transport pathways



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