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Moderation of the Photosynthetic Performance and Terpenoid Profile of *in vitro* Cultures of the Medicinal Plant *Artemisia alba*

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Abstract. In this work we study the crosslink between the targeted terpenoid synthesis and the photosynthetic performance in the medicinal plant *Artemisia alba* by moderating its homeostasis via application of a panel of selected plant growth regulators (PGR). We study in vitro tissue cultures supplemented with indole-3-butyric acid (IBA, auxin) and benzyl adenine (BA, cytokinin) and probe their photosynthetic capacity, thylakoid morphology and terpenoid profile.

Pulse amplitude modulated fluorometry measurements were used to determine the effect of the applied PGR on the quantum yield of photosystem II and the linear electron transport rate. Our results reveal strong differences in those parameters between leaves of the apical and medium region of the stem, as well as strong dependence on the type and concentration of PGRs applied. A common feature is the pronounced stimulating effect of BA on the photosynthetic parameters, while that exerted by IBA was significantly smaller. Atomic force imaging revealed that IBA application induced a subpopulation of extraordinarily large and high thylakoids while BA compensated for this effect. The PGR treatment also provoked a concentration and combination dependent moderation of the monoterpenoids content in the plant essential oils, higher PGR concentrations leading to lower monoterpenoids content.

In summary, our data revealed a direct link between the functionality of the photosynthetic apparatus and the terpenoid synthesis ensuring a control over the secondary metabolism of the medicinal plant species *A. alba* via moderation of its photosynthetic performance.

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