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**A retrograde signal originating at PSII influence herbivore preferences**

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Under natural conditions, plants have to cope with a multitude of stresses, two of those are light-stress and herbivory. Plants have evolved several mechanisms to avoid the damage done by strong and fluctuating light. One of the most efficient photoprotection mechanism is the qE-type of non-photochemical quenching (NPQ), a process where the protein PsbS is highly involved. Light-stress causes a variety of changes in the metabolism of plants and these changes also influence plant–herbivore interactions.

To test the effect on herbivores of different levels of photoprotection, we used Arabidopsis thaliana wild-type and two photoprotection genotypes, npq4 and oePsbS that, respectively, lack and overexpress the PsbS protein. Food choice and oviposition preference experiments were conducted with a specialist and a generalist insect herbivore. We have also studied metabolomics of the npq4 and oePsbS plants when transferred to the field, where the plants experienced both light and herbivore stress.

In dual-choice feeding experiments, both insect herbivores preferred the less light stressed plants. For oviposition, female adults of diamondback moth were preferentially attracted to more light stressed plants. Metabolomics result point to a weather dependent shift between the genotypes. This together with a study of reactive oxygen species (ROS) and marker genes of the jasmonic acid and salisylic acid pathways result in a model where superoxides released at photosystem II (PSII) influence herbivore preferences.

Thus, in Arabidopsis plants, the variation in the abundance of a single protein (PsbS) that affects the regulation of light harvest, influenced preferences and the performance of insect herbivores. Our results suggest that, in plants, there may be opposing selection pressures on their capacity to handle both light-stress and herbivory.