

Response of photosynthesis to environmental light dynamics

Photosynthesis is a fundamental process in the biosphere, essential for primary production in all ecosystems. Environmental conditions have a strong impact on photosynthetic reactions, requiring complex modulation, specific to various species depending on their ecological niche. Photosynthesis is thus finely regulated, and plants employ photoprotective mechanisms to modulate electron pathways to dissipate excess energy and avoid potential damage from over-excitation and over-reduction.

Different plant species grown outdoors and monitored across different seasons show substantial diversity in photosynthetic properties, enabling their response to variable environmental conditions. Only a small fraction of this diversity is associated with phylogenetic distance, while the largest component is linked to the ability of each individual plant to modulate its photosynthetic performance. These results suggest that the ability to modulate photosynthetic reactions is an essential feature for plants resilience to environmental dynamics and ecological success.

Considering the impact of photosynthesis in biomass there is a strong interest in understanding if optimization of photosynthesis regulation also opens the possibility of improving light-use efficiency in crops, increasing their biomass productivity and ultimately yield.