

## The mystery of albinos orchids - a integrated ‘omics’ study to better understand mycoheterotrophy

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Some terrestrial photosynthetic orchids can have two carbon sources for their metabolism: photosynthesis and their mycorrhizal partners. These mixotrophic plants can adjust the relative balance of their carbon sources depending on the environmental conditions. In some rare occasions, they can even completely lose the photosynthetic ability without obvious adverse effect resulting in albino plants, which survive and eventually flower. This highlights the extraordinary versatility of their primary metabolism. To understand the mechanisms underlying this ability and the role of their mycorrhizal partners, we performed an integrated metabolomics and transcriptomic analysis of naturally-occurring albino individuals of *Cephalanthera damasomium*, *Epipactis helleborine* and *Epipactis purpurata*. Using the localizations provided by field orchidologists, mostly from the Société Française d’Orchidophilie, samples were collected in France and Luxembourg. When comparing albino plants to green counterparts from the same populations, we observed a conserved pattern for the three species. The metabolomics analysis showed a global shift of the carbon/ nitrogen balance, with aerial parts handling mainly N metabolism in albinos, as expected from previous studies on albino plants. Surprisingly, the impact on the transcriptome was very limited, supporting the idea that the physiology of these orchids is resilient and versatile, and partially independent from photosynthesis.