

Proyecto: Too close for comfort: exploring the molecular and genetic basis of shade avoidance and tolerance in plants

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In many plant ecosystems, including forests and agricultural communities, **vegetation proximity** reduces the amount and quality of light available for photosynthesis. Plants have evolved two alternative strategies to cope with this condition: **shade avoidance** and **shade tolerance**. Shade-avoiding species, such as *Arabidopsis thaliana*, respond to shade by promoting stem or hypocotyl elongation, accelerating flowering, and adjusting photosynthetic activity. In contrast, **shade-tolerant species**, such as the close relative *Cardamine hirsuta*, lack the characteristic elongation response and are better adapted to growth under low-light conditions.



→ Although the regulation of shade avoidance is relatively well understood, much less is known about shade tolerance. Our work has shown that **(1)** both strategies involve the same core genetic components, **(2)** but that these components exhibit distinct activities in *Arabidopsis* and *Cardamine*.

→ We are now investigating **(i)** how these components function in *A. thaliana* and **(ii)** which molecular and mechanistic differences between the two species account for their divergent responses to vegetation shade. Understanding these mechanisms could ultimately contribute to the development of crops that maintain high yields under high-density planting, including **regenerative agricultural systems** based on intercropping and increased crop biodiversity.

→ The proposed TFM will use comparative genetic, molecular, and mechanistic approaches in *Arabidopsis* and *Cardamine* to investigate how evolution has shaped divergent responses to the same environmental stimulus and to identify the mechanisms underlying shade avoidance versus shade tolerance.

REFERENCES of the group: DOI, 10.1093/plphys/kiag602, 10.1111/nph.70384, doi.org/10.3390/plants13223212, 10.1093/plphys/kiae417, 10.1111/nph.19047, 10.15252/embj.2019104273

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<https://ibmcp.upv.es/research-groups/light-and-shade-regulation-of-plant-development/>