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Competition between the invasive macrophyte *Caulerpa taxifolia* and the seagrass *Posidonia oceanica*: contrasting strategies

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Abstract

Background: Plant defense strategy is usually a result of trade-offs between growth and differentiation (i.e. Optimal Defense Theory – ODT, Growth Differentiation Balance hypothesis – GDB, Plant Apparency Theory – PAT). Interaction between the introduced green alga *Caulerpa taxifolia* and the endemic seagrass *Posidonia oceanica* in the Mediterranean Sea offers the opportunity to investigate the plausibility of these theories. We have accordingly investigated defense metabolite content and growth year-round, on the basis of an interaction gradient.

Results: When in competition with *P. oceanica*, *C. taxifolia* exhibits increased frond length and decreased Caulerpenyne – CYN content (major terpene compound). In contrast, the length of *P. oceanica* leaves decreases when in competition with *C. taxifolia*. However, the turnover is faster, resulting in a reduction of leaf longevity and an increase on the number of leaves produced per year. The primary production is therefore enhanced by the presence of *C. taxifolia*. While the overall concentration of phenolic compounds does not decline, there is an increase in some phenolic compounds (including ferulic acid and a methyl 12-acetoxyricinoleate) and the density of tannin cells.

Conclusion: Interference between these two species determines the reaction of both, confirming that they compete for space and/or resources. *C. taxifolia* invests in growth rather than in chemical defense, more or less matching the assumptions of the ODT and/or PAT theories. In contrast, *P. oceanica* apparently invests in defense rather than growth, as predicted by the GDB hypothesis. However, on the basis of closer scrutiny of our results, the possibility that *P. oceanica* is successful in finding a compromise between more growth and more defense cannot be ruled out.