An integrated and multiscaling approach to study the allellopatic role of Carex distachya Desf. in plant communities of Mediterranean coastal vegetation.

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Abstract

Allelopathy has been showed to be one of the most important mechanisms regulating plant diversity and succession through several biological traits (e.g. germination, seedling growth, root symbionts and site quality). The modulation of these mechanisms can affect intra and inter-specific plant interactions and thus dynamical vegetation processes.
In Mediterranean-type ecosystems, climatic stress increases the production of allelochemicals amplifying the importance of allelopathic interactions under these ecological conditions.

However, the ecological relevance of allelopathy in Mediterranean plant communities is, still now, not well known because the effects of chemical interactions on germination and plant growth can be overlapped with those produced by competition and also because much of the information on this topic comes from laboratory experiments.

To better understand the role of allelopathy in the mechanisms regulating biodiversity maintenance and dynamical processes of Mediterranean plant community we undertook studieson steno-mediterranean *Carex distachya* Desf. (Cyperaceae), a perennial densely caespitose hemicriptophyte dominant in the intermediate successional stages of sand dune *macchia* vegetation.

Different approaches have been performed to investigated the potential allelopathic interference of *C. distachya* on the coexisting and weed species: i) chemical characterization and bioactivity of fresh and decomposing aqueous plant extracts; ii) bioactivity of pure metabolites; iii) analysis of pure metabolites/plant organ in relation to habitat; iv) analysis of pure metabolites in the soil with the characterization of their spatio-temporal dynamics and temperature effects; v) greenhouse experiment by monoculture of *C. distachya* on the selected plant species.
The obtained results evidenced that *C. distachya* metabolome is characterized by a wide spectrum of chemodiversity with different metabolic patterns in leaves and roots. The RP-HPLC analysis of soil community revealed that most of these compounds were released in the environment. Bioassay on the coexisting species and two common weeds highlighted a different behaviour with constantly toxic effects on these two latter.

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