
Isoprene emissions under climate change, future impact on allelopathy

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Abstract

Isoprene represents the major fraction of Biogenic Volatile Organic Compounds (BVOC) emitted by *Quercus pubescens*. This compound is highly useful to *Quercus pubescens* since it can maintain the stability of thylakoid membranes in plants. In the same way, isoprene could also be useful to non-emitter species which could benefit from isoprene advantages without production costs, especially when drought occurs. However, impacts of water deficit on isoprene emissions are not well understood yet. Indeed, isoprene emissions can increase, decrease or remain unchanged according to the stress severity and the studied species. There is also a lack of knowledge on isoprene modifications across recurrent drought that is, a water deficit period that occurs during few years.

In this study, we evaluated the impact of a recurrent water deficit on isoprene emissions of *Quercus pubescens*, a species that is well widespread in the Mediterranean region and the possible implications of isoprene on the ecosystem through allelopathic processes.

For this purpose, isoprene emissions were measured after 3-4 years of recurrent drought, with a PTR-ToF-MS on the experimental site O3HP in Southern France. This site is equipped with a rain exclusion device which allows to reduce by 30% the annual rain according to the most severe scenario of climate change.

We showed that isoprene emissions were reduced with recurrent drought which can be negative for the whole ecosystem. Indeed, it seems that isoprene emissions from *Q. pubescens* can enhance physiological performances of *Acer monspessulanum*, a non-emitter species, under

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moderate water deficit. Hence, if recurrent drought expected with climate change limits isoprene released into the atmosphere, non or low-emitter species could in turn be impacted but this hypothesis needs further research.

Keywords: isoprene emissions, recurrent drought, physiological performance, allelopathy