Thresholds above which the oxidative potential of the tropospheric ozone ($O_3$) affects biotic interactions have been neglected in most studies and in the European Directive (2008/50/EC) of 14 April 2008.
**EFFECT OF OZONE POLLUTION ON THE CHEMICAL SIGNAL EMITTED BY A MEDITERRANEAN TREE TO ATTRACT ITS SPECIFIC POLLINATOR**

C. Dubuisson, E. Ormeño-Lafuente, B. Lapeyre, B. Buatois, M. Staudt, B. Temime-Roussel, L. Della-Puppa, M. Hossaert-McKey, H. Wortham, M. Proffit

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**Context**

**Objectives & Study system**

**Methods**

**Results Part I**

**Results Part II**

**Conclusion & Perspectives**

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**What is the impact of O₃ pollution on a plant-pollinator interaction?**

We expect that tropospheric O₃ affects each step of the plant-pollinator chemical communication:

\[ \text{Signal emission by the plant} \xrightarrow{\text{Chemical signal in the atmosphere}} \text{Attraction of the pollinator} \]

**Study system**: The Mediterranean fig tree *Ficus carica* and its obligatory and specific pollinator

*Ficus carica*

*Blastophaga psehes*

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*Oviposition site*
**Impact of O₃ on the VOCs emission by the plant**

Exposure of **pairs of fig trees to 0 and 200 ppb of O₃** during 5h to simulate a quite realistic pollution peak (On summer 2003 at Marseille an [O₃] concentration of 208 ppb was measured)

**VOCs collections** were conducted in the two chambers at different times: t₀ (Before the exposure), t₁ (3h of exposure), t₂ (5h of exposure) and t₃ (30min after shutting down the exposure) and analysed by Gas Chromatography Mass Spectrometry (GC-MS)

Measurement of the plant response to the oxidative stress by **comparing the stomatal conductance before and after O₃ exposure**
Impact of O₃ on the lifetime of VOCs emission in the atmosphere

Proton Transfer Reaction-time of flight-Mass Spectrometer (PTR-tof-MS) recordings of VOCs isolated in a reaction chamber and exposed to “control/O₃” phases

Comparisons of VOCs concentrations with and without O₃ in the reaction chamber in real time.

Identification of VOCs formed by the reaction between VOCs and different concentrations of O₃
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Impact of O\(_3\) on the fig tree physiology

Plant response to a high concentration of O\(_3\) = stomatal closure

\[ \text{Im(stomatal conductance } \sim \text{ treatment } \times \text{ time)} \]

- ** P < 0.01

Impact of O\(_3\) on the fig tree VOCs emission

During O\(_3\) exposure \(\Rightarrow\) Concentrations of some VOCs vary and some new VOCs are formed.

When there is no longer O\(_3\) in the chamber (t3) \(\Rightarrow\) emissions are still different from “control” emissions and from “ozone t1” and “ozone t2” emissions.

**O\(_3\) affects:**

- \(\Rightarrow\) the plant’s physiology by inducing stomatal closure
- \(\Rightarrow\) the plant by a change in its VOCs emission
- \(\Rightarrow\) identity and quantity of fig tree VOCs by the reaction with O\(_3\) provoking the alteration of the chemical signal
During O₃ exposure \( \rightarrow \) Concentrations of the VOCs responsible for pollinator attraction follow different patterns and we know that the attraction of the pollinator is inhibited when the proportions of these compounds are modified (Proffit et al., 2020).

**Impact of O₃ on the VOCs responsible for pollinator attraction**

**Impact of O₃ on the VOCs plume**

**Context**

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**Conclusion & Perspectives**

Under high \([O₃] \rightarrow \) formation-degradation of VOCs

New VOCs that are in part products of reactions of linalool with O₃ (Atkinson & Arey, 2003) \( \rightarrow \) Lavender lactone, methylglyoxal, formic acid, acetone and formaldehyde

These results indicate that:

- The VOCs emitted by fig trees react differently with O₃ in the atmosphere
- As a consequence proportions of VOCs change dramatically
We want to couple Y olfactometer tests on *Blastophaga psenes* and O₃ exposures of fig trees to evaluate the pollinator behavior when the plants are exposed to O₃, changing the proportions of the VOCs

We want to perform Gas Chromatography coupled with Electroantennography Detection on *B. psenes* antenna to determine which of the new VOCs formed with O₃ the pollinator can detect

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