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# STRUCTURAL AND FUNCTIONAL TRAITS OF THE BASIDIOMYCETE *TRAMETES VERSICOLOR* ARE BIOMARKERS FOR THE ASSESSEMENT OF SOIL ECOTOXICITY ?

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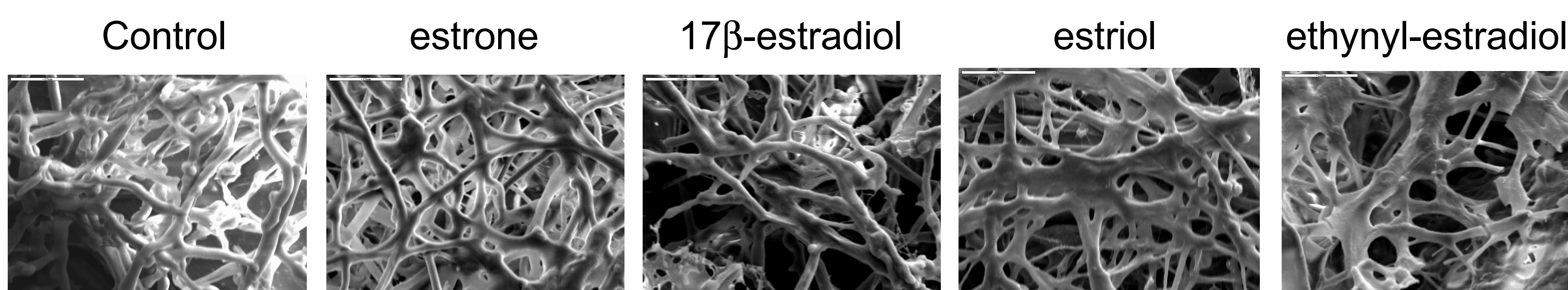
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## Rationale / objectives

- Fungi constitute one of the largest biomass in the soil, and are responsible of key environmental functions.
- As a consequence, they may be pertinent indicators for soil ecotoxicity assessment.
- Our objectives are i) to understand the physiological basis of structural and functional disturbances of these organisms after exposure to pollutants, ii) to develop fungal-based tools for soil ecotoxicity assessment.

## Pollutants alter the morphology of fungal hyphae

The effects on fungal morphology were assessed by treating pure cultures of *T. versicolor* with estradiol, estrone, estriol and ethynyl-estradiol. Each hormone was provided at 0.01 mM in the culture medium. The effects were assessed by SEM after 4 days of exposure.

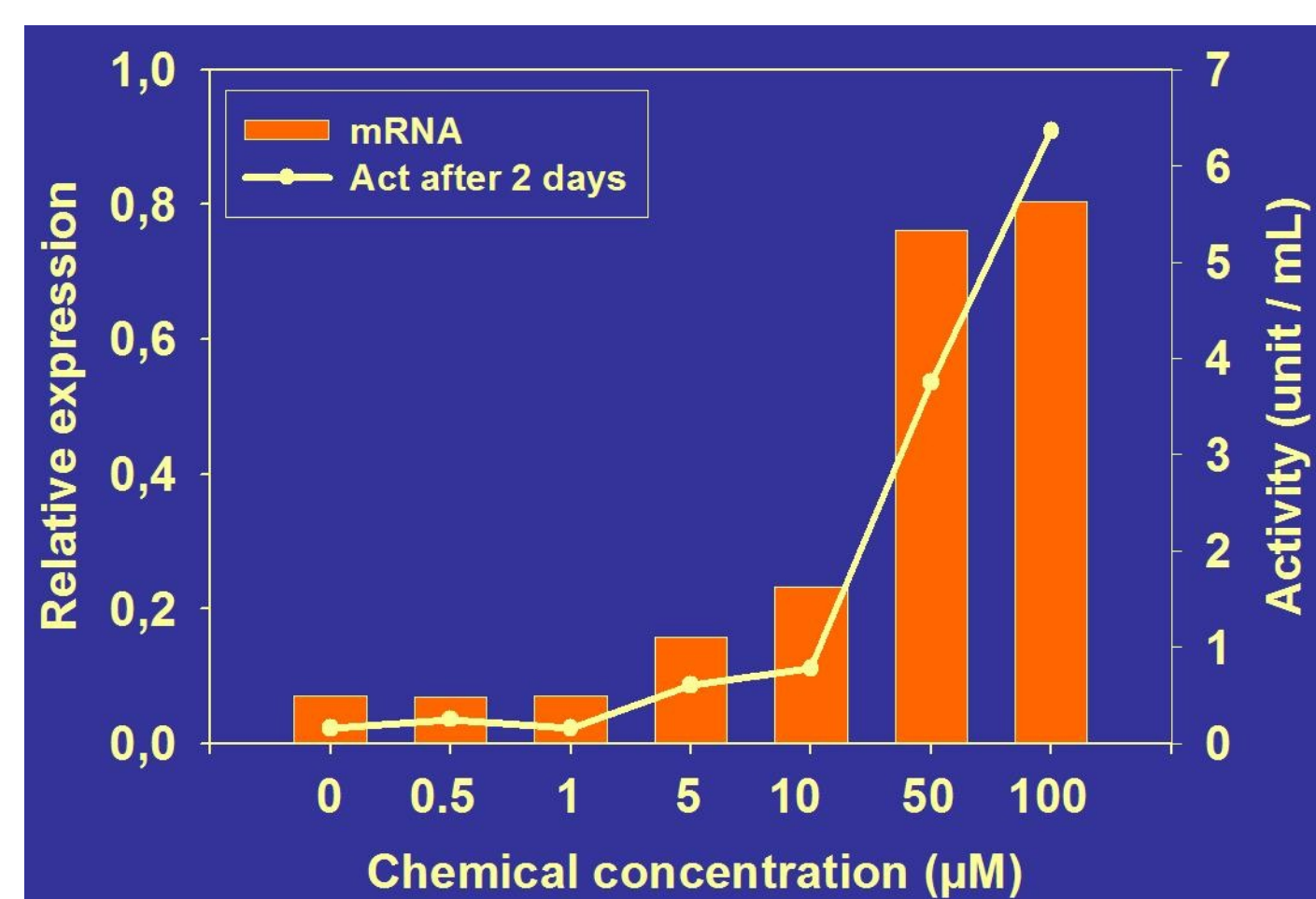
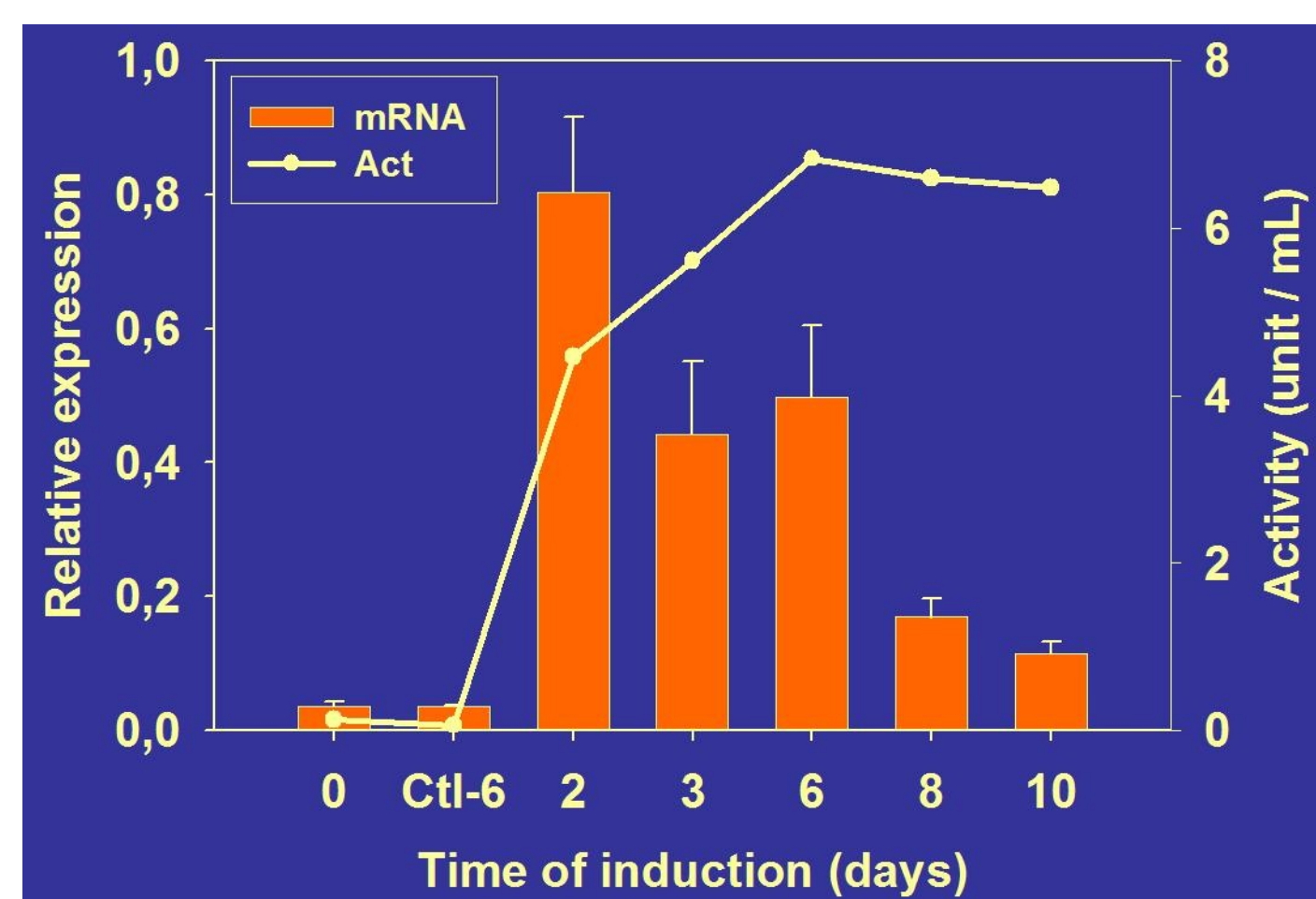


► Different morphological alterations arise from fungal exposure to estrogens, even at lower concentrations (10<sup>-6</sup> mM). Ethynyl-estradiol induces an unusual hyphae morphology. 17β-estradiol seems the less active compound, because of its rapid biotransformation by the fungus.

- Other effects have been previously noticed after exposure to heavy metals, including hyphae shrinkage, reduced index of ramification and roughness.
- Image analysis will be used to quantify these morphological alterations, and establish a typology by family of pollutants.

## Pollutants have effects at the transcriptomic level

The effects of pollutants on mRNA production were assessed by treating pure cultures of *T. versicolor* with 2,5-dimethylaniline. After different durations of exposure, mRNAs encoding laccase of type A were extracted and quantified by Q-PCR. In parallel, enzymatic activity was measured using ABTS as a substrate.



► Fungal expose to 2,5-dimethylaniline results in a time-dependent and dose-dependant synthesis of mRNA encoding the laccase. That induction well corresponds to an increase of enzymatic activity.

► Similar effects are observed with environnemental pollutants such as herbicides and endocrine disrupters.

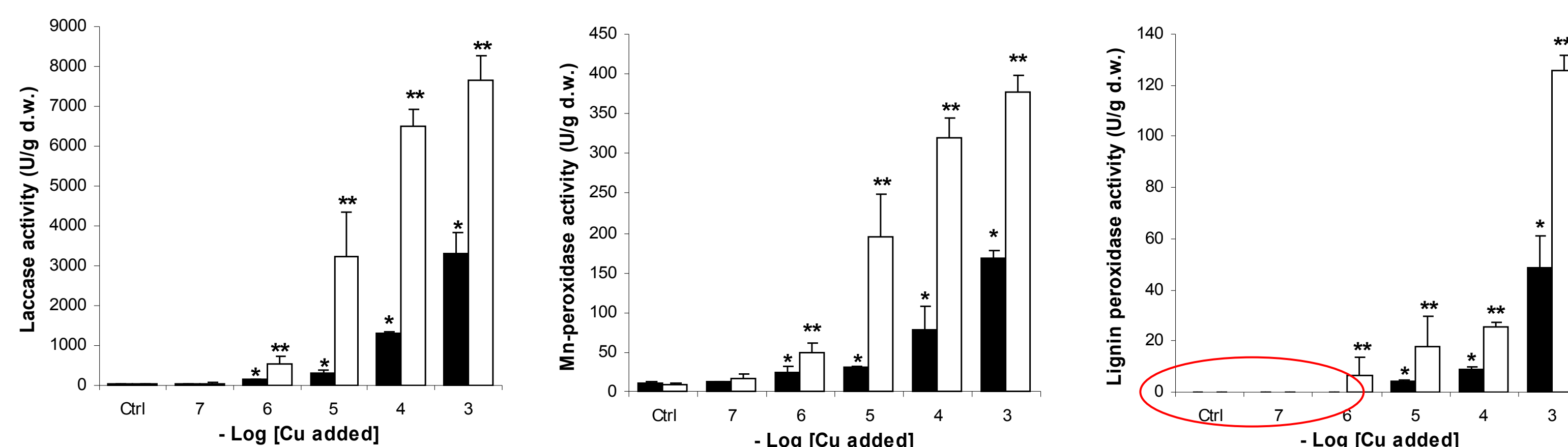
## Pollutants modify the activity of oxidases

The effects of pollutants on the activity of the oxidases secreted by *T. versicolor* were assessed by treating pure cultures with copper in media exhibiting moderate (black bars) or low (white bars) metal complexing properties. After 7 days of exposure, activities of secreted enzymes were measured using UV-Vis spectrophotometry.

► Laccase and Mn-peroxidase are constitutive enzymes in *T. versicolor*. Their activity is increased after expose to Cu, with a dose-response relationship. An low complexing medium, allowing a high metal bioavailability, increases the sensitivity of the response.

► Lignin peroxidase is not constitutive in *T. versicolor*. It is specifically expressed in the presence of copper.

► Similar effects have been previously observed on laccase activity with other environmental pollutants such as herbicides, endocrine disrupters, and heavy metals.



## Conclusions

- In pure cultures, structural and functional traits of *T. versicolor* are affected by fungal exposure to environmental pollutants.
- Additional studies are needed to assess the sensitivity and selectivity of the responses.
- Methodologies have to be developed to perform studies in soils.

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