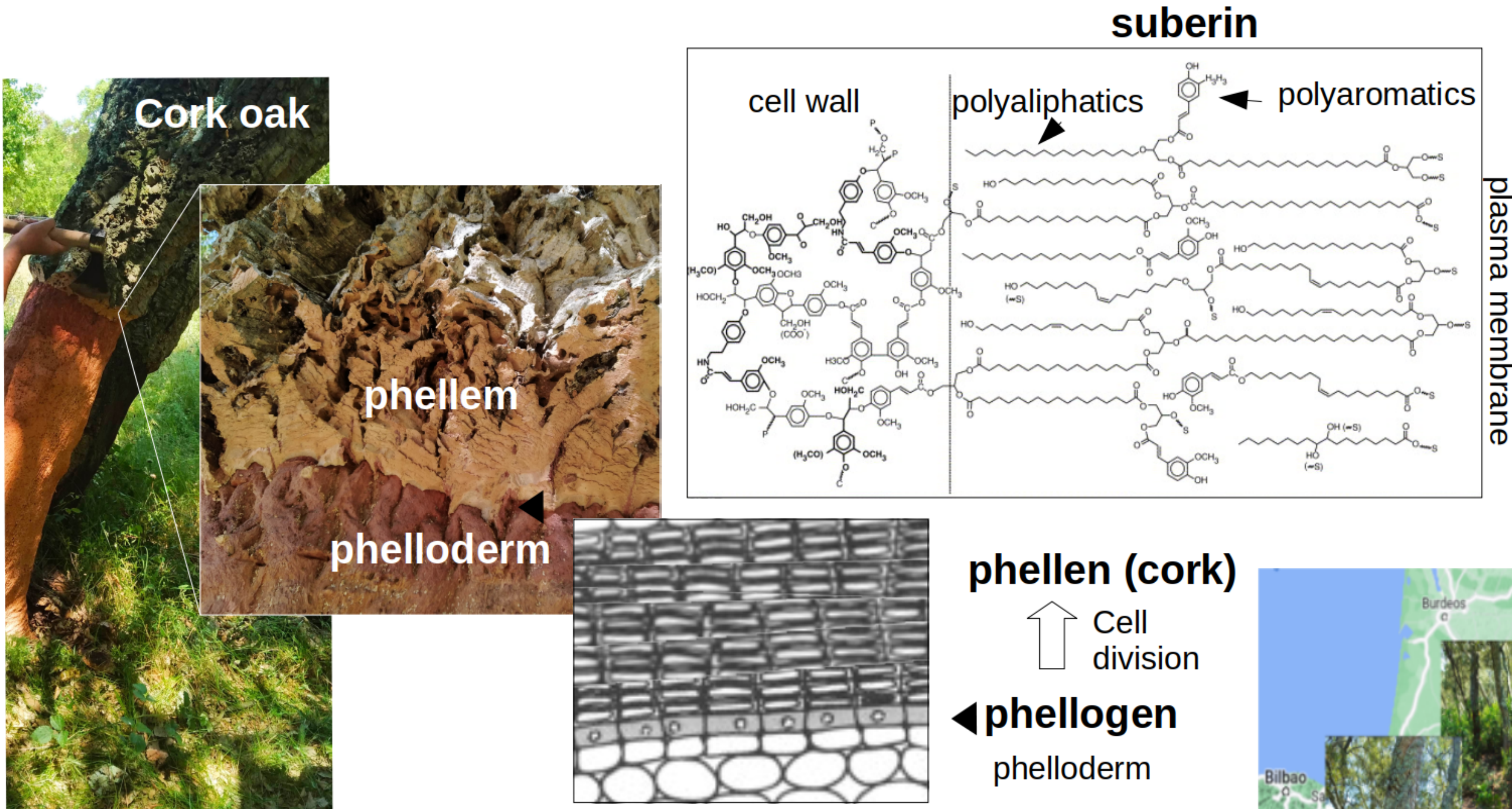


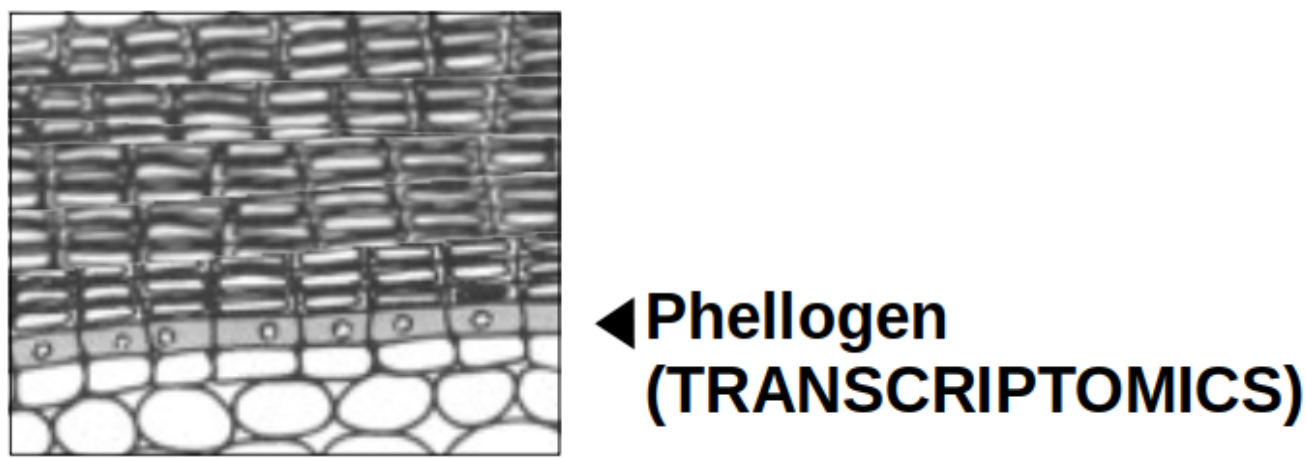
MULTI-OMICS ANALYSIS AND METABOLIC NETWORK CONSTRUCTION IN SUBERINIZATION OF CORK OAK

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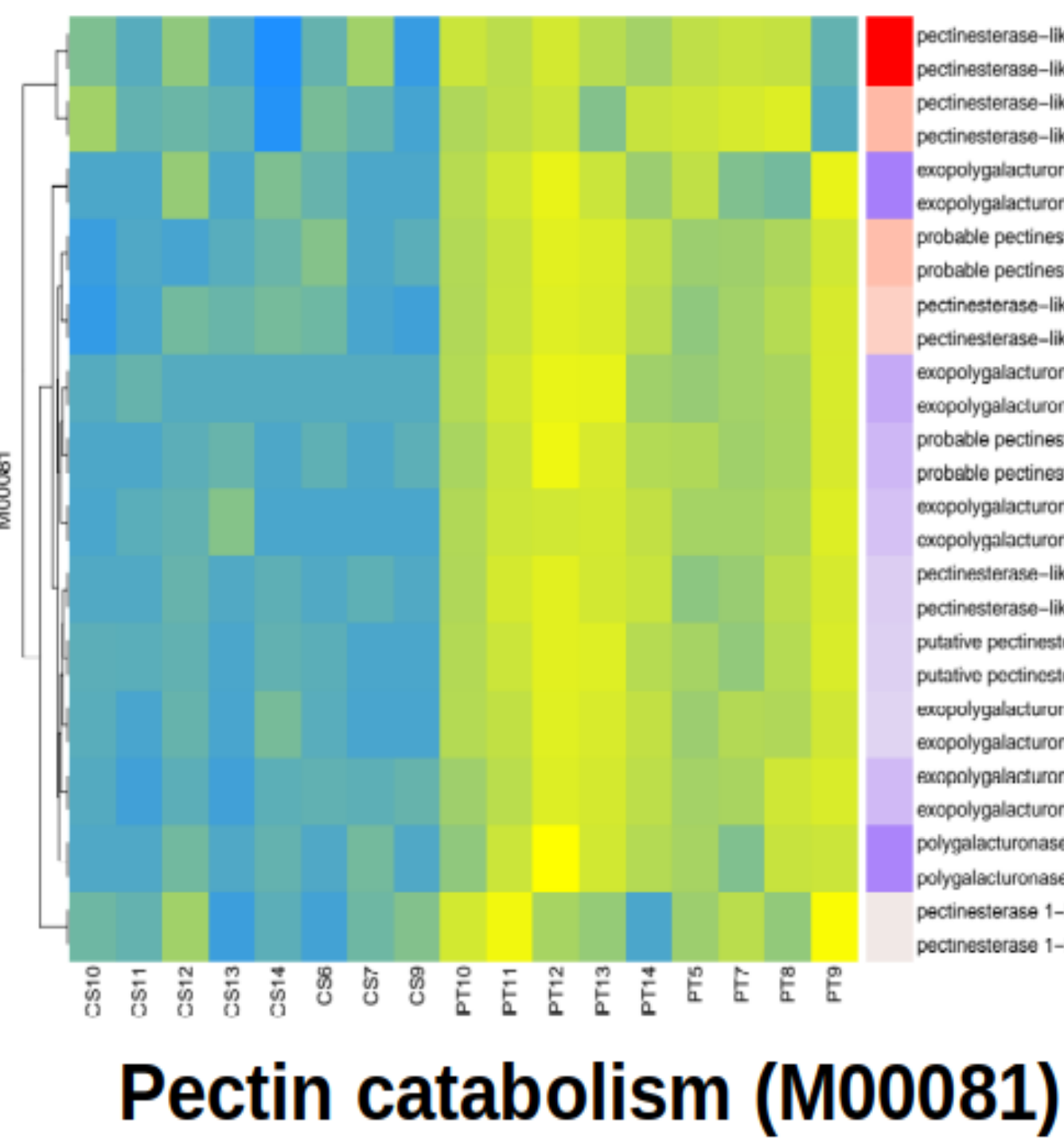


Suberin is a specialized polymer present in the cell wall of dermal tissues growing above and below ground, which provides a hydrophobic layer to prevent water loss and pathogen infection. Wounding experiments in potato tubers and waterlogging in Arabidopsis roots have been largely used as a model system to study suberin deposition. However, the periderm of cork oak presents an specific composition and structure that represents an opportunity to advance further in the knowledge on this polymer.

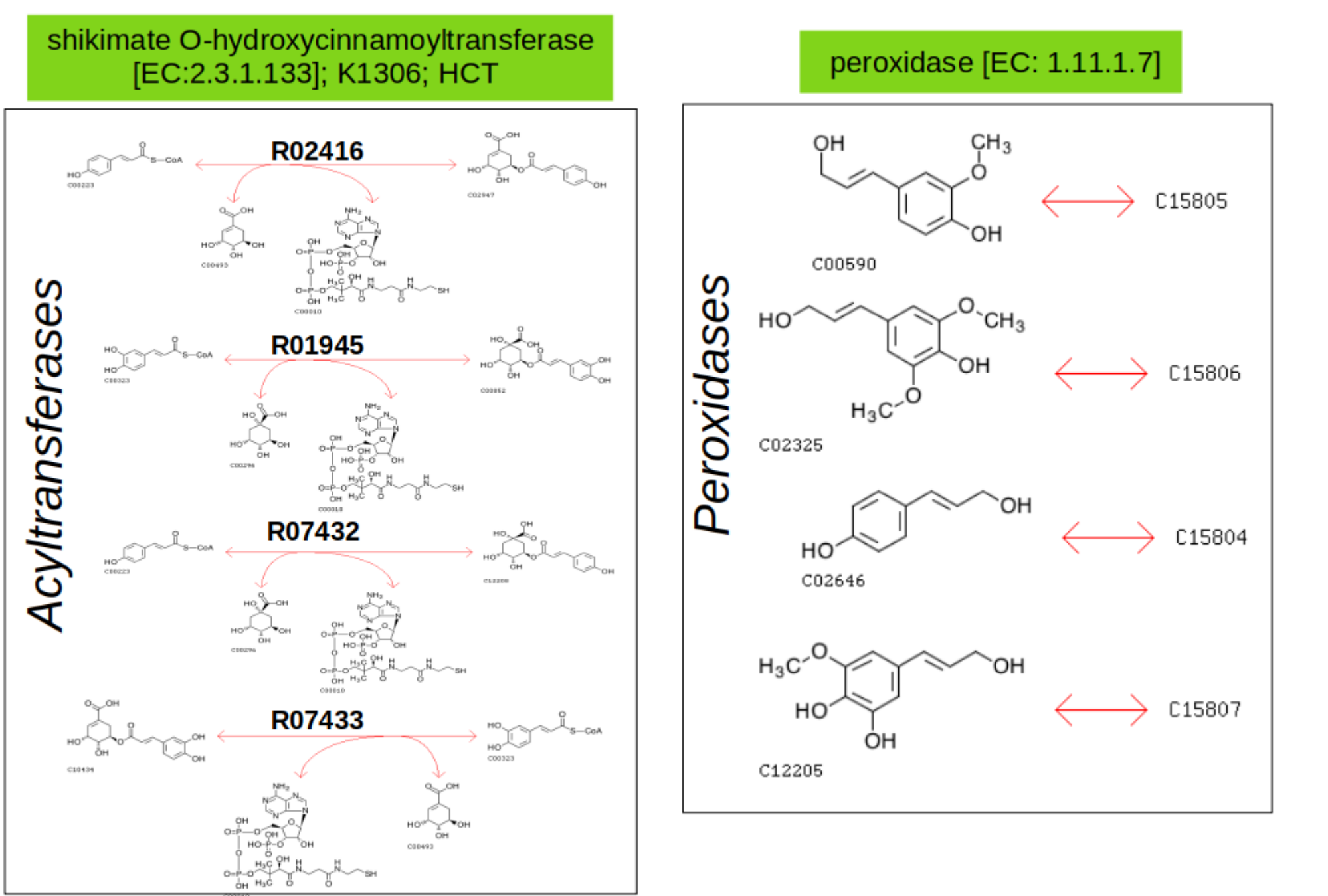
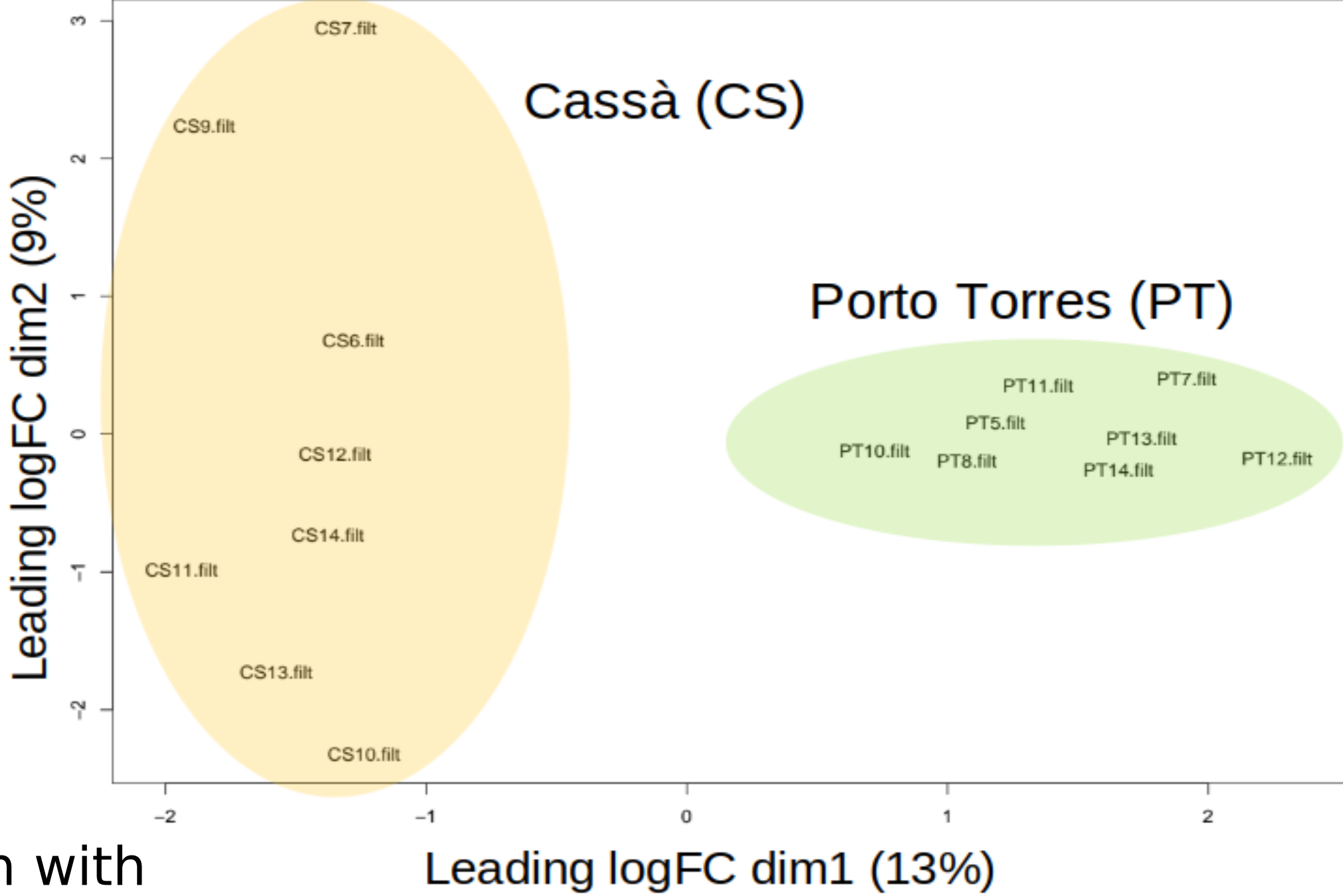
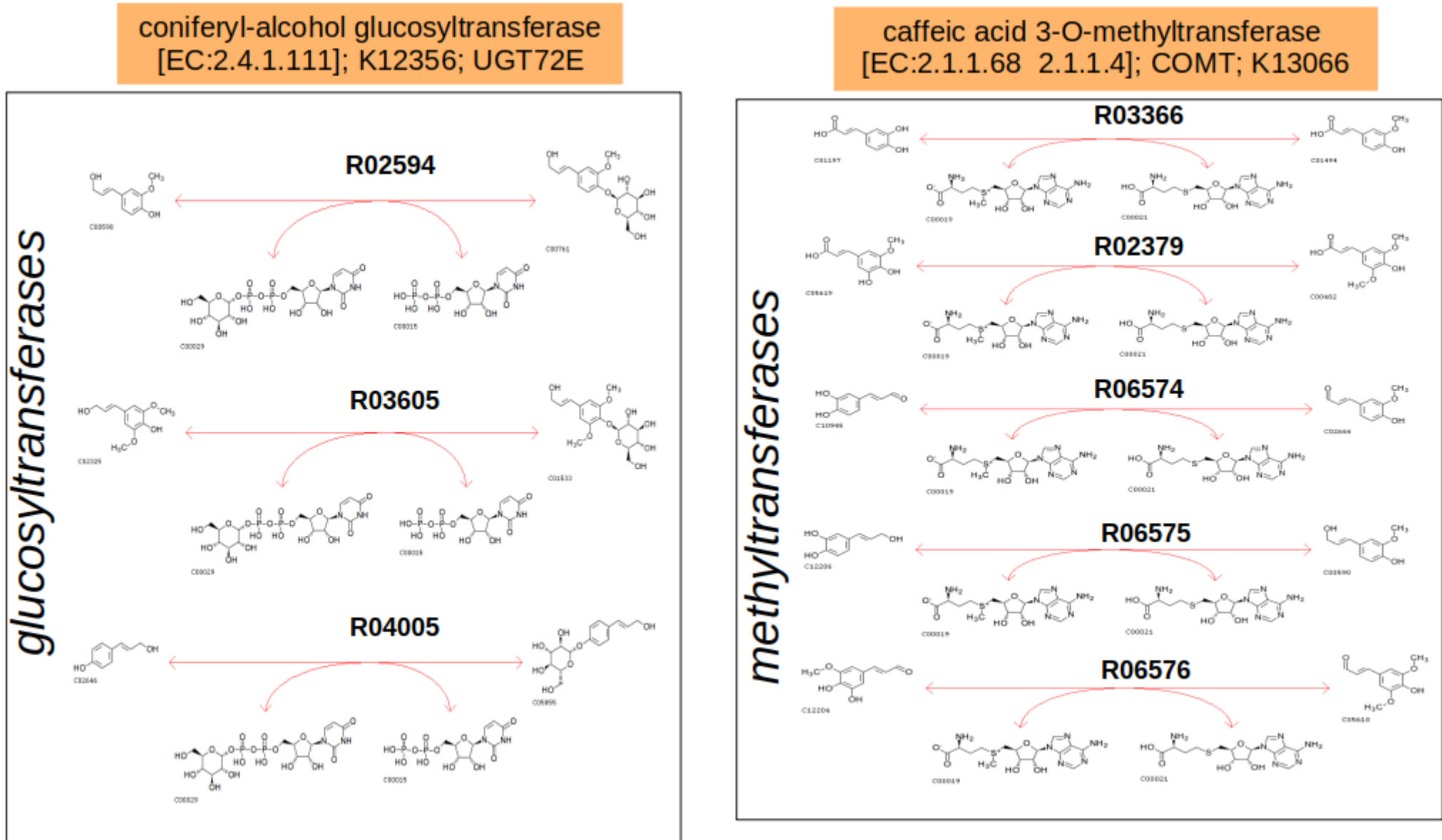
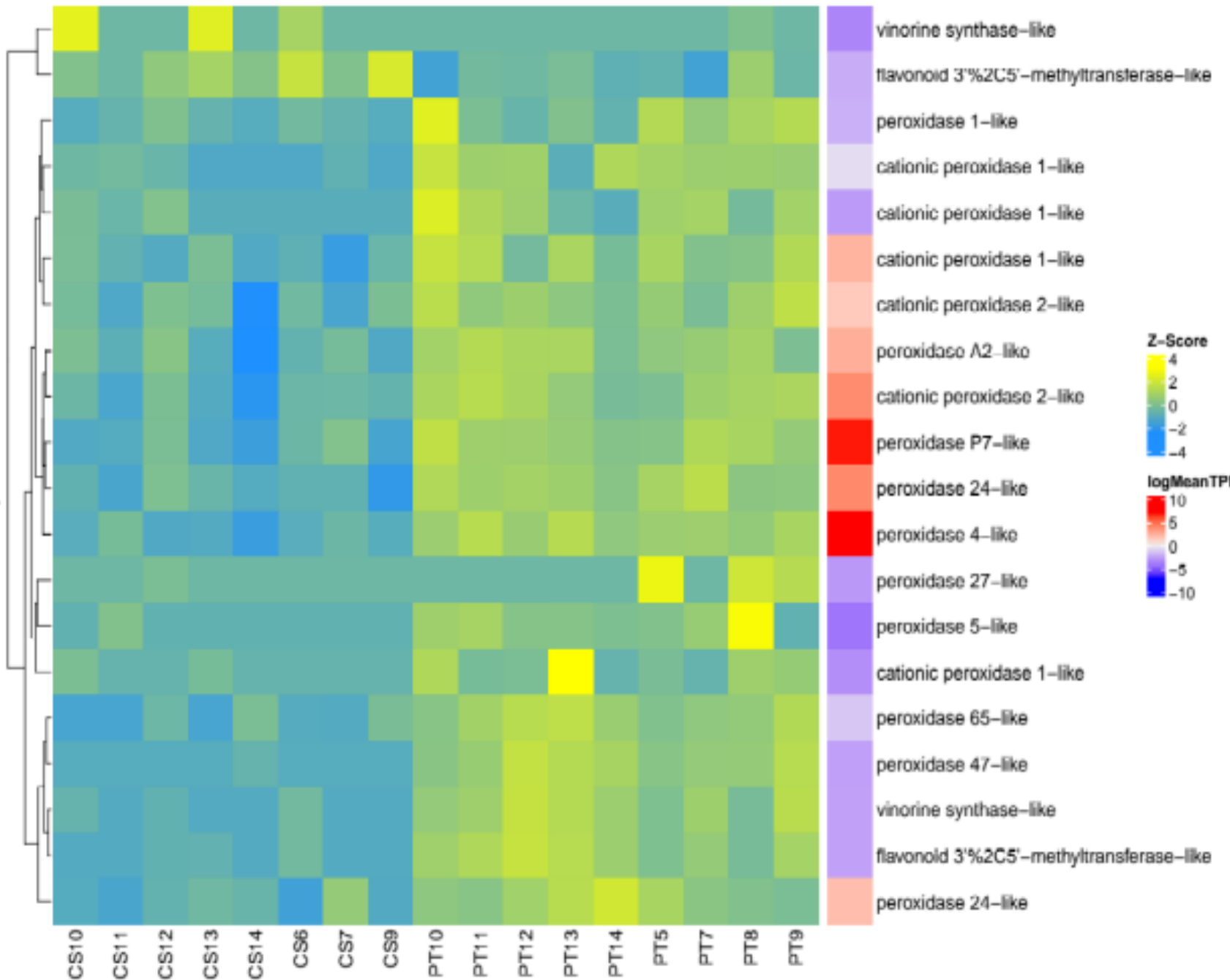
The main aim of this study is to investigate the **metabolic networks involved in Quercus suber** suberinization with particular emphasis on the phenylpropanoid biosynthesis by combining multi-omics data analysis with metabolic network construction methods to predict novel reactions and interactions. For this purpose, two groups of trees from Italy and Spain were investigated because of their different mechanical and quality cork properties.



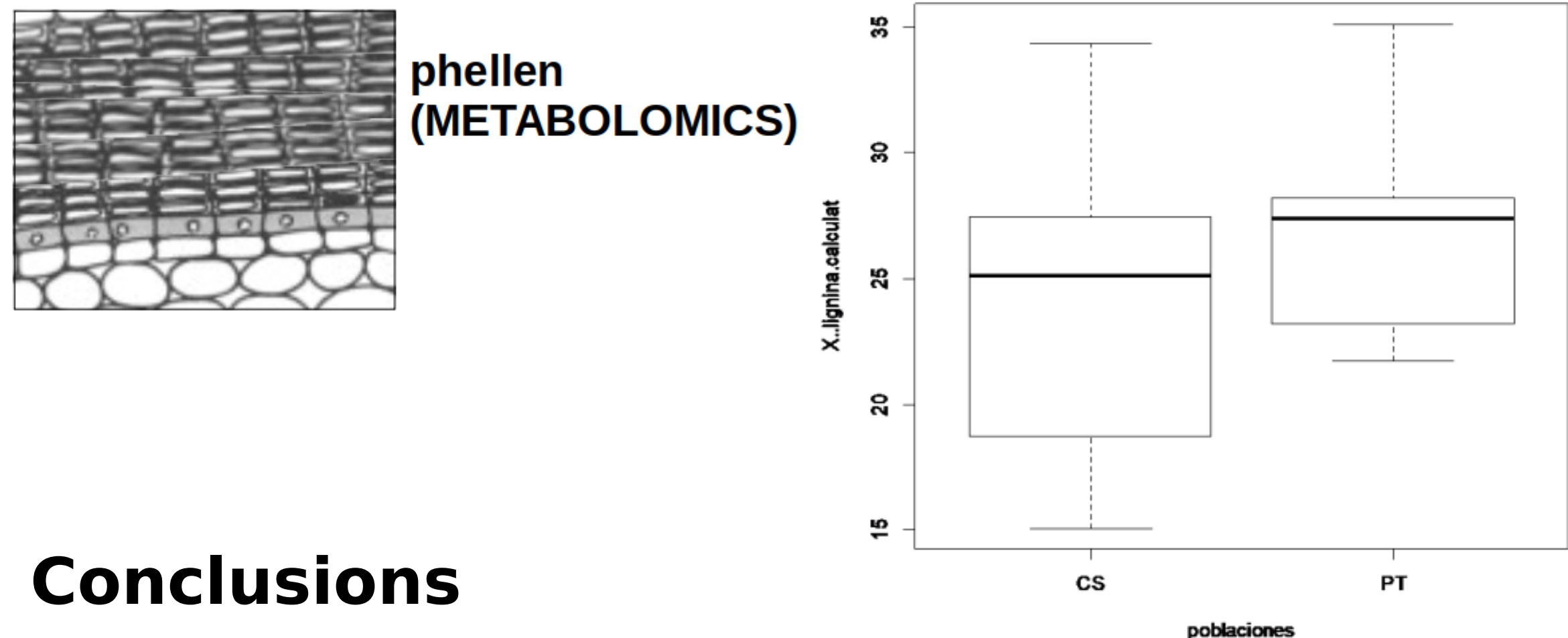
RNA extracted from the phellogen tissue was sequenced individually by Illumina system. Principal component analysis indicated differences between both populations (CS and PT). Pathway enrichment analysis based on KEGG database showed significant differences in pectin catabolism module (MM00081) and **phenylpropanoid biosynthesis** (00940). Four principal enzyme reactions were enriched in the dataset: peroxidases and acyltransferases in CS, and, glucosyltransferases and methyltransferases (COMT-like) in PT samples.



Phenylpropanoid biosynthesis (00940)



Two groups of responsive-genes showed correlation with CS and PT samples, being **auxin**-responsive DEGs more present in PT and **ethylene**-responsive DEGs in CS.



Conclusions

This research will expand the understanding of the cork oak biology in some aspects such as the participation of cell wall peroxidases and esterases in the assembly of the suberin polymer, or the role of phytohormones in its regulation. In addition, the genetic variation described in this work may contribute to breeding and conservation programs for these species, for instance, in responding to drought-stressed conditions.

Suberin was extracted from the corresponding cork tissue and levels showed a significant increase in PT population. Extracts are now being evaluated separately in order to discriminate the polyaromatic or polyaliphatic fraction. Individual compounds of these fractions are being identified by GC-MS analysis. After that, matching identities between metabolites and transcripts will be used to model the suberin pathway in Q. suber.

