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***Vitis* OneGenE: a causality-based method for gene network analysis in grapevine. Characterization of the laccase and dirigent protein gene families**

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The availability of transcriptomic data organized in coherent databases and the development of causal inference methods have paved the way to gene network analysis in grapevine. The identification and visualization of gene-gene interactions as networks can be supportive to several aims, such as the identification of hub genes or modules, the prediction of gene function, the integration of different -omics data and the comparison of the found networks across species. OneGenE, an *in-house* developed causality-based data mining tool, has been applied to the *Vitis Vespucci* dataset to produce a list of directly interacting genes, for each gene of the grapevine genome. Due to the computational power requirement of the OneGenE algorithm, it has been run as part of the gene@home project, a distributed computation project relying on thousands of volunteers' computers by means of the TN-Grid, an infrastructure based on BOINC system. Finally, bioinformatics tools have been built *in-house* to reconstruct association gene networks using OneGenE generated lists. All this information and analysis tools are now available to the community through the website vitis.onegenexp.eu. Here, we present the integration between OneGenE approach and a phylogenetic analysis to *in silico* characterize the two gene families of laccases and dirigent proteins. These enzymes are considered to be involved in the final steps of lignin biosynthesis, but we found that in grapevine a diverging group of them seemed rather related to the biosynthesis of oligomeric stilbenoids, important plant phytoalexins with antifungal properties. Co-expression analyses performed in dedicated datasets supported this hypothesis. Although experimental validation is undoubtedly required to confirm these findings, they represent an interesting example of how the causality-based OneGenE approach can drive knowledge discovery in grapevine.

Keywords: OneGenE, gene network, laccase, dirigent protein, causal inference, stilbenoids, co-expression analysis