

# *Eucalyptus grandis* Anomaly Related to Expression of Defense Genes

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In collaboration with the Suzano Papel and Celulose SA company, we identified an anomaly derived from a full-sib population in a controlled cross between two *Eucalyptus grandis* individuals. Abnormal seedlings died in a few months and showed significant phenotypic differences ( $P < 0.05$ ), including seedling height, seedling stem-base diameter, and individual leaf area, compared with normal seedlings. Previous genetic analysis of the full-sib progeny showed a Mendelian segregation of 3 (normal): 1 (abnormal) ( $\chi^2 = 2.32$ ,  $P > 0.1$ ), suggesting that the lethality phenotype is controlled by a recessive allele (Tambarussi 2006). To identify the genes associated with the anomaly detected, we compared the transcriptional profiles of leaf, stem, and root tissue of normal and abnormal plants by RNA-seq technology. RNA-seq analysis showed the most differentially expressed genes were upregulated in the anomalous plants in all tissues analyzed. Most of these upregulated genes belong to functional groups of defense response and metabolism. Functional and metabolic analysis also demonstrated gene ontology and pathways involved in defense response upregulated in the abnormal plants.

Our results suggest that this lethality is associated with inappropriate activation of the immune system, similar to the phenomenon of hybrid necrosis. Hybrid

necrosis is a deleterious genetic incompatibility often associated with negative epistatic interactions (Bateson-Dobzhansky-Muller model) or single-locus incompatibility. Due to some characteristics such as rapid nucleotide sequence evolution and high copy number, response genes have a predisposition to cause genetic incompatibility. Therefore, three gene families differentially expressed (thaumatin, Bet v1, and chitinase class I) were considered as candidates for causing the negative interactions. Research is underway to identify the locus by using high-resolution mapping with the molecular markers derived from the candidate families of which the genes are differentially expressed between normal and lethality plants.

## REFERENCE

Tambarussi, E.V. 2006. Associação de marcador RAPD e desenvolvimento de marcador SCAR para um tipo de anomalia de viveiro em *Eucalyptus grandis* [course conclusion paper] Botucatu: Faculdade de Ciências Agrônomicas, Universidade Estadual Paulista “Júlio de Mesquita Filho”.

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