

# DOTTORATO DI RICERCA IN BIOLOGIA CELLULARE E DELLO SVILUPPO

**38 CYCLE**

## Project proposal for a Sapienza PhD scholarship

### Main research line

**Title:** Molecular and genetic basis of the priming of defense responses in *Arabidopsis thaliana*.

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### Summary

Priming is an adaptive immune response triggered by exposure to biotic elicitors, molecules derived from microorganisms or from plant tissues during infections, that leads to a faster and stronger defense response against pathogens. The goal of this research is the characterization of the molecular mechanisms that regulate this elicitor-induced resistance. Genes differentially regulated during fungal infection in plants pre-treated with water or elicitors will be selected based on available transcriptomic data, and their role in basic immunity and in the regulation of elicitor-induced resistance will be evaluated by reverse genetics. Changes in the levels of hormones and defense-related compounds in WT and mutant plants after elicitation, both in the absence and in the presence of pathogens, will be determined to correlate them with induced resistance. Preliminary data suggest that elicitor-induced resistance is associated with epigenetic modifications in key defense-related genes. This hypothesis will be investigated by analyzing the methylation status of DNA and post-translational modifications of the histones associated to these genes. In addition, the impact of the treatment with elicitors on the fitness of the plant will be studied. The obtained results will provide knowledge essential to implement the use of elicitors in agriculture and useful tools to increase the natural resistance of crops to disease, reducing the need for pesticides.

### Pertinent Publications of the proponent (last 5 years)

- Giovannoni M, Lironi D, Marti L, Paparella C, Vecchi V, Gust AA, De Lorenzo G, Nürnberger T, **Ferrari S.** (2021) "The *Arabidopsis thaliana* LysM-containing Receptor-Like Kinase 2 is required for elicitor-induced resistance to pathogens". *Plant Cell & Environment* 44(12):3545-3562. doi: 10.1111/pce.14192.
- Lorrai R, Francocci F, Gully K, Martens HJ, De Lorenzo G, Nawrath C, **Ferrari S** (2021) "Impaired cuticle functionality and robust resistance to *Botrytis cinerea* in *Arabidopsis thaliana* plants with altered homogalacturonan integrity are dependent on the class III peroxidase AtPRX71" *Frontiers in Plant Science* 12:696955. <https://doi.org/10.3389/fpls.2021.704958>
- Giovannoni M., Marti L., **Ferrari S**, Tanaka-Takada N. Maeshima M., Ott T., De Lorenzo G., Mattei MB, (2021) "The plasma membrane-associated Ca<sup>2+</sup>- binding protein PCaP1 is required for oligogalacturonide and flagellin-induced priming and immunity" *Plant Cell & Environment* 44(9):3078-3093. doi: 10.1111/pce.14118.

- Lorrai R, **Ferrari S** (2021) "Host Cell Wall Damage during Pathogen Infection: Mechanisms of Perception and Role in Plant-Pathogen Interactions" *Plants* 2021, 10(2), 399; <https://doi.org/10.3390/plants10020399>
- Wang P, Zhou L, Jamieson P, Zhang L, Zhao Z, Babilonia K, Shao W, Wu L, Mustafa R, Amin I, Diomaiuti A, Pontiggia D, **Ferrari S**, Hou Y, He P, Shan L (2020) "Cotton wall-associated kinase GhWAK7A mediates responses to fungal wilt pathogens by complexing with the chitin sensory receptors" *Plant Cell* DOI: <https://doi.org/10.1105/tpc.19.00950>.
- Wu J., Reca IB, Spinelli F, Lironi L, De Lorenzo G, Poltronieri P, Cervone F, Joosten MHAJ, **Ferrari S**<sup>§</sup>, Brutus A (2019) "An EFR-Cf-9 chimera confers enhanced resistance to bacterial pathogens by SOBIR1- and BAK1-dependent recognition of elf18." *Mol Plant Pathol.* 20(6):751-764. doi: 10.1111/mpp.12789
- De Lorenzo G, **Ferrari S**, Giovannoni M, Mattei B, Cervone F (2019) "[Cell wall traits that influence plant development, immunity and bioconversion](#)". *Plant J*, 97(1):134-147 doi: 10.1111/tpj.14196.
- De Lorenzo G, **Ferrari S**, Cervone F, Okun E (2018) "Extracellular DAMPs in Plants and Mammals: Immunity, Tissue Damage and Repair". *Trends Immunol.* 39(11):937-950. doi: 10.1016/j.it.2018.09.006.

**References (other than publications of the proponent, if appropriate)**