**DOTTORATO DI RICERCA IN BIOLOGIA CELLULARE E DELLO SVILUPPO**

**39th CYCLE**

**Project proposal for a Sapienza PhD scholarship**

**PNRR ex-DM118 research line**

**Title: Plant tissue damage: signalling gunshots and waves for immunity**

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**Summary**

Plant signals (Damage-Associated Molecular Patterns or DAMPs) released upon tissue injury activate immunity and establish a state of protection in the plant against pathogens also at distal sites, through an uncharacterized long-distance signal propagation. Protection is due to a primed state that allows to respond to stress stimuli more promptly. By monitoring typical readouts, we will study the interplay among oligosaccharide DAMPs derived from different components of plant cell wall (CW), and the complex network leading to CW DAMP-induced priming at distal sites, as well as the role of enzymes, all capable of forming apoplastic biologically active H2O2 [the NADPH oxidase RBOHD, the copper amine oxidase CuAOβand the CW oligosaccharide-oxidizing BBE-l enzymes]. This project addresses frontline aspectsin plant biology and will generate knowledge essential for translation and crop protection strategies, relevant to the green transition actions.

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

1. *Pontiggia, D.* \**,*Giulietti, S.\*, Gramegna.\*, Lionetti, V., Lorrai, R., Marti, L, Ferrari, S., De Lorenzo, G., & Cervone, F. **(in press).** The Ancient Battle Between Plants and Pathogens: Resilience of the Plant Cell Wall and Damage-Associated Molecular Patterns (DAMPs) Drive Plant Immunity In: Geitmann A (ed) Plant Cell Walls – Research Milestones and Conceptual Insights. CRC Press, Taylor & Francis Group
2. *Pontiggia, D.* \**,* Benedetti, M.\*, Costantini, S.\*, De Lorenzo, G., & Cervone, F. **(2020)** Dampening the DAMPs: How Plants Maintain the Homeostasis of Cell Wall Molecular Patterns and Avoid Hyper-Immunity. **Frontiers in Plant Science,***11*. Doi: 10.3389/fpls.2020.613259
3. 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).**The Cotton Wall-associated Kinase GhWAK7A Mediates Responses to Fungal Wilt Pathogens by Complexing with the Chitin Sensory Receptors.**The Plant Cell**. *32*(12), 3978-4001 Doi: 10.1105/tpc.19.00950.
4. Del Corpo D, Fullone MR, Miele R, Lafond M, *Pontiggia D*,Grisel S, Kieffer‐Jaquinod S, Giardina T, Bellincampi D, Lionetti V. **(2020)*.***AtPME17 is a functional Arabidopsis thaliana pectin methylesterase regulated by its PRO region that triggers PME activity in the resistance to Botrytis cinerea*.* **Molecular Plant Pathology***.21*(12), 1620-1633Doi: 10.1111/mpp.13002
5. *Pontiggia D,,*Spinelli, F., Fabbri, C., Licursi, V., Negri, R., De Lorenzo, G., & Mattei, B. **(2019).**Changes in the microsomal proteome of tomato fruit during ripening. **Scientific Reports,** *9*(1), 1-18. Doi: 10.1038/s41598-019-50575-5
6. Locci F, Benedetti M, *Pontiggia D,,*Citterico M, Caprari C, Mattei B, Cervone F, De Lorenzo G. **(2019).**An Arabidopsis Berberine-Bridge Enzyme-Like Protein Specifically Oxidizes Cellulose Oligomers And Plays A Role In Immunity. **The Plant Journal,***98*(3), 540-554. Doi: 10.1111/Tpj.14237.
7. Benedetti M\*, Verrascina I\*, *Pontiggia D\*,* Locci F, Mattei B, De Lorenzo G, Cervone F. **(2018).**Four Arabidopsis berberine-bridge enzyme-like proteins are specific oxidases that inactivate the elicitor-active oligogalacturonides.**The Plant Journal** *94*(2), 260-273. Doi: 10.1111/tpj.13852.
8. Mravec, J., Kračun, S. K., Rydahl, M. G., Westereng, B., *Pontiggia, D.,*De Lorenzo, G., Domozych, D. S. and Willats, W. G. T. **(2017).**An oligogalacturonide-derived molecular probe demonstrates the dynamics of calcium-mediated pectin complexation in cell walls of tip-growing structures.**The Plant Journal**. *91*(3), 534-546.Doi:10.1111/tpj.13574

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**Barghahn S, Arnal G, Jain N, Petutschnig E, Brumer H, Lipka V** (2021) Mixed-linkage b-1,3/1,4-glucan oligosaccharides induce defense responses in *Hordeum vulgare* and *Arabidopsis thaliana*. Frontiers in Plant Science **12:** 682439

**Bigeard J, Colcombet J, Hirt H** (2015) Signaling mechanisms in pattern-triggered immunity (PTI). Molecular Plant **8:** 521-539

**Gamir J, Minchev Z, Berrio E, Garcia JM, De Lorenzo G, Pozo MJ** (2020) Roots drive oligogalacturonide-induced systemic immunity in tomato. Plant, Cell and Environment

**Johnson JM, Thurich J, Petutschnig EK, Altschmied L, Meichsner D, Sherameti I, Dindas J, Mrozinska A, Paetz C, Scholz SS, Furch ACU, Lipka V, Hedrich R, Schneider B, Svatos A, Oelmuller R** (2018) A Poly(A) ribonuclease controls the cellotriose-based interaction between *Piriformospora indica* and its host Arabidopsis. Plant Physiology **176:** 2496-2514

**Peng Y, van Wersch R, Zhang Y** (2018) Convergent and Divergent Signaling in PAMP-Triggered Immunity and Effector-Triggered Immunity. Molecular Plant Microbe Interactions

**Souza CA, Li S, Lin AZ, Boutrot F, Grossmann G, Zipfel C, Somerville SC** (2017) Cellulose-derived oligomers act as damage-associated molecular patterns and trigger defense-like responses. Plant Physiology **173:** 2383-2398

**Vega-Munoz I, Duran-Flores D, Fernandez-Fernandez AD, Heyman J, Ritter A, Stael S** (2020) Breaking bad news: dynamic molecular mechanisms of wound response in plants. Frontiers in Plant Science **11:** 610445

**Wu, Binyan, Fan Qi, and Yan Liang.** "Fuels for ROS signaling in plant immunity." *Trends in Plant Science* (2023).