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PhD in Biotechnology - 37th cycle

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Prosystemin novel peptides: their role in shaping tomato defenses and leaf microbial community

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Signalling peptides are key regulators of several physiological events in plants, including defense. Among them, many have been defined as plant resistance activators or elicitors, termed damage-associated molecular patterns (DAMPs), released upon insect pest or pathogen attack, triggering an amplification of defense responses (Conrath *et al.*, 2015). Tomato Systemin (Sys) is one of the best characterized signalling peptides described in plants. This 18-amino acid peptide hormone is released from the C-terminal end of a larger precursor protein of 200 amino acids called ProSystemin (ProSys) (Pearce *et al.*, 1991). Tomato ProSys gene is structured into 11 exons, of which the last one codes for Sys and the first ten are organized in five repeated couples and code for repeated peptide sequences never found *in vivo*. Although Sys is traditionally considered as the main actor of resistance, triggering multiple defense pathways in response to a wide range of biotic/abiotic stress agents, recent findings suggests that ProSys could be more than a simple precursor of Sys peptide (Corrado *et al.,* 2016; Molisso *et al.,* 2021). Indeed, ProSys truncated form lacking Sys coding region, can trigger tomato defenses in multiple stress events. We assume that ProSys could be a reservoir of other peptide sequences able to activate multiple stress-related pathways, like other precursor of defense peptides such as *Hydoxyprolin-rich sistemins* (Zhang *et al.*, 2020). To contribute to this knowledge, we identified and produced three synthetic peptides, called Green, Red and Total which results repeated four times each along ProSys protein. We want to demonstrate that ProSys novel peptides are biologically active being able to induce defense-related genes when exogenously supplied to tomato plants in lab and also under field condition, in order

to test a prospective tool for crop protection. Furthermore, protein derivatives such as peptides may act as a nutritional substrate for plant phyllosphere microbiota and/or affecting defense hormone pathways, causing microbial community shift in its abundance or biocontrol behaviour (Cappelletti *et al.,* 2016; Luziatelli *et al., 2019).* Thus, exploring peptides impact on above-ground microbial community will allow us to contribute to pioneering research on host immunity-microbiota interaction.

References

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