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PROSYSTEMIN PEPTIDES AS NOVEL TOOLS FOR SUSTAINABLE TOMATO CROP PROTECTION

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Chemical pesticides represent a pivotal tool in agriculture to control pest agents and secure both quality and yield in plant production. Nevertheless, their extensive use in crop protection led to a widespread toxicity that involved also non-target organisms as well as the surrounding environment, endangering ecosystems sustainability. Therefore, the increasing demand for food products low or free in pesticide residues, spurred the scientific community to develop more effective, sustainable, and eco-friendly solutions for pest control.

Promising biotechnological strategies include molecules that act as plant immunity inducers, known as elicitors. Among them, tomato Systemin (Sys) was traditionally considered as the principal actor of plant resistance phenotype, triggering multiple defense pathways in response to a wide range of biotic/abiotic stressors. This 18-amino acids peptide is released upon wounding from the C-terminal end of its 200 amino acids precursor called Prosystemin (ProSys), activating an array of local and systemic defenses. The mechanisms that underpin such a broad protection capacity are possibly linked to the intrinsic disorder of ProSys sequence that promotes the binding to different molecular partners. However, since our recent findings suggests that ProSys is likely more than a simple precursor of Sys peptide, we supposed that it contains other peptide sequences able to activate

multiple stress-related pathways. To contribute to this knowledge, both bioinformatic and gene-expression analysis were carried out. We identified and produced different synthetic peptides which are derived from ProSys precursor. We demonstrated that these peptides, among which none of them included Sys, when exogenously supplied can induce defense-related genes protecting tomato plants against *Spodoptera littoralis* larvae and towards necrotrophic fungal pathogens such as *Botrytis cinerea* and *Alternaria alternata*. Our data give a significant contribution to the understanding of the functional mechanism of ProSys, demonstrating that is not only a simple scaffold of Sys, but it contains biologically active sequences that may be novel exploitable tools for crop protection.