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## SYSTEMIN TREATED TOMATO PLANTS TRANSMIT TO THE PROGENY AN EPIGENETIC DEFENSE SIGNAL

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To be protected from biological threats, plants have evolved an immune system involving constitutive and inducible defences. Upon perception of specific stimuli, plants can develop a state of enhanced defensive capacity against pathogens and pests, resulting in a phenotype called 'induced resistance' (IR). Often, IR can be maintained for long periods, extending for the lifetime of the plant and in some instances, it may even perdure into the following generations. Growing evidence demonstrates that this stress memory can be programmed epigenetically. For instance, a more accessible chromatin structure, due to DNA methylation and/or histone modifications through post-translational modifications (PTMs), can facilitate a more potent gene expression. Specifically, changes in histone H3 lysine acetylation/methylation in promoter regions can prime defence genes. One of the best-studied peptides in plants acting as a resistance inducer is Systemin (Sys). Sys is a hormone peptide, playing a central role in the activation of plant endogenous defences. The exogenous application of Sys to tomato plants enhances defence barriers against a wide range of stress agents. Nonetheless, the involvement of this small peptide in long-lasting induced defences has been scarcely investigated.

Here, we showed that Sys results in long-lasting resistance and that the progeny of Sys-treated plants are more resistant to the necrotrophic fungus *Botrytis cinerea*. Transcriptomic data on parental and progeny lines revealed an overlap of 19% of differentially expressed genes (DEGs) of the parents 24h after Sys treatment with those of their progeny. Enriched Gene

Ontology terms of DEGs reveal an association with defence responses and metabolic processes. We investigated epigenetic regulation of a set of defence related DEGs common to both transcriptomic data set by analysing epigenetic markers as specific histone PTMs (H3K1+K9ac, H3K4me3) and DNA methylation. We proved that Sys treatment modified histones associated to the promoter region of these genes. Taken together, these results indicate that Sys treatment promotes a transgenerational defence signal and suggest epigenetic control of gene transcription. From a practical point of view, these findings can pave the way to the generation of seeds with primed resistance to pathogens through parental treatments.