BIOFORTIFICATION OF EDIBLE PLANTS WITH ZINC TO COUNTERACT CONTAMINATION BY PATHOGENIC ENTEROBACTERIA

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Contamination of edible plants by enterobacteria is a significant threat to food safety and public health. *Salmonella enterica* is a highly adaptable bacterium known to colonize various environments, from the human digestive tract to multiple ecological niches, and is primarily transmitted through contaminated food. It can infiltrate, replicate, and persist within plant tissues, turning plants into potential reservoirs for the pathogen (Zarkani & Schikora, 2021). This underscores the urgent need to understand the mechanisms that modulate the interactions between plant hosts and human pathogens. Recent studies have suggested that plants accumulate Zn as a defense mechanism against phytopathogens. A recent study from our laboratory highlighted that the ability of *S.* Typhimurium to colonize and persist in plant tissues depends on the functionality of the bacterial Zn/Cd detoxification system, hypothesizing a plant mechanism of zinc intoxication to fight the pathogen (Visconti et al., 2022). This suggests that plant biofortification with zinc could be a potential strategy to enhance the resistance of raw edible plants against pathogenic enterobacterial contamination. Moreover, zinc biofortification, which enhances the nutritional content of crops, has gained attention as a potential strategy for addressing nutritional deficiencies.

The main objective of the present study is to analyze the molecular mechanisms underlying plant/enterobacteria interaction, influenced by the availability of zinc, and to evaluate whether the modulation of this micronutrient is a discriminating factor for the ability of pathogenic enterobacteria to colonize plant tissues. This study involves various experimental approaches including plant growth assays, gene expression analysis, and nutritional analysis using an experimental infection model of *Arabidopsis thaliana* and *Salmonella* Typhimurium. Moreover, mechanisms of *Salmonella* colonization related to zinc availability in plant tissues will be analyzed in different raw edible plants (rocket, purslane, lettuce), both in *in vitro* and greenhouse conditions. These experiments aimed to assess the impact of zinc biofortification on the colonization and survival of *Salmonella enterica* in different edible plant species. Furthermore, this study aimed to unravel the molecular mechanisms involved in zinc-induced resistance, including activation of plant defense responses and potential alterations in nutritional composition

The results of this project will contribute to understanding whether the biofortification of crops with zinc can provide protection against pathogens besides improving the nutritional quality of the crops themselves.

References:

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