

Systematic Discovery of Bacterial Toxins Against Plants Pathogens Fungi

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Abstract : *Fusarium oxysporum*, a fungus that attacks a broad range of plants and can cause infections in humans, operates across different kingdoms. This pathogen encounters varied conditions, such as temperature, pH, and nutrient availability, in plant and human hosts. The *Fusarium oxysporum* species complex, pervasive in soils globally, can affect numerous plants, including key crops like tomatoes and bananas. Controlling *Fusarium* infections can involve biocontrol agents that hinder the growth of harmful strains. Our research developed a computational method to identify toxin domains within a vast number of microbial genomes, leading to the discovery of nine distinct toxins capable of killing bacteria and fungi, including *Fusarium*. These toxins appear to function as enzymes, causing significant damage to cellular structures, membranes and DNA. We explored biological control using bacteria that produce polymorphic toxins, finding that certain bacteria, non-pathogenic to plants, offer a safe biological alternative for *Fusarium* management, as they did not harm macrophage cells or *C. elegans*. Additionally, we elucidated the 3D structures of two toxins with their protective immunity proteins, revealing their function as unique DNases. These potent toxins are likely instrumental in microbial competition within plant ecosystems and could serve as biocontrol agents to mitigate *Fusarium* wilt and related diseases.

Keywords : microbial toxins, antifungal, *Fusarium oxysporum*, bacterial-fungal interactions

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