

Bioelectronic Sensors for Understanding Plant Stress Responses

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Abstract:

Climate change and a growing global population call for plants with enhanced tolerance to biotic and abiotic stress, as well as increased productivity. In this talk, I will present our recent advances in interfacing bioelectronic tools with plants, with the aim of enabling new discoveries and expanding possibilities in plant science. Electrical signals in plants mediate long-distance communication and are closely linked to stress responses. We have developed conformable multielectrode arrays based on organic electronics for large-scale, high-resolution plant electrophysiology. This technology has enabled precise spatiotemporal mapping of fast electrical signals associated with plant movement. We are now extending this approach to other plant species to advance the mechanistic understanding of plant responses to environmental stress. In parallel, we have developed a multimodal sensing platform that correlates electrical signals with ionic and biochemical processes, allowing us to investigate the role of specific genes in regulating and coordinating these signaling pathways. Beyond monitoring, we also explore the use of electric fields to actively stimulate plant processes. I will present our recent work on bioelectronic platforms that not only deepen our understanding of plant biology but also have the potential to contribute to more sustainable food production.

Keywords:

plants, agriculture, electrophysiology, stress signaling