Plant electrocardiogram:

Machine learning for smart and sustainable irrigation

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Abstract

Living organisms have evolved complex signaling networks to drive appropriate physiological processes in response to changing environmental conditions. Amongst them, electric signals are a universal method to rapidly transmit information. In animals, bioelectrical activity measurements in the heart or the brain provide information about health status. In plants, practical measurements of bioelectrical activity are in their infancy and transposition of technology used in human medicine could therefore, by analogy provide insight about the physiological status of plants. This study reports on the development and testing of an innovative electrophysiological sensor that can be used in greenhouse production conditions, without a Faraday cage, enabling real-time electric signal measurements. The bioelectrical activity is modified in response to nycthemeral rhythm, water or nutrients deficiency conditions. Furthermore, the automatic classification of plant status using supervised machine learning allows detection of these physiological modifications. In greenhouse cultivation, maintenance and control of water and/or nutrients status are key for optimal growth of plants and, in turn crop yields. Real-time assessment of plants' physiological status would allow automatic irrigation management according to actual plant needs/demands and therefore improve resource management for sustainable agriculture.