Extended Abstract

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Identification of low pH induced differentially expressed genes in rice: An experimental and computational approach

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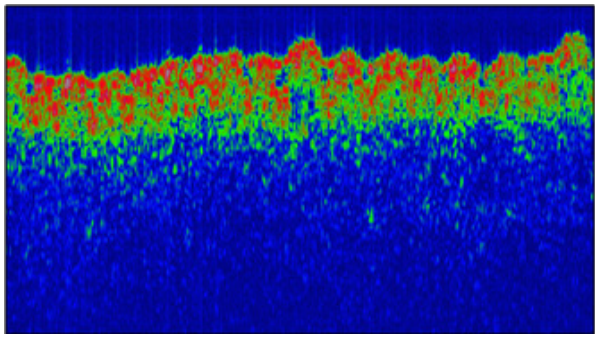
Rice (Oryza sativa) is a very important crop used in various forms for consumption by majority of the population. Its growth and productivity are affected by variety of biotic and abiotic stresses. Soil acidity is among the various factors depressing the rice crop growth and productivity. Majority of soil in Jharkhand, India is acidic having a pH < 5.5 and one of the major limiting factors for rice production (Singh 2011). In paper birch (Betula papyrifera), under low pH conditions, the water flow rate and hydraulic conductivity was reduced (Kamaluddin & Zwiazek, 2004). Also, acidic stress leads to altered seedling growth, chlorophyll content, photosynthesis and other physiological parameters in citrus (Long et al. 2017). Low-pH altered the antioxidant enzyme, ATPase activities in the roots of rice seedlings (Zhang et al. 2015), altered plant gene expression and modulate auxin and elicitor responses (Lager et al. 2010). Optical coherence tomography (OCT) is a useful imaging method that generates 3D cross-sectional high-resolution images (Huang et al. 1991). The application of OCT has been studied in the agriculture sector also. It has been used to observe the morphological differences in different parts of the plant (Clements et al. 2004; Meglinski et al. 2010). In-vivo studies of fungal infections in leaves of Capsicum annuum and its growth was carried out with the help of OCT (Ravichandran et al. 2016). Recently OCT has been adopted to study microstructural changes in plant leaves under various conditions (Rateria et al. 2019; Kim et al. 2019; Anna et al. 2019). Considering above challenge investigating such genes which are induced under low pH conditions in the traditional variety of rice making them to be tolerant for acidic stress is a great of interest. For this study surface sterilized seeds of some verities were sown in soil containing pots at varying low pH and kept in growth chamber under controlled conditions. Low pH treated varieties were studied for measuring the changes in morphological, biochemical, molecular and micro-structural parameters. Low pH induced changes in growth and biochemical parameters were observed. RT-PCR based differential gene expression pattern of various genes under acidic stress was overserved. Field emission scanning electron microscope (FESEM) based changes in characteristics of stomata while optical coherence tomography (OCT) based micro-structural changes in different layers of low pH treated leaves were observed. Online available microarray data of A. thaliana grown under low pH were used for finding novel candidate (hub) genes. Rice homolog of these hub genes were identified and studied for Real-Time PCR based gene expression under low pH stress.



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