

Proteome and Growth Characteristics Responses of Perilla to Waterlogging Stress in Paddy Soil

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[Introduction]

Worldwide, extreme climates have caused heat and heavy rainfall, leading to crop damage. Waterlogging Stress causes oxygen deficiency and reduces growth, development and yield, and damages many cell molecules and metabolites. Waterlogging damages induce protein changes in various physiological processes. Proteomics is conceived as the high throughput molecular tool to explore protein expression alterations against abiotic stress including waterlogging stress.

[Materials and Methods]

Perilla were sown in a wagner pot (1/50000) in the Chungbuk National University Agricultural farms on June 4, 2018, and raised in greenhouse. The condition of the waterlogging stress were treated for 3 days each early vegetative period (2 leaf stage and 3 leaf stage) and the leaves of the plants were collected and lyophilized at -80 °C. Growth Characteristics such as plant height, stem diameter, SPAD, fresh weight and dry weight were investigated. Proteome analysis was carried out using gel-free technique to investigate the changes patterns of protein of the leaves of the plants.

[Results and Discussions]

In the growth characteristics, there was a significant difference in the 2 leaf stage and 3 leaf stage. In 2 leaf stage, The most significant reduction in plant height (8.3 cm) was recorded at 3 days exposure to waterlogging stress at the 2-leaf stage compared to control plants, whereas the plant height exhibited the largest reduction (11.7 cm) at the 3-leaf stage. Waterlogging significantly reduced stem diameter and the adverse effects were more pronounced when duration of waterlogging increased. Stem diameter showed a significant reduction both 2-leaf (1.5 mm) and 3-leaf stage (2.1 mm) compared to the control plants. For proteome analysis, a total of 329 differentially expressed proteins (DEPs) were identified from the 2 leaf stage while a total of 395 DEPs were detected on the 3 leaf stage. Among these DEPs, glutamin synthetase, superoxide showed significant changes under waterlogging stress. Taken together, the DEPs play a significant role in assisting perilla to cope with the adverse effects of oxidative stress caused by waterlogging stress.

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