

Changes in Amino Acid Content of Teosinte in the Flooding Condition

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[Introduction]

Compared to normal conditions, plants undergo many changes of metabolites in the flooding condition. The decrease of oxygen availability in the flooding condition becomes limitative factor for oxidative phosphorylation in plants and then plant cells depend on alternative metabolic pathways to produce ATP. Under limited oxygen circumstances, the important source for plant life energy is the glycolytic pathway, which generates two ATPs and two pyruvic acid molecules per glucose while attendantly reducing NAD⁺ to NADH. Also, the amino acid content produced by the plant metabolic cycle also changes under the flooding conditions. Therefore, it investigated the changes of amino acid content under the flooding condition using teosinte in this experiment.

[Materials and Methods]

Teosinte plant seeds were received from USDA genebank and grown in a greenhouse under 27°C day temperature, 22°C night temperature, and 11 hours daylight period. After planting, the flooding was treated for 7 days after the third leaf of the plant emerge. After harvest, the treated teosinte plants were in storage in lyophilization. Gas chromatography-mass spectrometry (GC/MS) was used for the analysis of amino acids by applying the method of Sumner et al.

[Results and Discussions]

A comprehensive profiling data about primary metabolism after the flooding conditions was obtained by gas chromatography-mass spectrometry(GC/MS). After GC/MS analysis, principal component analysis(PCA) analysis of each amino acid was carried out.

PCA analysis showed significant changes in aspartate, glutamine, and alanine. Generally, it was occurred by changes in the plant interior as well as plant exterior. Especially under the flooding conditions, the most basic metabolism, the glycolysis process and the tricarboxylic acid cycle (TCA), is different from the normal conditions. As a result, this also causes changes in amino acid metabolism. Several studies have reported that some amino acids, including alanine, have a significant effect on nitrogen metabolism under the flooding conditions. In this study, similar results were obtained and further research is needed.

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