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Screening of 2-Oxoglutarate, Glutamate Foliar Application Concentration for Alleviation of Soybean(*Glycine Max L.*) Drought Stress

Chang Wook Park¹, In Jung Lee^{1*}

¹Division of Plant Biosciences, Kyungpook National University, Daegu 41566, Korea

[Introduction]

Soybean(*Glycine Max L.*) is an important source of protein, and is one of the most important crops in the world. However, The nation's self-sufficiency rate stood at only 10.1 percent in 2010. So it is necessary to expand its cultivation. Droughts occur frequently during early growth stage, which is likely to lead to exposure to drought stress, which can lead to yield reducing. Therefore, it is necessary to find a way to alleviate the drought stress in the early stages of soybean cultivation. Glutamate (Glu) is a type of amino acid that acts as the central role of nitrogen metabolism in plants and is a precursor of various kinds of amino acids and physiological active substances. One of the most representative substances is the proline, which acts as an osmotic regulator in drought conditions. Therefore, it is estimated that the drought stress can be alleviated by the exogenous Glu treatments. By exogenous Glu treatment, it is known that the concentrations in plants are not shown significant changes as they can be used in various metabolic processes. However, 2-OG (2-Oxoglutarate) treatment significantly increases the concentration of glu in the plant. 2-OG is a precursor used for glu synthesis. Therefore, this experiment was conducted to identify the change of metabolism by the treatments of the each substances on the metabolic pathways, and to find out the appropriate concentrations of treatments for drought stress alleviation and recovery of growth of soybean at early growth stage.

[Materials and Methods]

The soybean seeds were seeded into the horticultural soil and then transplanted into 0.45 L ports filled with horticultural soil when the first foliage leaves were developed. 3days after transplantation, the Drought stress experimental group(D) were treated 13.5% (w/v) of the Polyethyleneglycol(PEG) solution, and the Well-Watered experimental group(WW) were treated distilled water(dw) 50ml per each days. 4days after transplantation, 2-OG and Glu Solution were treated to leaf surface with a degree of 5uM, 10uM, 50uM, 100uM, 500uM, and 1mM respectively. After treatment, the PEG and dw supplements were maintained for 7 days, and then the leaf length and width, chlorophyll content, and photosynthesis of the third trifoliolate leaves were measured.

[Results and Discussion]

The results of the experiment showed that both 2-OG and Glu treated groups had higher growth, chlorophyll content and photosynthesis compared to drought treatment experimental groups in the low concentration segments (5, 10, 50, and 100uM). On the other hand, in the high concentration treated groups, yellow spots were formed on the leaves and the damages are caused such as wither. As a result, it is considered important to treat 2-OG and Glu with appropriate concentrations. It is also expected that the results of appropriate concentration of 2-OG and Glu treatments can be used as basic data to identify the plant's metabolism.

*Corresponding author: Tel. +82-53-950-5708, E-mail. ijlee@knu.ac.kr