PA-15

Physiological and Biochemical Responses to Water Stress in Ginger(*Zingiber officinale*)

Sang-Kuk Kim[1]*, Young-Un Song[1], Su-Gyeong Jeon[1], Eun-Young Gu[1], In-Jung Lee[1]

[1]Institute for Bioresources Research, Gyeongsangbuk-do Provincial Agricultural Research & Extension Services, Andong 36614, Republic of Korea

[Introduction]

Ginger is the second important cash crop of the northern area, Andong and it has also been major agricultural commodity in Gyeongsangbuk-do. It was already the first biggest ginger production area with occupying about 37.7% of domestic production in our country since 2015 year. In general productivity of rhizome in ginger has been depended on their regional microclimate like temperature, soil moisture, and disease resistance. Continuous high temperature accompanying with drought had been to be major production constraint. In particular, intermittent water stress lead to decrease growth and enlargement of rhizome during growing season. Thus, this study is basically focused on endogenous biochemical change of leaves in ginger at early growth stages exposed to water stress.

[Material and Methods]

Large white ginger seed rhizome imported from China was used in this study. Criteria of seed rhizomes used were firm, weight 7-20 g, have 2-3 buds and free of pests and seed born diseases. Seed rhizomes were soaked in a solution of fungicide and bactericide prior to seeding for half day. Ginger seedlings grown for 40days were planted 2cm depth from soil surface in pots(70 length×40 width×50 cm depth) containing clay silt placed in a glasshouse and fertilizer supplied initially consisted of 6g, 12.9g, and 3.5g each N, P_2O_5 and K_2O. For drought stress, water was applied to irrigated treatments(control) to maintain soil water potential above −30 kPa. The stressed treatment was irrigated only when soil water potential was lower than −70 to 80 kPa, and it received about 50% of the total quantity of water applied to the controls. Irrigation was also applied on average 3 or 4 days for the irrigated treatments and only every 6 or 7 days for the stressed ones for 2 months after planting seed rhizomes. Data collected during the stress period included plant growth characteristics, endogenous gibberellins, glycinebetaine, leaf area and SPAD value. Experiment design was conducted in randomized complete blocks. Data were analysed with the SAS system.

[Results and Discussion]

Glycinebetaine is an important non-toxic osmoprotectant, which is accumulated in higher plants under various stresses. When ginger plant was exposed to water stress around soil water potential −70 to −80 kPa, glycinebetaine in leaf tissue of ginger showed significant increase continuously. GA_1 content was always lower than that of GA_4 content in both well watered and water stress treatments. In the change of GA_4 level, when the water stress condition was extended to 20 days, its amount was linearly increased. SPAD value as chlorophyll level index was always lower in water stress than in well watered condition. Leaf area(cm^2 per plant) did not affected within 30 days after water stress, however it was also linearly increased in both well watered and water stress conditions. The amount of free proline under water stress were within a range of 2.8 to 4.3 μmole/g leaf fresh weight.

*Corresponding author: Tel. +82-054-859-5123, E-mail. sk2@korea.kr