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Beneficial Effects of Foliar Applied H₂O₂ on the Growth of Sorghum Plant Inhibition Under Drought Conditions

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[Introduction]

Drought has negative effects the growth of crop. It is an abiotic stress that reduces crop yields, often produces abundant amounts of reactive oxygen species (ROS). But hydrogen peroxide is known to induce a stress resistance at low concentrations as well as an oxidative stress at high concentrations. Therefore, our study was conducted to investigate the effect of hydrogen peroxide application as a signaling molecule of environmental stress on the growth of sorghum plants under the drought condition.

[Materials and Methods]

This experiment was carried out at the experimental farms of the Gyeongsang National University, Jinju, Korea. The sorghum variety (cv. Hwangeumchal) was sown in a seedbed on June 14, 2018 and the seedlings were transplanted with plant space of 60cm × 30cm in sandy loam soil. Soil moisture conditions were adjusted as well-watered condition (from 0 MPa to -0.13 MPa) and drought condition (from -0.33 MPa to -0.58 MPa) by controlling watering amount using perforated irrigation pipe. The hydrogen peroxide treatments (0 and 30 mM H₂O₂) were carried out six times with 5 days interval at the beginning of 6-leaf stage. Growth and physiological characteristics were measured on a weekly basis from 0 days after treatment (DAT) to 42 DAT. At the physiological maturity, the aerial part was collected and separated each part and the fresh weight was measured.

[Results and Discussions]

The effect of hydrogen peroxide treatment on the growth of sorghum (*Sorghum bicolor* L.) were investigated with the treatment of 30 mM H₂O₂ on the leaf surface at six-leaf stage under two different moisture conditions of well-watered condition and drought condition. Plant height, leaf length, and leaf area were decreased in the drought condition, but inhibition was reduced by 30 mM H₂O₂ treatment. The degree of leaf greenness was increased by 30 mM H₂O₂ application in both well-watered and drought conditions. The photosynthetic rate increased by H₂O₂ treatment both in well-watered and drought conditions at 25 days after treatment, Dry matter production of the plants treated with 30 mM H₂O₂ was 141 kg ha⁻¹ higher than that of untreated plants. The total root length, the root surface area, and the number of root tips of 30 mM H₂O₂ treated plants were higher by 675 cm, 151.0 cm² and 2395, respectively, than those of untreated plants, respectively, under the drought condition. Therefore, it was concluded H₂O₂ application reduces the growth inhibition of sorghum plants subjected to water stress.

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