## **Abstract**

****Background:****Jasmonic acid (JA) is an important molecule that has a regulatory effect on many physiological processes in plant growth and development under abiotic stress. This study investigated the effect of 60 μmol L-1 of JA in seed priming (P) at 15 °C in darkness for 24 h, foliar application (F), and/or their combination effect (P + F) on two soybean cultivars - 'Nannong 99-6' (salt tolerant) and 'Lee 68' (salt sensitive) - under salinity stress (100 mmol L-1 sodium chloride (NaCl)).

****Results:****Salinity stress reduced seedling growth and biomass compared with that in the control condition. Priming and foliar application with JA and/or their combination significantly improved water potential, osmotic potential, water use efficiency, and relative water content of both cultivars under salinity stress. Similarly, seed priming with JA, foliar application of JA, and/or their combination significantly improved the following properties under salinity stress compared with the untreated seedlings: net photosynthetic rate by 68.03%, 59.85%, and 76.67% respectively; transpiration rate by 74.85%, 55.10%, and 80.26% respectively; stomatal conductance by 69.88%, 78.25%, and 26.24% respectively; intercellular carbon dioxide concentration by 61.64%, 40.06%, and 65.79% respectively; and total chlorophyll content by 47.41%, 41.02%, and 55.73% respectively. Soybean plants primed, sprayed with JA, or treated with their combination enhanced the chlorophyll fluorescence, which was damaged by salinity stress. JA treatments improved abscisic acid, gibberellic acid, and JA levels by 60.57%, 62.50% and 52.25% respectively under salt stress compared with those in the control condition. The transcriptional levels of the FeSOD, POD, CAT, and APX genes increased significantly in the NaCl-stressed seedlings irrespective of JA treatments. Moreover, JA treatment resulted in a reduction of sodium ion concentration and an increase of potassium ion concentrations in the leaf and root of both cultivars regardless of salinity stress. Monodehydroascorbate reductase, dehydroascorbate reductase, and proline contents decreased in the seedlings treated with JA under salinity stress, whereas the ascorbate content increased with JA treatment combined with NaCl stress.(Guyan)

****Conclusion:****The application of 60 μmol L-1 JA improved plant growth by regulating the interaction between plant hormones and hydrogen peroxide, which may be involved in auxin signaling and stomatal closure under salt stress. These methods could efficiently protect early seedlings and alleviate salt stress damage and provide possibilities for use in improving soybean growth and inducing tolerance against excessive soil salinity. © 2020 Society of Chemical Industry.

****Keywords:****antioxidant enzymes; gene expression; jasmonic acid; priming; salinity stress; soybean.