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Exogenous nitric oxide (NO) application reprograms soybean (*Glycine max* L.) to improved growth and flooding stress tolerance

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[Introduction]

The rapidly increasing human population and anthropogenic activities caused global climate change, which resulted in different environmental stresses. Among the various environmental stresses caused by climate change. Flooding stress is considered a major restrict factor of grain yield loss. Moreover, nitric oxide (NO) is a small bioactive molecule which has been reported to be actively involved in stress tolerance. However, the role of nitric oxide in flooding stress is not fully explored. Therefore, the current study was undertaken to investigate the role of nitric oxide in flooding stress mitigation, plant growth response, stress related endogenous abscisic acid modulation (ABA) and amino acids regulation.

[Materials and Methods]

The current study used the soybean plants. A complete randomized design experiment was carried out with seven treatments (Control, Control+flooding, SNP, NaN_3, cPTIO, IAA and Ethylene) to investigate the flooding stress mitigating role of nitric oxide after 7 and 14 days. Growth attributes Shoot and Root length, Fresh and Dry weight were recorded after completion of stress periods and the chlorophyll contents were measured by using SPAD (SPAD-502, Minolta, Japan). Moreover, the endogenous ABA was examined by using GCMS (5973 Network Mass Selective Detector and 6890N Network Gas Chromatograph, Agilent Technologies, Palo Alto, CA, USA) and amino acids were estimated by using automatic amino acid analyzer of Hitachi Japan (L-8900).

[Results and Discussions]

The results revealed that exogenous nitric oxide (SNP), Ethylene and IAA application resulted in significantly improved shoot and root length, plant biomass, chlorophyll contents and significantly reduced ABA contents as compared to NaN_3, cPTIO and only flooding stress, while significantly regulated total amino acids in plants after 7 and 14 days of flooding stress. Moreover, the application of nitric oxide inhibitor (NaN_3) resulted in poor growth performance and chlorophyll contents, increased endogenous ABA while significantly down regulated total aminoacids. It is concluded that flooding stress can negatively affect normal plant functions in terms of growth and defense via regulating physio-chemical changes. In addition, exogenously applied nitric oxide (SNP) was found to induced physio-chemical changes which resulted in significantly promoted soybean growth performance and stress tolerance against flooding stress, which revealed that nitric oxide (NO) could impose a variety of biochemical and genetic changes that could be ameliorative to plant growth under stress condition.

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