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Nitric oxide-Releasing Chitosan Nanoparticles: A Potential Impeding Strategy Against Salinity Stress in *Arabidopsis thaliana*

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[Abstract]
Plants being sessile are prone to various abiotic challenges, including salinity. Plants generally cope with salt stress by regulating their endogenous NO levels. NO exogenously applied in various forms also successfully impedes the salt stress, but its small size, short half-life, and high volatility rate hamper its application in agriculture. NO application via CS as a nanocarrier is an alternate option to ensure the optimal kinetic release of NO for a long period compared to the free NO form. Herein, we synthesized and characterized GSNO-CS NP by ionic gelation of TPP with CS and then reacting with GSH, followed by reaction with $NaNO_2$ suspension. The synthesized NPs were characterized using non-destructive analytical techniques such as DLS, FTIR, and SEM to ensure their synthesis and surface morphology. NO-release profile confirmed optimal kinetic NO release for 24 h from NO-CS NP as compared to free NO form. The efficiency of NO-CS NP was checked on Arabidopsis plants under salinity stress by gauging the morphological, physiological, and enzymatic antioxidant system and SOS pathway gene expression levels. Overall, the results revealed that NO-CS NP successfully mitigates salinity stress compared to free GSNO. Concluding, the findings provide sufficient experimental evidence for the application of nanotechnology to enhance NO delivery, thus inducing more benefits for the plants under stress conditions by mitigating the deleterious impacts of salt stress on the morphological and physiological status of the plants, and regulating the ions exchange by overexpression of SOS pathway candidate genes.

[Abbreviations]
NO: Nitric oxide; **CS:** Chitosan; **GSNO:** S-nitroso glutathione; **NP:** Nanoparticle; **TPP:** Tripolyphosphate; **GSH:** Glutathione; **DLS:** Dynamic light scattering; **FTIR:** Fourier transform infra radioscopy; **SEM:** Scanning electron microscopy; **SOS:** Salt-overly sensitive.

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