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Nitric Oxide-Induced Downregulation of a NAD(P)-Binding Rossmann-Fold Superfamily Gene Negatively Impacts Growth and Defense in *Arabidopsis thaliana*

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[Abstract]
Plant defense systems against pathogens have been studied extensively and are currently a hot topic in plant science. Using a reverse genetics technique, this study looked into the involvement of the NO-downregulated NAD(P)-binding Rossmann-fold superfamily gene in plant growth and defense in *Arabidopsis thaliana*. For this purpose, the knockout and overexpressing plant of the candidate gene along with the relevant controls were exposed to control, oxidative and nitro-oxidative stresses. The results showed that candidate gene negatively regulates plants' root and shoot lengths. To investigate the role of the candidate gene in plant basal defense, *R-gene*-mediated resistance and systemic acquired resistance (SAR) plants were challenged with virulent or avirulent strains of *Pseudomonas syringae pathovar tomato* (*Pst*) *DC3000*. The results showed that the candidate gene negatively regulates plants' basal defense, *R-gene*-mediated resistance and SAR. Further characterization via GO analysis associated the candidate gene with metabolic and cellular processes and response to light stimulus, nucleotide binding and cellular location in the cytosol and nucleus. Protein structure analysis indicated the presence of a canonical Oxidoreductase family NAD (P)-binding Rossmann fold domain of 120 amino acids with a total of 121 plant homologs across 35 different plant species in the clad streptophyta. Arabidopsis eFP browser showed its expression in almost all the above-ground parts. Protein analysis indicated C225 and C359 as potential targets for S-Nitrosylation by NO. SMART analysis indicated possible interactions with mevalonate/galactokinase, galacturonic acid kinase, arabinose kinase, putative xylulose kinase, GroES-like zinc-binding alcohol dehydrogenase and various glyceraldehyde-3-phosphate dehydrogenases.

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