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OVEREXPRESSION OF *ATPAP18* GENE IN SOYBEAN HAIRY ROOTS MEDIATED BY *AGROBACTERIUM RHIZOGENES*

Ali Izadi-Darbandi, Mehdi Younessi-Hamzekhanlu[2], Mohammad Ali Malboubi[3], Mohsen Ebrahimi[1], Moslem Abdipour[4], Francesca Sparvoli[5] and Dario Paolo[5]

[1]University of Tehran, College of Aburaihan, Iran
[2]Ahar Faculty of Agriculture, University of Tabriz, Iran
[3]National Institute of Genetic Engineering and Biotechnology, Iran
[4]Jehadi-Agriculture Research Institute, Iran
[5]Biotecnologia Agraria Dipartimento di Scienze Bio-Agroalimentari Consiglio Nazionale delle Ricerche, Italy

Low-P stress is a challenging factor in limiting plant development. Soybean is cultivated in soils often low in phosphorus. However, on average 65% of total P arises as organic phosphates, which they become unavailable to plants unless hydrolyze to release inorganic phosphate. One approach for enhancing crop P acquisition from organic P sources is boosting activity of acid phosphatases (APases). This study seeks to understand and explain the role of an Arabidopsis (*Arabidopsis thaliana*) purple APase gene (*AtPAP18*) in soybean. Thus, the gene was isolated and final vector (*AtPAP18/pK7GWG2D*) was built by using Gateway instruction. Composite soybean plants were created using *Agrobacterium rhizogenes* mediated transformation. *A. rhizogenes* K599 carrying the *AtPAP18*/pK7GWG2D vector, carrying *EGFP* gene as a reporter gene, was used for soybean hairy root transformation. Analysis of *EGFP* expression detected fluorescence signals in transgenic roots, whereas there was no detectable fluorescence in control hairy roots. Enzyme assay results showed that the APase activity increased by 2-fold in transgenic hairy roots. The transformed hairy roots displayed meaningful increase in plant soluble P and total P contents, as compared with control plants, leading to improved biomass production. RT-PCR analysis revealed high expression levels of *AtPAP18* in transformed hairy roots. It is noteworthy that these primers amplified no *PAP18* transcript in control hairy roots. Taken together, it is evidently clear from the findings that overexpression of *AtPAP18* gene offers an operative tactic to reduce the utilization of Pi fertilizer through increased acquisition of soil Pi, especially improving crop yield on soils low in available P.

aizady@ut.ac.ir