

SILICON INDUCES THE BIOSYNTHESIS OF LIGNIN IN WHEAT CULTIVARS GROWN UNDER PHOSPHORUS STRESS[†]

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Abstract: Although both silicon (Si) and lignin accumulate on plant cell walls and confer resistance to multiple biotic and abiotic stresses, the impact of Si on lignin production in plants grown under phosphorus (P) stress still remains unknown. We evaluated the effect of Si on the lignin accumulation pattern and the expression of lignin biosynthesis-related genes in wheat grown at different P levels. Two wheat cultivars differing in tolerance to P deficiency (Púrpura-sensitive and Fritz-tolerant) were hydroponically grown with P (0, 0.01 or 0.1 mM) in combination with Si (0, 1 or 2 mM) during 21 days. At harvest, lignin concentration, lignin distribution pattern and the gene expression of phenylalanine ammonia lyase (*TaPAL*) and cinnamyl alcohol dehydrogenase (*TaCAD*) were analyzed in shoots. Lignin concentration of both wheat cultivars did not vary at different P doses; nevertheless, 2 mM Si increased lignin accumulation at either 0 mM P (cv. Púrpura) or 0.01 mM P (cv. Fritz), with a more noticeable effect in Púrpura than in Fritz. In fact, confocal microscopy analyses showed stronger *Safranin O* staining after Si was added to both cultivars grown under P-limitation. Interestingly, Si also induced the expression of lignin biosynthesis-related genes. Up-regulation of *TaPAL* was detected in cv. Púrpura grown at low P levels, with a further increase in plants treated with Si. Likewise, Si addition to P-stressed plants of cv. Fritz increased the transcript level of *TaPAL* by 1.5-fold. Similarly, the expression level of *TaCAD* augmented by 1.7-fold as a result of Si supply to both cultivars grown at low P. Overall our results shows that Si induced the biosynthesis of lignin in shoots of wheat plants grown under P stress. Acknowledgments. FONDECYT Regular Project N° 1201257 and FONDECYT Postdoctoral Project N° 3200901.

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