



Abstract

The Impact of Si Fertilization on Healthy Attributes and Yield of Grains of Wheat Plants Grown under P Deficiency[†]

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[†] Presented at the 1st International Electronic Conference on Agronomy, 3–17 May 2021. Available online: <https://iecag2021.sciforum.net/>.

Abstract: Phosphorus (P) deficiency is one of the major limiting factors of wheat production worldwide. Although silicon (Si) is known to improve plant growth under low phosphorus (P) conditions, the impact of Si supply on the nutritional quality of wheat grains at field conditions remains unclear. This study aimed to investigate the impact of Si fertilization on the healthy attributes and yield of grains of wheat plants grown under a P deficiency. A field experiment on an Andisol with low available P content never amended with Si fertilizer was conducted. Two wheat cultivars with contrasting tolerance to P deficiency (cv. Púrpura, sensitive to P deficiency; and cv. Fritz, tolerant to P deficiency) were used during two growing seasons. Three P doses (0, 200, and 400 mg P kg⁻¹ soil; as triple superphosphate) were applied in combination with three Si doses (0, 250, and 500 mg Si kg⁻¹ soil; as magnesium silicate). At the mature grain stage, Si and P concentration, total phenols, phenolic acids, radical scavenging activity, and yield components were evaluated. At both growing seasons, Si supply enhanced the grain P concentration of cv. Púrpura grown in the absence of P, whereas grain Si concentration increased in both cultivars along the gradient of P supply. Interestingly, increasing Si doses augmented the phenol concentration and antioxidant capacity in grains of cv. Púrpura grown without P in both growing seasons. In contrast, Si decreased grain phenol concentration of cv. Fritz under P deficiency. A slight increment of phenolic acids induced by 250 mg kg⁻¹ Si was also detected in grains of both wheat cultivars grown without P. A positive effect of Si fertilization on the grain yield of both wheat cultivars was also found. In the first growing season, Si added to P deficient plants increased grain yield by about 23% and 47% in cv. Púrpura and cv. Fritz, respectively. A significant increase in grain yield was also observed in both wheat cultivars in the second year of the field assay. Taken together, our finding showed that Si fertilization improved the P concentration, phenols production, antioxidant capacity and yield of wheat grains under low P conditions. In this way, Si fertilization could be used as a potential strategy to improve crop production in soils with low P availability. Acknowledgments. FONDECYT Regular Project N° 1201257.

Keywords: silicon; P deficiency; wheat; grains; phenols



Citation: Vega, I.; Pontigo, S.; Cartes, P. The Impact of Si Fertilization on Healthy Attributes and Yield of Grains of Wheat Plants Grown under P Deficiency. *Biol. Life Sci. Forum* **2021**, *3*, 39. <https://doi.org/10.3390/IECAG2021-09701>

Academic Editor: Peter Langridge

Published: 1 May 2021

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Supplementary Materials: The poster presentation is available online at <https://www.mdpi.com/article/10.3390/IECAG2021-09701/s1>.

Funding: This research was funded by FONDECYT Regular Project N° 1201257.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.