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SILICON AND IRON IN FOOD CROPS: IMPACT ON HUMAN HEALTH

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Silicon (Si) and iron (Fe) are the second and fourth most abundant elements in the Earth's crust, respectively. The essentiality of Fe was recognized in the mid-19th century, yet essentiality of Si for both higher plants and humans is not fully accepted. Silicon serves as a beneficial mineral for plants, enhancing their resilience to biotic (diseases and pests) and abiotic (drought, low pH, salinity, nutrient disbalances, etc.). The beneficial effects of Si for human health, including contributions to bone and collagen development and the prevention of Alzheimer's disease, have also been well established. Approximately one-third of global agricultural soils are conductive to Fe-deficiency in various crops, leading to anemia in over two billion world population. To improve content of Si and Fe in edible plant parts (biofortification), two primary strategies are proposed: (1) increasing soil bioavailability of both minerals alongside the use of Si/Fe-based fertilizers, and (2) improving the nutritional quality of plant-derived foods through molecular breeding techniques to modify the content of Si and Fe in crops. We revealed that Si supplementation in crops can promote the root acquisition of Fe and enhance its phloem transport to the edible crop parts. Our recent results demonstrate the ability of Fe-deficient crops to increase Si availability in the rhizosphere, which, in turn, enhances the uptake and transport of both minerals. This opens new innovative approaches in crop Si/Fe biofortification practices for improved human health.

Keywords: Biofortification, Crops, Human health, Iron, Silicon.

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