

Effects of foliar selenium application on grain yield and nutritional quality of common wheat

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Selenium (Se) is an essential micronutrient for human health, yet its deficiency is widespread worldwide due to low concentrations in staple crops such as common wheat (*Triticum aestivum* L.). Increasing Se content in wheat grains through foliar application is a promising strategy to address this deficiency without compromising yield. This study evaluated the effects of different Se rates and application timings on grain yield and quality in two bread wheat varieties (Bologna and Sieve) grown under rainfed conditions. Field trials were conducted over two growing seasons (2020–2022) at two locations in Italy, using a split–split plot design. Selenium was applied at five rates (0, 2.57, 5.14, 10.27, and 20.54 g ha⁻¹) and at two growth stages (flowering and watery ripe). Measured parameters included grain yield, protein content, starch concentration, free asparagine levels, and phytic acid (Phy) content. Data were analyzed using a mixed-effects linear model to assess the interactions between varieties, Se rates, and application timings. Results showed that Se application did not affect grain yield in either variety. However, significant effects on grain quality were observed, with responses varying by variety. Se application reduced free asparagine and phytic acid contents, with the decrease in free asparagine being more pronounced in Sieve. Additionally, the molar Phy:cation ratio decreased in both varieties, indicating improved mineral bioavailability. Nevertheless, high Se rates were associated with reduced protein and starch contents. In conclusion, foliar Se application proved effective in lowering anti-nutritional factors such as phytic acid and free asparagine and in improving Se bioavailability, while having no effect on grain yield. However, reductions in protein and starch contents at higher Se rates highlight the need to tailor application strategies to specific wheat varieties. Such optimization could enhance the nutritional quality of wheat-based foods and contribute to addressing Se deficiencies in human diets.

Keywords: agronomic practices; crop nutrition; Se foliar application; micronutrient enrichment; trace elements

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