From Gene to Grain: Integrated Approaches to Free Asparagine and Acrylamide Mitigation

# Reducing Acrylamide Risk in Wheat: Selenium Fertilization Targeting Free Asparagine

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**ABSTRACT**

Free asparagine in wheat grain is the main precursor of acrylamide, a process contaminant formed during high-temperature processing of cereal-based foods. Reducing its concentration through agronomic practices is a key objective of the COST Action ACRYRED. Our study evaluates foliar selenium (Se) fertilization as strategies to modulate free asparagine and improve wheat grain quality under rainfed Mediterranean conditions. A two-year field experiment (2020–2022) was conducted in Tuscany (Italy) using two bread wheat cultivars with contrasting genetic backgrounds ('Bologna' and 'Sieve'). Five Se rates were applied at different phenological stages. Grain yield, protein composition, free asparagine, mineral content, and technological traits were considered. Grain yield was mainly driven by genotype and seasonal conditions, with no penalties from Se application. Selenium significantly reduced free asparagine but also decreased phytic acid and improved mineral bioavailability. These results highlight integrated Se management as an effective strategy to reduce acrylamide risk while maintaining yield and improving wheat quality.

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