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FUSARIUM POAE IN CEREAL CROPS: CURRENT KNOWLEDGE AND PERSPECTIVES FOR BACILLUS-BASED BIOLOGICAL CONTROL

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ABSTRACT

Fusarium poae is an increasingly recognized but underexplored phytopathogen affecting economically important cereal crops such as wheat, barley, and oats. Although other *Fusarium* species—most notably *F. graminearum* and *F. culmorum*—have been extensively studied, *F. poae* remains among the least investigated, despite its role in causing Fusarium head blight (FHB), reducing grain yield and quality, and producing harmful mycotoxins such as nivalenol, enniatins, and beauvericin. Climate variability and limitations in the efficacy and safety of chemical fungicides highlight the need for sustainable alternatives. To date, most research on *F. poae* has focused on its pathogenicity mechanisms, epidemiology, and the spectrum of mycotoxins it produces, such as nivalenol and enniatins. Studies have also investigated environmental factors influencing its prevalence and interactions with host plants, yet limited attention has been given to developing effective and sustainable control measures. The use of bioinoculants based on beneficial bacteria represents a sustainable alternative to chemical pesticides, reducing environmental pollution and preserving soil and plant health. This approach is particularly important in cereal production, where excessive use of chemical pesticides poses a risk to food safety and long-term soil fertility. This review aims to raise awareness of the importance of studying *Fusarium poae* as a neglected pathogen and to encourage further research toward the development of effective biological solutions based on *Bacillus* spp. Based on published studies, strains of *Bacillus velezensis*, *B. subtilis*, *B. amyloliquefaciens*, *B. inaquosorum*, and *B. nakamurai* have shown promising antifungal effects against *F. poae* through multiple mechanisms. These include the production of antimicrobial lipopeptides (e.g., surfactin, iturin, fengycin), secretion of cell wall-degrading enzymes (chitinases, glucanases), synthesis of siderophores that limit iron availability to the pathogen, biofilm formation, and strong rhizosphere competence. Some strains also promote plant health by producing phytohormones (such as indole-3-acetic acid), enhancing systemic resistance, and improving nutrient uptake. By compiling these findings, this review underscores the importance of further investigating *F. poae* and advancing the application of selected *Bacillus* strains as biocontrol agents. Their multifunctional traits make them strong candidates for inclusion in integrated pest management (IPM) programs aiming at sustainable protection of cereal crops.

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