Abstract

Background: Rapid population growth has made the sustainable intensification of agricultural productivity essential for meeting global food demands while maintaining environmental integrity and biodiversity. Diversified cropping systems, such as intercropping, push-pull systems, and cover cropping, are recognized as agroecological strategies to enhance plant growth and protection, and suppress major pests, including the fall armyworm (FAW, Spodoptera frugiperda). These systems influence complex above-andbelow ground interactions among herbivorous pests, plants, soil microbes, and their natural enemies. Aims: This review synthesizes current knowledge on how diversified cropping systems shape multitrophic interactions that affect soil health, plant performance, S. frugiperda suppression, and biocontrol within agroecosystems. Methods: We critically reviewed the impact of below-and-above ground interactions and synthesized recent knowledge from soil microbiology, entomology, ecology, and agronomy to examine how diversified cropping systems shape plant-microbe-pest interactions. Particular emphasis is given to the roles of soil microbial communities, plant defensive responses, and natural enemies contributing to S. frugiperda suppression. Results and Conclusions: This review provides a comprehensive understanding of below-and-above ground interactions and the contribution of soil microbes in crop protection. Evidence indicates that diversified cropping systems can reduce S. frugiperda infestations through multiple ecological mechanisms. These include increased activity of natural enemy, improved plant defense traits, and beneficial changes in soil microbial communities. These systems also promote improved soil structure, nutrient cycling, and crop productivity. Integrating these ecological interactions into crop management offers a promising integrated pest management strategy for sustainable S. frugiperda management, particularly smallholder farming systems in sub-Saharan Africa and other regions affected by S. frugiperda.