

*The Fall Armyworm, *Spodoptera frugiperda* (J.E. Smith): A Global Threat to Agriculture*

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ABSTRACT

The fall army worm (*Spodoptera frugiperda*) has emerged as one of the most significant agricultural pests worldwide. Originally native to the Americas, this invasive species has expanded its range, wreaking havoc on crops and posing severe economic threats to farmers and food security globally. This article explores the biology, spread, impact, and management strategies associated with the fall armyworm, highlighting its role as a formidable challenge to modern agriculture.

INTRODUCTION

One species of autumn armyworm moth that can be identified by its larval life stage is the *Spodoptera frugiperda*, which belongs to the Lepidoptera order. The word "armyworm" can be used to describe a variety of species, and it frequently describes the widespread invasive behaviour of the larval stage of the species. It is regarded

as a pest and can damage and destroy a wide variety of crops, which causes large economic damage. Since the species can ruin crops, its scientific name, *frugiperda*, comes from the Latin word for lost fruit. The habits and potential for crop protection of the autumn armyworm have been extensively researched due to its destructive nature. Given that, it

currently looks to be splitting into two species, it is also a noteworthy example for researching sympatric speciation. Another remarkable trait of the larva is that they consistently practice cannibalism, despite its fitness costs (Buntin and McPherson, 2019). The fall armyworm is distinct from the true armyworm, which is a species belonging to the same family and order as the noctuidae but of the genus *Mythimna*. While outbreaks of the true armyworm typically happen in the early summer, the fall armyworm causes the most damage in the late summer and early fall in the northern and southern parts of the United States (Fasulo, 2020).

Biology and Life Cycle

Description and Characteristics

The fall armyworm is a nocturnal moth characterized by its distinctive morphological features. Adult moths have a wingspan of about 3.5 to 4 inches, with forewings that are dark brown to gray, often displaying a light patch. The larvae, primarily responsible for crop damage, vary in color from green to brown and exhibit a distinctive inverted “Y” marking on their heads (Goosey *et al.*, 2016).

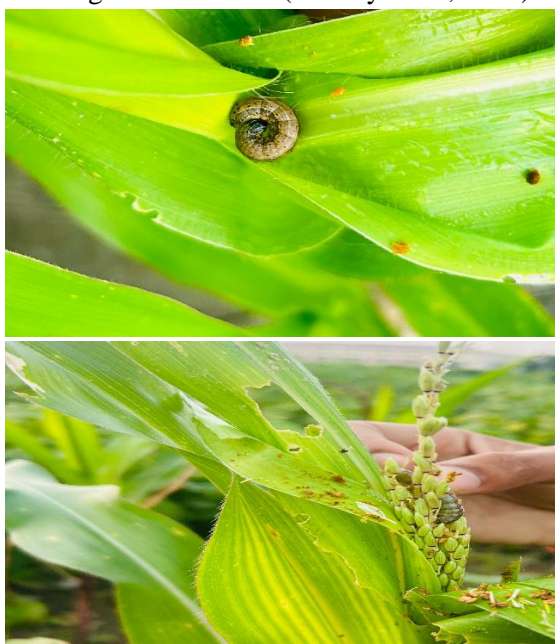
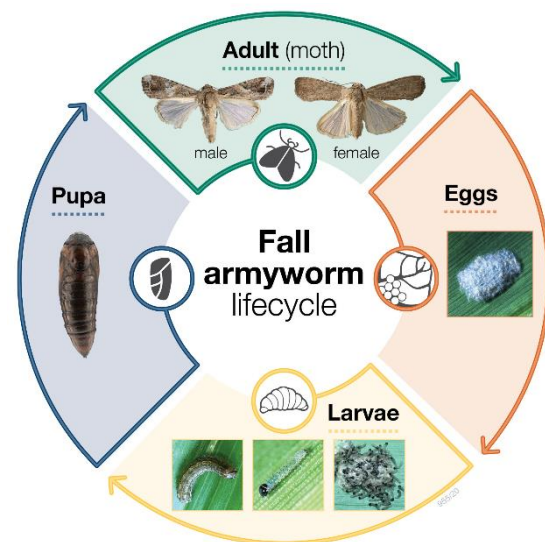


Fig: Fall armyworm larvae feeding on maize leaf folds and flowering parts

Life Cycle

The life cycle of the fall armyworm consists of four stages: egg, larva, pupa, and adult. Females lay eggs in clusters, typically on the undersides of leaves. The larvae hatch within a few days and begin feeding voraciously on host plants. They can undergo six to seven instars before pupating in the soil. The entire life cycle can be completed in as little as 30 days under optimal conditions, allowing for multiple generations each year (Buntin *et al.*, 2019).



(Source: Department of Agriculture, Govt. of Western Australia)

Host Range

Fall armyworms have a wide host range, with over 80 plant species, including maize, rice, sorghum, and various vegetables. This adaptability allows them to thrive in diverse agricultural environments, making effective control challenging (Fasulo, 2020).

Global Spread

Historical Context

Historically, the fall armyworm was primarily a pest in the Americas. However, in recent years, it has spread to Africa, Asia, and parts of Europe. This expansion is attributed to global trade, climate change, and agricultural

practices that favor its proliferation (Mizubuti *et al.*, 2020).

Current Distribution

Today, the fall armyworm is a significant concern for farmers in Sub-Saharan Africa and South Asia. Countries such as India, Nigeria, and Zambia have reported severe infestations, resulting in substantial crop losses. The pest's rapid spread has prompted international attention and cooperation to manage its impact.

Economic Impact

Crop Damage

The economic impact of fall armyworm infestations can be devastating. Studies indicate that crop losses can reach up to 70% in heavily infested fields (FAO, 2018). The primary crops affected include maize, which is a staple food in many regions.

Financial Burden on Farmers

Farmers face increased costs for pest control measures, including pesticides and integrated pest management strategies. Additionally, reduced yields can lead to food insecurity, particularly in regions reliant on agriculture for their livelihoods (Beresford *et al.*, 2020).

Broader Economic Consequences

The fall armyworm's impact extends beyond individual farms. It affects national food security, trade, and economic stability, making it a critical issue for governments and policymakers (Hassan *et al.*, 2022).

Management Strategies

Cultural Practices

Cultural practices such as crop rotation, intercropping, and the use of resistant crop varieties can significantly reduce fall armyworm infestations. Educating farmers

about these practices is crucial for sustainable management (Khan *et al.*, 2021).

Biological Control

Utilizing natural predators and parasitoids can help control fall armyworm populations. Research into biological control agents, such as certain wasps and nematodes, shows promise in reducing pest numbers with minimal environmental impact.

Monitoring and Forecasting

Effective monitoring and forecasting systems are essential for timely interventions. Technologies such as remote sensing, pheromone traps, and mobile applications can assist farmers in predicting infestations and implementing control measures.

Chemical Control

Pesticides have traditionally been the last line of defense against fall armyworm infestations. However, over-reliance on chemical controls has raised concerns about resistance and environmental impact. Integrated pest management (IPM) strategies are becoming more favored.

International Cooperation and Research

Global Initiatives

Recognizing the threat posed by fall armyworms, international organizations such as the Food and Agriculture Organization (FAO) and the International Plant Protection Convention (IPPC) have initiated programs to combat the pest. These programs focus on research, training, and resource sharing among countries (FAO, 2020).

Collaborative Research

Collaboration between countries and research institutions is vital for developing effective management strategies. Sharing data on pest

behavior, resistance patterns, and control measures can enhance global understanding and response to fall armyworm infestations.

Future Challenges and Considerations

Climate Change

Climate change poses additional challenges for managing fall armyworms. Warmer temperatures and changing precipitation patterns may influence the pest's lifecycle and distribution, necessitating adaptive management strategies.

Resistance Management

As with many agricultural pests, the potential for developing resistance to chemical controls is a significant concern. Ongoing research is needed to understand resistance mechanisms and develop strategies to mitigate this risk (Jalali *et al.*, 2020).

Education and Outreach

Educating farmers and stakeholders about the fall armyworm, its biology, and management options is crucial. Extension services and community engagement can play a significant role in disseminating knowledge and best practices (Khan *et al.*, 2021).

CONCLUSION

The fall armyworm is a formidable global threat to agriculture, with far-reaching implications for food security and economic stability. A multifaceted approach, combining chemical, biological, and cultural control methods, is essential for effective management. International cooperation and continued research are vital in addressing this challenge, ensuring that farmers have the tools and knowledge necessary to combat this invasive pest. As we face the complexities of modern agriculture, proactive measures and adaptive strategies will be key to safeguarding

our crops and communities against the ever-present threat of the fall armyworm.

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