International Journal of Entomology Research
www.entomologyjournals.com
ISSN: 2455-4758
Received: 19-01-2026; Accepted: 18-02-2026; Published: 05-03-2026
Volume 11, Issue 1, 2026, Page No. 446-448

Damaging impact of *Spodoptera* spp. on major agricultural crops from Aurangabad District: A comprehensive study

Shedolkar T S[1*], Lakhe A D[1], Pawar M V[2]
[1] Department of Zoology, Rajmata Jijau Mahavidyalaya, Kille Dharur, Beed, Maharashtra, India
[2] Department of Zoology, Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar, Maharashtra, India

Abstract
The present study was conducted to evaluate the damaging impact and host range of the genus *Spodoptera* in the Aurangabad district of Maharashtra, India, from June 2022 to May 2024. Field surveys were carried out in different agricultural fields under natural conditions. The predominant species recorded were *Spodoptera frugiperda* and *Spodoptera litura*. Larval infestation was mainly observed during the vegetative stage, causing leaf scraping, irregular holes, defoliation, and reduced plant vigour, leading to significant yield loss. The study confirms the polyphagous nature and damaging potential of *Spodoptera* species and emphasizes the need for regular monitoring and effective pest management strategies.

Keywords: *Spodoptera frugiperda*, *Spodoptera litura*, crop damage, pest infestation, Aurangabad

Introduction

The family *Noctuidae* represents one of the largest and most economically significant groups of moths within the order *Lepidoptera*. Among the noctuid moths, the genus *Spodoptera* is considered one of the most destructive due to its wide host range and aggressive feeding behaviour (Pogue and Passoa, 2000) [11]. Species belonging to the genus *Spodoptera* are highly polyphagous, meaning they can feed on a wide variety of plants. The immature stages, particularly the larvae, are known to infest over 100 plant species, many of which hold major economic importance in agriculture (Robinson *et al*., 2010) [13]. These include cereal crops such as maize, sorghum, and rice, as well as commercial crops like cotton, groundnut, and several vegetable species.

The larvae of *Spodoptera* species typically feed gregariously in their early instars, causing rapid and visible damage to the foliage of host plants (Ahmad *et al*., 2007) [1]. They prefer to feed on tender and young leaves, which leads to extensive defoliation and stunted plant growth (Zucchi, 1984) [16]. In severe infestations, the larvae may even attack the growing points, fruits, and flowers, resulting in heavy crop losses (Waterhouse and Norris, 1987) [14]. In certain crops, *Spodoptera* larvae are known to cause specific forms of damage. For instance, in banana and grape plantations, their feeding activity leads to the development of a condition known as the "brown flag syndrome," characterized by the drying and browning of leaf tips and margins (Ranjith *et al*., 1997) [12]. This damage not only reduces the photosynthetic capacity of the plant but can also lead to yield losses ranging between 5% and 10% under severe infestation conditions (Balikai *et al*., 1999) [4]. Due to their wide host range, high reproductive capacity, and remarkable adaptability to diverse environmental conditions, species of the genus *Spodoptera* have emerged as major agricultural pests, particularly in tropical and subtropical regions. Their polyphagous feeding behaviour enables them to infest a large number of economically important crops, including cereals, pulses, oilseeds, vegetables, and commercial crops. In view of the economic importance and increasing incidence of these pests, the present investigation was undertaken to assess the damaging impact of *Spodoptera* species on major agricultural crops in the Aurangabad district of Maharashtra. The observations of the present investigation will contribute to a better understanding of their pest status and provide baseline information for developing appropriate management strategies in the region.

Materials and Methods

This investigation was carried out in the Aurangabad district of Maharashtra, which is located at 19° 54' 3.7944" N 75° 21' 8.9208" E. Adult moth specimens of the genus *Spodoptera* were collected from various agricultural and horticultural fields in the Aurangabad district of Maharashtra between June 2022 and May 2024. Collection was carried out using standard entomological methods, including handpicking, sweep nets, and light traps, to ensure maximum sampling from different crop habitats. The collected moths were euthanized using ethyl acetate in killing jars to preserve their morphological characters. Photographic documentation of the collected specimens, as well as the damaged plant parts showing infestation symptoms, was carried out for accurate record and reference. For long-term preservation, the specimens were properly dried, mounted on entomological pins, and stored in labelled wooden insect boxes. Each specimen was carefully labelled with essential collection data, including the name of the host plant, locality, date of collection, and other relevant information, to facilitate accurate identification, documentation, and future reference. Specimens were carefully examined for all details using a stereoscopic microscope. The obtained specimens were recognized up to the species level using standard literature and keys such as Hampson (1894) [6]; Lefroy and Howlett (1909) [7]; Pogue (2002) [10].

Results and Discussion

A systematic field investigation was carried out from June 2022 to May 2024 in the Aurangabad district of Maharashtra to evaluate the damaging effects of Genus *Spodoptera* on a variety of agricultural and horticultural crops. The study was conducted under natural field conditions and included observations across different cropping seasons, ensuring comprehensive coverage of pest occurrence and damage patterns throughout the year. Regular field surveys were undertaken in cultivated areas to monitor the presence, infestation level, and feeding behaviour of *Spodoptera*n larvae.

During the course of the investigation, considerable damage caused by insect species belonging to the genus *Spodoptera* was documented on several economically important crops. Among the species observed, *Spodoptera frugiperda* and *Spodoptera litura* were found to be the predominant and most destructive pests in the study area. These species exhibited a wide host range and were capable of infesting multiple crop types, indicating their polyphagous nature. These observations indicate that continuous monitoring and early detection are essential for effective management of *Spodoptera* species to reduce crop damage and prevent significant economic losses.

Table 1: Damaging effects of Genus *Spodoptera* on different agricultural crops from Aurangabad district

Sr. No.	Name of Species	Host Plants	Damage Symptoms
1	*Spodoptera frugiperda*	Maize, Sorghum, Sugarcane, Cotton, Soybean, Vegetable crops	Scraping of leaf surface in early instars; window-pane feeding; irregular holes on leaves; whorl damage in maize; presence of frass inside whorl; severe defoliation under heavy infestation
2	*Spodoptera litura*	Cotton, Soybean, Groundnut, Tomato, Cabbage, Pulses	Skeletonization of leaves; irregular feeding holes; complete defoliation in severe cases; feeding on buds and tender shoots; damage to fruits and pods

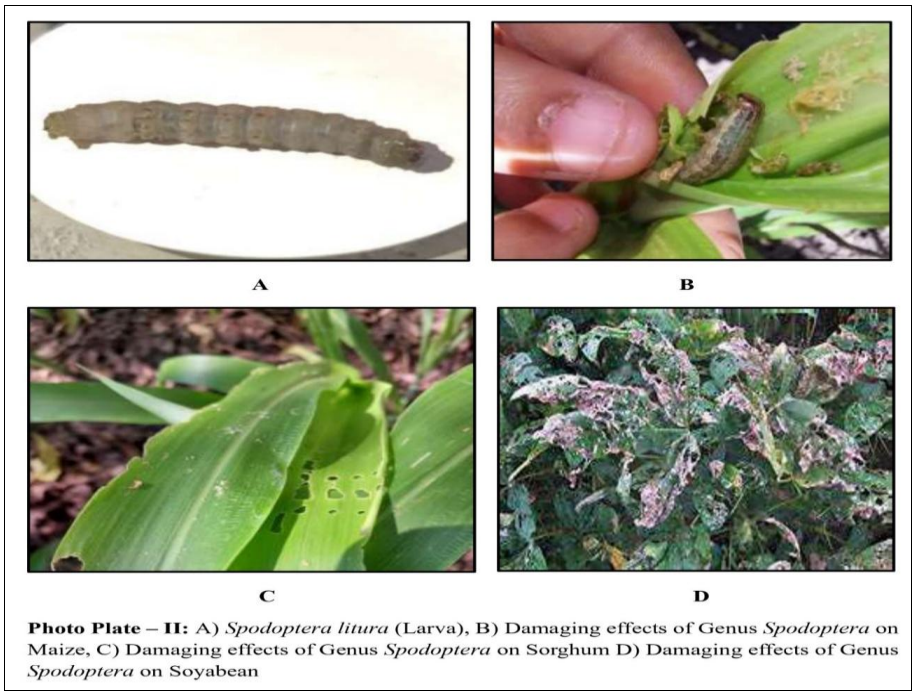

Photo Plate – II: A) *Spodoptera litura* (Larva), B) Damaging effects of Genus *Spodoptera* on Maize, C) Damaging effects of Genus *Spodoptera* on Sorghum D) Damaging effects of Genus *Spodoptera* on Soyabean

The damaging effects of two species of the genus *Spodoptera* recorded on various agricultural crops in the Aurangabad district. The study identified *Spodoptera frugiperda* and *Spodoptera litura* as major pest species affecting multiple host plants. *Spodoptera frugiperda* was observed infesting crops such as maize, sorghum, sugarcane, cotton, soybean, and various vegetable crops. The larvae caused characteristic damage symptoms including scraping of the leaf surface, window-pane feeding, irregular holes on leaves, and severe damage to maize whorls. Under heavy infestation, severe defoliation was recorded, leading to significant reduction in plant vigour and productivity.

Similarly, *Spodoptera litura* was found feeding on cotton, soybean, groundnut, tomato, cabbage, and pulse crops. The larvae caused skeletonization of leaves, irregular feeding holes, and complete defoliation in severe cases. They also fed on tender shoots, buds, fruits, and pods, resulting in direct damage to economically important plant parts and ultimately reducing crop yield and quality. Overall, the present observations highlight the polyphagous nature and destructive feeding behaviour of these *Spodoptera* species, confirming their status as major agricultural pests in the Aurangabad district.

Numerous researchers worldwide have also carried out similar studies to evaluate the impact of species belonging to the genus *Spodoptera* on a wide range of agricultural and horticultural crops. Ahmad *et al*., (2013) [2] surveyed the host range of *Spodoptera litura* in Pakistan and confirmed the polyphagous nature of *S. litura* and its preference for certain herbaceous crops of economic importance. Wijerathna *et al*., (2018) studied the feeding preferences of *Spodoptera frugiperda* (fall armyworm) on maize and several selected vegetable crops. Their study reported that *S. frugiperda* is an invasive and highly destructive pest primarily infesting maize crops. Naharki *et al*., (2020) [9] highlighted that *S. frugiperda* is a highly invasive pest characterized by a wide host range, rapid establishment ability, and strong migratory behaviour. Cao *et al*., (2021) [5] revealed that *S. frugiperda* is capable of completing its entire life cycle when fed on tomato and pepper, indicating these crops can serve as suitable alternative hosts. Madhu *et al*., (2023) [8] reported an unusual incidence of defoliation caused by *Spodoptera litura* on young cocoa saplings (*Theobroma cacao*). Alam *et al*., (2024) [3] concluded that *S. frugiperda* is a highly migratory and destructive pest with the ability to infest a wide variety of crops. It primarily causes severe damage to jade rice, paddy rice, sorghum, sugarcane, cotton, pasture grasses, and sugar beet. The findings of the present study, together with earlier research reports, clearly demonstrate the polyphagous nature and significant damaging potential of the genus *Spodoptera* on a wide range of agricultural and horticultural crops.

Conclusion

The present investigation revealed that species of the genus *Spodoptera* are important agricultural pests causing significant damage to a variety of crops in the Aurangabad district of Maharashtra. The major species recorded were *Spodoptera frugiperda* and *Spodoptera litura*, which showed a wide host range and high infestation levels, especially during the vegetative stage of crop growth. Their feeding activity resulted in leaf damage, defoliation, and reduced plant vigour, leading to yield loss. The present study confirms the polyphagous nature and economic importance of *Spodoptera* species in the region. Regular monitoring and the adoption of integrated pest management strategies are essential to minimize crop damage and ensure sustainable agricultural productivity.

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