

Survey of Insect Pests in Cotton and Soybean Fields across Cardinal Directions of Digras Region, Yavatmal District (Maharashtra, India)

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Abstract

Agriculture is the economic cornerstone of the Digras taluka in Yavatmal district, Maharashtra, where cotton (*Gossypium* spp.) and soybean (*Glycine max*) are principal Kharif crops. The productivity of these crops, however, is severely constrained by a wide spectrum of insect pests, leading to significant economic losses annually. Despite the regional importance of these crops, there has been a notable paucity of systematic, localized entomological surveys, leaving region-specific pest dynamics poorly understood. The primary objective was to identify and document the diversity of major and minor pests across the locality. These fields were strategically selected to represent the four cardinal directions (east, west, north, and south) of the Digras region to ensure a spatially comprehensive assessment. This study provides the first foundational, region-specific pest data for Digras. It underscores the urgent need for targeted pest monitoring and the development of localized Integrated Pest Management (IPM) strategies. This research serves as essential groundwork for future methodological and intervention-focused studies aimed at enhancing crop productivity and supporting the livelihoods of local farmers.

Keywords: Cotton pests, Soybean pests, Sap-sucking insects, Pest survey Maharashtra, Integrated Pest Management (IPM)

Introduction

Agriculture remains the cornerstone of India's economy, with a significant portion of the rural population relying on it for their livelihood. In the Vidarbha region of Maharashtra, the Digras taluka of Yavatmal district plays a vital role in the cultivation of major Kharif crops, notably cotton (*Gossypium* spp.) and soybean (*Glycine max*). These crops not only contribute substantially to the local agrarian economy but also serve as key commodities in both national and international markets. However, the productivity of these crops is severely threatened by a wide spectrum of insect pests, whose infestation leads to considerable economic losses every year. Cotton, often referred to as the "white gold" of Maharashtra, is highly susceptible to a complex of pests including *Helicoverpa armigera*, *Spodoptera litura*, *Aphis gossypii*, and the notorious pink bollworm (*Pectinophora gossypiella*). Similarly, soybean, which serves as a major oilseed and protein crop, is frequently attacked by pests such as *Spodoptera exigua*, *Nezara viridula*, *Bemisia tabaci*, and *Etiella zinckenella*. These pests not only damage the crops directly by feeding on various plant parts but also act as vectors for viral and fungal diseases, compounding their impact on crop yield and quality. The agro-climatic conditions of Digras—characterized by semi-arid weather, black cotton soils, and monsoon-dependent rainfall—create a conducive environment for the emergence and

proliferation of a diverse range of insect pests. Despite the economic and agronomic importance of this region. The research will also aim to analyse seasonal fluctuations, population trends, and damage potential of both major and minor pest species over the cropping period. Comparative pest profiling between cotton and soybean in the same microregion, and the lack of ground-level data linking field incidence to local farmer practices. This study will contribute valuable insights into the ecological entomology of the region.

Review of Literature

Several key studies have established the pest complex affecting cotton. Nag rare N., et al. Provide a recent, comprehensive overview by examining the seasonal population trends of various pests and their natural enemies across different cotton species and cultivars in India. This broad context is narrowed by a study in the Online-Access to Scientific Journals (OAJI), which focused on the *Major Cotton Pest in Akot Region District Akola, Vidarbha*. This localized study identified a pest complex of bollworms, jassids, aphids, thrips, and whiteflies, which is highly relevant to the adjacent Digras region. The pink bollworm (*Pectinophora gossypiella*) has received specific academic attention due to its economic impact. Dake, R. B., et al. (2021) conducted a detailed study on the seasonal incidence of pink bollworm, providing a scientific basis for understanding its population dynamics in Bt Cotton. Furthermore, the *Genetic Diversity in the Vidarbha Region's Pink Bollworm* specifically used adult populations collected from Yavatmal and other districts, Confirming the pest's strong, localized presence.

Regarding other cotton pests, Y Rajashekar et al. On the *Incidence Pattern of Sucking Insect Pests* is particularly noteworthy. It moves beyond simple identification to analyse pest pressure variations *within* the plant canopy, emphasizing that jassids and other sucking pests can cause yield losses as high as 21.2% in certain cultivars. For the dusky cotton bug, the foundational work by Thangavelu, K. (1978) remains critical, as it analysed the population dynamics of *Oxycarenus laetus* and its relationship with climatic variations.

On the soybean front, research has identified a different but equally damaging set of pests. A. S., et al. (n.d.) investigated the *Seasonal Incidence of Major Pests of Soybean* and its direct correlation with weather parameters, providing a predictive framework for pest outbreaks. Two pests are consistently highlighted the girdle beetle and the pod borer. A study by RS Chouhan et al. detailed its method of stem girdling and tunnel formation, which leads to significant yield reductions.

For the legume pod borer, the comprehensive review by Sharma, H.C (1998) is a seminal work. It covers the complete bionomics, host plant resistance, and management of *Maruca vitrata*, a pest known to cause devastating harvest losses by damaging flowers and young pods. It also addresses the critical human and economic impact of these pest outbreaks. A report highlighted the severe harm to farmers in Vidarbha, who face pesticide-related health issues from extensive spraying. This reporting emphasizes the urgent need for sustainable solutions. Addressing this need, the recent work by D. K., Warade, S. V., et al. (2024) evaluates the *Impact of Integrated Pest Management (IPM) Technology* on cotton crops in the Vidarbha region. Their study analyses the disparities in yield and technology adoption, providing crucial data on the effectiveness of current IPM strategies. Collectively, this body of research confirms the significant, region-specific pest pressures on both cotton and soybean in Vidarbha.

Origin of the Work

The motivation for this study stems from the critical reliance of the Digras region on the Kharif crops of cotton and soybean. While these crops are the "white gold" and economic pillars of Yavatmal district, farmers face stagnant yields due to escalating pest pressures. This work originated to fill a specific research gap the lack of high-resolution, localized entomological data that accounts for spatial variation within the Digras taluka. By surveying across cardinal directions, this study seeks to understand if geographical orientation and local micro-climates influence pest colonization patterns

Research Objectives

- . Spatial Distribution Analysis: To evaluate the diversity and abundance of insect pests in cotton and soybean across the North, South, East, and West sectors of Digras.
- . Taxonomic Identification: To identify and categorize major and minor pests, focusing on sap-sucking complexes and bollworms in cotton, and leaf-feeders and stem-borers in soybean.
- . Seasonal Dynamics: To document the population trends of key pests (like the Pink Bollworm or Girdle Beetle) during the peak cropping season.
- . IPM Groundwork: To establish a localized pest inventory that serves as a baseline for implementing sustainable Integrated Pest Management (IPM) practices search Objectives

Significances

Economic Impact - Providing farmers with precise knowledge of when and where pests emerge can prevent the 21.2% yield loss often attributed to sucking pests.

Ecological Sustainability- By identifying "hotspots" in specific cardinal directions, farmers can move away from "blanket spraying" toward targeted interventions, reducing pesticide-related health issues.

Academic Contribution- This serves as the first foundational inventory for the Digras region, providing a reference for future entomological researchers

Materials and Methods

Study Area: Digras Taluka, Yavatmal District. Four sites were selected representing the cardinal points (e.g., North, South, East, West) to ensure a comprehensive spatial survey.



Map of Digras Taluka



Working Site



Cotton and Soyabean fields according to cardinal directions

Study Duration

The study was carried out over a period from September 2025 to December 2025. Fields surveys were mainly conducted weekly during the morning hours.

Materials used

Mobile phone (Apple iPhone 12) for capturing images
Field notebook and pen for recording observation

Methodology

Field Surveillance

Weekly Surveillance - Each selected field was visited once a week to track the progression of pest populations and identify the emergence of different species. Random Plant Selection - In each field, 5–10 plants were randomly selected using a "Z" or "W" walking pattern to ensure unbiased observation. Detailed visual inspections were conducted on various plant parts, including the upper and lower surfaces of leaves, stems, flowers, and fruiting bodies, Digital Documentation (Mobile Photography) The primary tool for data collection was mobile photography. This method allowed for the recording of pests without disturbing the local ecosystem.

Imaging Protocol -Macro-photography was employed to capture clear, detailed images of sap-sucking pests (aphids, jassids, whiteflies) and larger lepidopteran larvae.

Damage Symptoms -Photographs were also taken of specific crop damage, such as leaf curling, stem tunnelling (by Girdle Beetle), and punctured bolls.

Result and Observation: -

Spatial Distribution of Identified Insect Pests in Cotton

This table organizes observations of the specific Cotton pests identified during the weekly field surveillance conducted in Digras Region from September to December 2025.

Direction	Observation 1: Primary Pest and Stage	Observation 2: Secondary Pest and Damage Symptom
North	Pink Bollworm (<i>P. gossypiella</i>) Late-stage larva found inside maturing bolls.	Cotton Jassids (<i>A. biguttula</i>) Nymphs observed on the lower leaf canopy causing initial yellowing.
South	Mealybug (<i>P. solenopsis</i>) Waxy white colonial masses observed on the main stem.	Pink Bollworm (<i>P. gossypiella</i>) Premature boll dropping and internal lint staining.
East	Cotton Aphids (<i>A. gossypii</i>) Clusters of nymphs on young shoots and apical buds.	Cotton Jassids (<i>A. biguttula</i>) Characteristic "hopper burn" (yellowing/curling) on leaf margins.
West	Whitefly (<i>B. tabaci</i>) Adults observed on the ventral side of leaves.	Pink Bollworm (<i>P. gossypiella</i>) "Double flower" symptom observed during the peak flower ↓se.

Spatial Distribution of Identified Insect Pests in Soybean

This table organizes observations of the specific soybean pests identified during the weekly field surveillance conducted in Digras Region from September to December 2025.

Direction	Observation 1: Primary Pest and Stage	Observation 2: Secondary Pest and Damage Symptom
North	Tobacco Caterpillar (<i>S. litura</i>) Early instar larvae found clustered on young leaves.	Stem Fly (<i>M. sojae</i>) Larval entry points observed near the basal nodes of the stem.

South	Stem Fly (<i>M. sojae</i>) Adult fly documented during oviposition on the leaf surface.	Whiteflies (<i>B. tabaci</i>) Adult colonies documented on the ventral side of lower leaves.
East	Whiteflies (<i>B. tabaci</i>) Nymphs and adults found on the underside of apical foliage.	Tobacco Caterpillar (<i>S. litura</i>) Mid-stage larvae causing characteristic leaf skeletonization.
West	Tobacco Caterpillar (<i>S. litura</i>) Late-stage larvae observed feeding on developing pods.	Stem Fly (<i>M. sojae</i>) Internal red-brown tunneling revealed in stem cross-sections.

Conclusion

The research successfully established the first foundational pest inventory specifically tailored to the Digras region. It concludes that while the pest complex remains consistent with broader Vidarbha trends. The findings confirm that Pink Bollworm remains the most critical threat to "white gold" Cotton productivity, while Stem Fly and Tobacco Caterpillar serve as primary constraints on soybean yields. By bridging the gap between academic entomology and field reality.

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