

Invasive Insects

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Summary

Non-native or exotic insect species that exist outside of their naturally adapted habitat and capacity for spread are considered invasive. Characterizing and measuring the effects of invasive alien species on native species and their ecosystems is still a vital issue in conservation biology, despite the fact that they have been designated as the second largest danger to biodiversity after habitat loss. The important natural agricultural systems that support our way of life and biodiversity are being severely harmed by these species. There are growingly severe direct and indirect health repercussions, and environmental and natural resource degradation is frequently irreversible. Through knowledge sharing about invasive pests and their natural adversaries, international cooperation can reduce the impact of insect pest invasion. The coordinated interdisciplinary activity of researchers aids in the identification and evaluation of their ecological issues.

Introduction

Non-native or exotic organisms that exist outside of their naturally occurring, suited habitat and capacity for dissemination are considered invasive insect pests. However, when intentionally or inadvertently transported outside of their natural habitats into new places where they have the ability to establish, invade, and outcompete native species, some invasive insect pests become invasive. Invasive insect pests are defined as those that establish themselves in natural or seminatural ecosystems or habitat and endanger native biological diversity, according to the International Union for Conservation of Nature and Natural Resources (IUCN). Over the world, invasive species are widely present in a variety of environments. International trade in agricultural products has expanded as a result of globalization, and the risk of invasive insect pests entering India has increased due to the movement of seeds and planting materials. These insect pests have the capacity to proliferate greatly and harm crop plants and economically significant plant species. The lack of natural adversaries and

favourable environmental conditions causes invasive insect pests to spread to newly introduced areas. The National Plant Protection Organization (NPPO) has used legal measures to reduce the unintentional or deliberate spread of plant pests into recently established areas. The Destructive Insect and Pest Act, 1914 is implemented in India by the Directorate of Plant Protection, Quarantine and Storage through the Plant Quarantine (Regulation of Import into India) Order, 2003. This order guards against the entry, establishment, and spread of exotic plant pests into India, thereby preserving horticulture, forest trees, and agriculture.

Various Orders of Insects that Invaded India

All the invasive pests that invaded India belongs to different orders. Sixty-three percent of all invasive insects were Hemipterans, 13% lepidopteran, 9% coleoptera, 6% Diptera, 6%Hymenoptera, 3% Thysanoptera. (Daniel *et al.*, 2020)

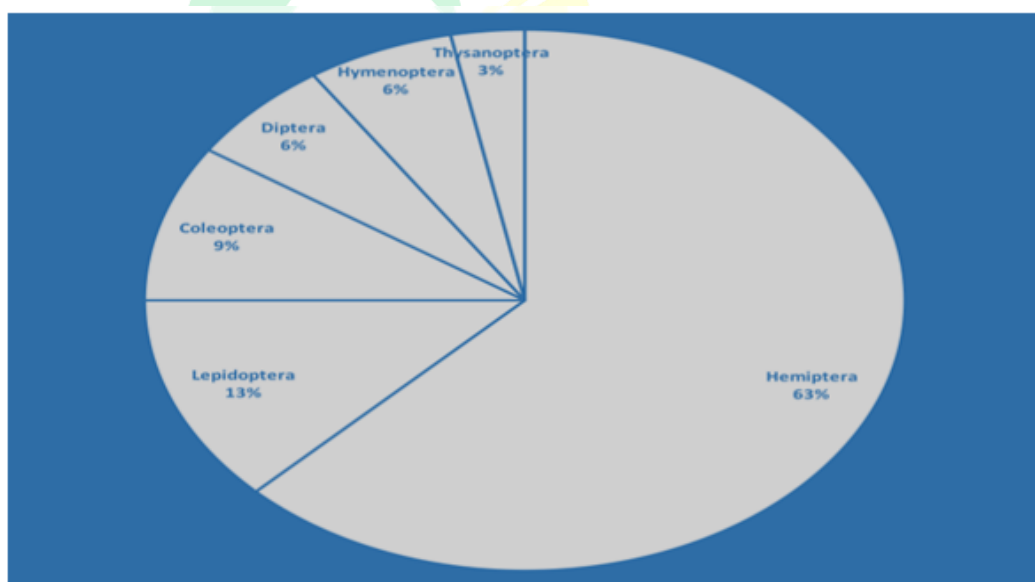


Fig. 1 : Different insect orders that invaded India.

Some of the Invasive Pests in India are Listed Below

- **Woolly apple aphid, *Eriosoma lanigerum*** (Aphididae: Homoptera): During the 18th century, this pest was transported to India by means of Chinese apple rootstock imports. It was originally noted in Conoor in 1889, and reports of it from Kumaun in the Uttarakhand Hills came in 1909. Mostly targeted host include pears and apples .



- **San Jose scale**, *Quadraspidiotus perniciosus* (Diaspididae: Homoptera): Originating in China, the San Jose scale made its way to India in 1911 and attained pest status in fruit orchards and tree plantations by 1933. Targeted hosts plants include *Populus spp.*; *Salix spp.*; *Aesculus spp.*; *Alnus spp.*; *Betula spp.*; *Celtis spp.*; *Fagus spp.*; *Morus spp.*
- **Cottony cushion scale**, *Icerya purchase* (Margarodidae: Homoptera): In 1921, it was unintentionally brought to India. *Acacia decurrens* and *A. deabata* are among the many additional forestry and agricultural plant species that serve as hosts.
- **Potato Tuber moth**, *Phthorimaea operculella* (Lepidoptera: Gelechiidae): It was brought to India in 1937 together with imported potatoes from Italy and has since expanded throughout the country. It is available practically everywhere in the world. It is a severe pest of potatoes that have been stored. Hosts: Tomato, tobacco, brinjal, and beet.
- **Diamond back moth**, *Plutella xylostella* (Linn.) (Plutellidae: Lepidoptera): The Diamond Back Moth was initially discovered in India in 1914 on cruciferous vegetables. Today, it can be found everywhere crucifers are farmed in India.



Cabbage, cauliflower, radish, turnip, beetroot, mustard, and knoll khol (rabi) are among the hosts.

- **Serpentine leaf miner**, *Liriomyza trifolii* (Agromyzidae: Diptera): In 1990–1991 the serpentine leaf miner, *Liriomyza trifolii*, inadvertently made its way into India. This polyphagous species is particularly harmful to peas, cucurbits, tomatoes, castor, and ornamental plants, impacting over 78 annual plant species.



- **Coffee berry borer**, *Hypothenemus hampei* (Scolytidae: Coleoptera): It is thought that the coffee berry borer is indigenous to northeastern Africa. In 1990, Gudalur in the Nilgiris was the first place in India where it was documented.



- **Spiraling whitefly**, *Aleurodicus disperses* (Aleyrodidae: Homoptera): The initial reports of it came from Kerala in 1993, and following reports came from other regions of the Indian peninsula. It is extremely polyphagous, impacting 481 different types of host plants



- **Papaya Mealy bug**, *Paracoccus marginatus* (Pseudococcidae; Hemiptera): The infestation was initially discovered in 2007 in Coimbatore, Tamil Nadu, on Papaya. In 2009, the insect reached the position of important pest throughout the nation, severely harming cotton, mulberries, tapioca, Jatropha, and



various other fruits, flowers, and plantation crops in Tamil Nadu, where it caused 90% of the damage.

- **South American tomato leaf miner, *Tuta absoluta*** (Lepidoptera: Gelechiidae): In the 2014 rabi season, *Tuta absoluta*, the tomato leaf miner, was first observed on tomatoes at the Indian Institute of Horticultural Research (IIHR), Hesaraghatta, Bengaluru, Karnataka, India. *T. absoluta* was found on two hosts, potatoes and tomatoes, with a larger incidence on the former than the latter.
- **Fall Armyworm, *Spodoptera frugiperda*** (J.E. Smith) (Lepidoptera: Noctuidae): Numerous sites in Karnataka have reported seeing *Spodoptera frugiperda* feeding on maize crops. There are reports of *S. frugiperda* occurrences in southern India, along with related natural enemies. From July to August 2018, severe damage was observed in Hassan, Shivamogga, Davanagere, Chitradurga, and Chikkaballapur.



. Strategies for prevention of invasive species

Identifying invasive alien species is crucial for prevention. Blacklisting them and prohibiting entry under national legislation is necessary. Whitelisting safe species after risk assessment, but monitoring is necessary. Most species are unknown and should be placed on a grey list. Invasive pests significantly impact the environment and agricultural production, with continuous changes in crop losses and insect-pest problems due to advancements in agricultural technology and biotic/abiotic factors. To control invasive species, following steps like identification, risk assessment, eradication planning, risk assessment review, and pestmonitoring should be adopted. Developing a national strategy with interdisciplinary



coordination for identifying invaded organisms, assessing ecological problems, ecosystem concerns, economic damage, and control methods should be considered.

Conclusion

Globalization has led to the invasion of insects, causing significant damage to native flora and fauna, and causing species extinction. Increased international agricultural trade and seed movement increase the risk of introducing invasive pests into India, highlighting the need for natural enemies as control measures.

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