

# An Overview of Invasive Insect Pests in India

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**Introduction**

The proliferation of invasive species poses a significant and swiftly escalating menace to agricultural diversity, human and animal well-being, livelihoods, forestry, and overall biodiversity. This phenomenon leads to substantial economic losses. Invasive insect pests are organisms that are not native to a specific area, being exotic and found outside their natural adapted habitat and dispersal potential. Nevertheless, certain invasive insect pests gain their invasive status through intentional or unintentional introduction into new areas where they demonstrate the ability to establish, invade, and outcompete native species. As defined by the International Union for Conservation of Nature and Natural Resources (IUCN), an invasive insect pest is one that establishes itself in natural or seminatural ecosystems, posing a threat to native biodiversity. These invasives are

prevalent in ecosystems worldwide. The rise of globalization has increased the risks associated with international agricultural trade and the movement of seeds and planting materials, leading to the introduction of invasive insect pests into India. These pests have the capacity to multiply rapidly, causing significant damage to economically important plant species and crops.

In India, the Directorate of Plant Protection, Quarantine, and Storage oversees the enforcement of the Destructive Insect and Pest Act of 1914 via the Plant Quarantine (Regulation of Import into India) Order of 2003. This is aimed at preventing the introduction, establishment, and proliferation of foreign plant pests into India, with the goal of protecting agriculture, horticulture, and forest tree plants.

### Steps of Invasion

**Introduction:** The introduction of invasive species can occur through different channels, including long-distance migrations or movements (illustrated by the brown planthopper, *Nilaparvata lugens*, in rice), transportation (for instance, *Parthenium* traveling with wheat grains in India), human activities, and aquarium plants like water fern and water lettuce.

**Establishment:** After successfully surmounting the environmental challenges in the new area, the invaded species establishes itself, reaching a stage where populations are

substantial, and the likelihood of local extinction due to environmental factors becomes minimal.

**Spreading:** For a species to expand into locations beyond its initial introduction sites, it must also surmount obstacles to dispersal within the new region, adapting to the abiotic environment and biota present in that area.




**Naturalization:** Naturalization initiates when both the abiotic and biotic challenges to survival are overcome, and various obstacles to regular reproduction are successfully surmounted.

### Current status of invasive insect pests in India

India has experienced the introduction of 173 invasive species, encompassing 54 terrestrial plants, 56 aquatic organisms, 47 entities with


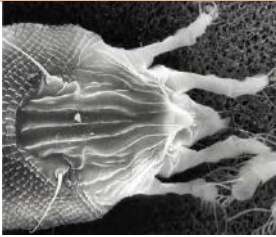

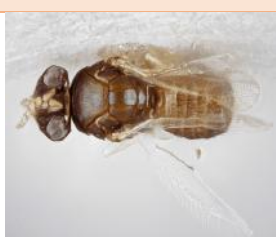



agricultural significance, and 14 organisms specific to island ecosystems. Additionally, 27 insect pests have been introduced to India.









**Table 1:** List of invasive insect pests recorded in India



Common name	Scientific Name	Image of pest	Entry to India (Place)	From/ Native	Host	Symptoms	Natural enemies	References
Woolly apple aphid	<i>Eriosoma lanigerum</i> (Hausmann) (Hemiptera)		1889 Coonoor, Tamil Nadu/ 1909 Uttar Pradesh	China / America	Apple, pear	Nymphs and adult individuals extract sap, causing harm to roots through the development of swellings, resulting in an unhealthy appearance of plants and potential death.	<b>Parasitoids</b> <i>Aphelinus mali</i> <b>Predators</b> <i>Coccinella septempunctata</i> , <i>Coccinella transversoguttata</i> , <i>Ballianacharis</i> , <i>Chrysopa nigricornis</i> , <i>uropygialis</i> , <i>Coleophora sunzetti</i>	Thakur and Dogra, 1980
Potato tuber moth	<i>Phthorimaea operculella</i> Zeller (Lepidoptera)		1906-(East Bengal now in Bangladesh)	Italy	Potato, Tobacco, tomato, Brinjal, beet	Caterpillars engage in leaf mining and create holes in tender shoots and tubers.	<b>Parasitoids</b> <i>Chelonus blackburni</i> , <i>Copid osoma kochleti</i> <b>Predators</b> <i>Chrysoperla zastrowi</i> , <i>Orius albidipennis</i> ,	Lefroy, 1907
San Jose scale	<i>Quadaspidiotus perniciosus</i> (Comstock) (Hemiptera)		1911- Kashmir	China	Populus spp., Salix spp.; Alnus spp. Betula spp Celtis spp. Fagus spp Morus spp.	Nymphs and adults individuals typically suck the cell sap, Severe infestations on the bark lead to gumming, posing a fatal threat to the plant. Pink discoloration surrounds areas affected by the presence of scales.	Parasitoids <i>Aphytis sp.</i> , <i>Novaproclia sp.</i> , <i>Encarsia perniciosi</i> , <i>Teleterbratus perversus</i> Predator <i>Chilocorus infernalis</i>	Fotedar, 1941

<b>Diamond back moth</b>	<i>Plutella xylostella</i> (Lepidoptera)		1914 -Tamilnadu	Europe	Cruciferous vegetables	The mining and skeletonization of leaves occur, and caterpillars also bore into cabbage heads.	<b>Parasitoids</b> <i>Brachymeria excarinata</i> , <b>Predators</b> <i>Motacilla flava</i> , <i>Pheidole</i> spp., <i>Camponotus sericeus</i>	Fletcher ,1914
<b>Lantana bug</b>	<i>Orthezia insignis</i> (Brownie) (Hemiptera)		1915-Nilgiri	Sri Lanka / West Indies	Coffee, Citrus, Brinjal etc.	Reproduction is parthenogenetic. Bug feeds by sucking the sap from the phloem.	<b>Predator</b> <i>Hyperaspis pantherina</i>	Muniappan <i>et al.</i> , 1986
<b>Cottony cushion scale</b>	<i>Icerya purchase</i> (Maskell) (Hemiptera)		1920 Tamil Nadu	Australia	<i>Acacia decurrens</i> , <i>Acacia dealbata</i>	The insect functions as a sap-sucking organism, releasing a substantial quantity of honeydew, which promotes the growth of sooty mold. This eventually hampers photosynthesis and reduces crop yield.	<b>Predator</b> <i>Rodolia cardinalis</i>	Rao, 1951
<b>Pine woolly aphid</b>	<i>Pineus pini</i> (Macquart) (Hemiptera)		1970/ Nilgiris, Tamil Nadu	Western & Central Europe	Pine trees	The aphid consume plant shoots, resulting in dieback starting from the tip.	Anthocorid bugs- <i>Tetraphleps raii</i> , <i>T. abdulghanii</i> Ghauri	McAvoy <i>et al.</i> , 2007
<b>Subabul psyllid</b>	<i>Heteropsylla cubana</i> Crawford (Hemiptera)		1988 Tamil Nadu & Bangalore	Central America	<i>Leucaena</i> sp.	These insects are sap suckers from the young shoots, leaves and inflorescences.	Lady beetle, <i>Curinus coeruleus</i> Mulsant from Mexico	Veeresh, 1990
<b>Coffee berry borer</b>	<i>Hypothenemus hampei</i> Ferrari (Coleoptera)		1990 Gudalur, Tamilnadu	Northeast Africa	Arabica and robusta types coffee	The fertilised female bores an entrance hole at the terminal pore or in the calyx ridge of the differential tissue that surrounds the pore and lays bean shaped eggs.	<b>Parasitoids</b> <i>Prorops nasuta</i> , <i>Cephalonomia stephanoderis</i> , <i>Phymastichus coffea</i> , <i>Cephalonomia stephanoderis</i>	Kumar <i>et al.</i> , 1990
<b>Serpentine leaf miner</b>	<i>Liriomyza trifolii</i> (Burgess) (Diptera)		1991 Hyderabad, Telangana	Florida (U.S.A.)	Tomato, Castor, Cucurbits, Ornamental plant etc.	The mature female uses its ovipositor to create punctures in the leaf tissue, serving both for feeding and laying eggs. The hatched larvae then tunnel through the leaf, consuming the mesophyll region and forming a serpentine structure.	<b>Parasitoid</b> <i>Hemiptarsenus varicornis</i>	Viraktamath <i>et al.</i> , 1993



<b>Spiralling whitefly</b>	<i>Aleurodicus disperses</i> Russell (Hemiptera)		1993 Kerala	Central America	Wide range of plants (481 hosts)	Nymphs and adults suck sap from host plants. Premature leaf drop.	<i>Encarsia haitiensis</i> and <i>E. Guadeloupe</i>	Palaniswami <i>et al.</i> , 1995
<b>Coconut Eriophid mite</b>	<i>Aceria gurreronis</i> Keifer (Arachnida)		1997 Enakulam, Kerala	Mexico	Coconut	Nuts are discoloured resulting in the reduction of market value	<b>Predator</b> <i>Neoseiulus baraki</i> <b>Fungal pathogen</b> <i>Hirsutella thompsonii</i>	Sathiamma <i>et al.</i> , 1998
<b>Silver leaf whitefly</b>	<i>Bemisia argentifolii</i> (Hemiptera)		1999- kolar, karnataka		Tomato, Cucumber, Squash, Eggplants, Okra, Beans, and Cotton	Tomato leaf curl virus transmitted by adults, Sooty mould development due to honeydew secretion	<b>Parasitoids</b> <i>Encarsia formosa</i> , <i>Eretmocerus eremicus</i> <b>Funga</b> <b>Ipathogens</b> <i>Lecanicillium lecanii</i> , <i>Beauveria bassiana</i>	Singh, 2004
<b>Eucalyptus gall wasp /Blue gum chalcid</b>	<i>Leptocybe invasa</i> Fisher & La Salle (Hymenoptera)		2001 Karnataka/ Tamil Nadu	Australia	<i>Eucalyptus</i> spp.	<i>L. invasa</i> deposits eggs in shoot bark or leaf midribs. The resulting small, white larvae create galls on the midribs of leaves, petioles, and twigs, causing inhibited growth, lodging, dieback, and ultimately leading to the death.	Megastigmus sp.	Jacob <i>et al.</i> , 2007
<b>Erythrina gall wasp</b>	<i>Quadrastichus erythrinae</i> Kim (Hymenoptera)		2006 Kerala	Tanzania, East Africa	black pepper, <i>Erythrina</i> sp.	Wasp forms galls on the leaves, stems, petioles, and youngs. Due to galls there reduction in size and number eventually decreases the growth.	<b>Eulophids</b> - <i>Quadrastichus ingens</i> , <i>Q. gallicola</i> , <i>Q. bardus</i> , <i>Aprostocetus nitens</i>	Faizal <i>et al.</i> 2006
<b>Cotton mealy bug</b>	<i>Phenacoccus solenopsis</i> (Hemiptera)		2006 Gujarat	Central america	Cotton, brinjal, okra,	stunting, yellowing, distortion and premature drop of leaves and fruits	<b>Parasitoid</b> <i>Aenasius bambawalei</i>	Tanwar <i>et al.</i> , 2007
<b>Papaya mealy bug</b>	<i>Paracoccus marginatus</i> (Hemiptera)		2007 Coimbatore, Tamil Nadu	Mexico	Mulberry, tapioca, <i>Jatropha</i> , cotton	Stylets inserted into leaves and skin of the fruits and suck the sap. Sooty mould is developed disturbing photosynthesis	<b>Parasitoid</b> <i>Acerophagus papayae</i> <b>Predator</b> <i>Cryptolaemus montrouzieri</i>	Tanwar <i>et al.</i> , 2010

Jack Beardsley mealybug (Banana)	<i>Pseudococcus jacobbeardsleyi</i> Gimpel and Miller (Hemiptera)		2012 Karnataka	America	Banana	infests fruit, stems and foliage, Honeydew and/or sooty mould, Wilting leaves, White dusty residue, Dead leaves or branches.	<b>Parasitoid</b> <i>Acerophagus papayae</i> <b>Predator</b> <i>Cryptolaemus montrouzieri</i>	Shylesh, 2013
South American tomato pinworm/ Tomato leaf minor	<i>Tuta absoluta</i> (Meyrick, 1917) (Diptera)		2014 Pune, Maharashtra	South America	Tomato, Chilli, Potato, Brinjal	Larvae feed on leaves, buds, stalks, and fruits, causing visible blotches on both sides of the leaves, and filling pinholes on fruits at the stalk end with their excrement.	<b>Parasitoid</b> <i>Trichogramma achaea</i> <b>Predator</b> <i>Nesidiocoris tenuis</i>	Shashank et al., 201
Black thrips	<i>Thrips parvispinus</i> (Thysanoptera)		2015- Bengaluru, Karnataka	Indonesia	Papaya, Pepper, Patoto, Brinjal	They cause leaf curling, flower drop, fruit distortion, and discoloration.		
Rugose spiralling whitefly	<i>Aleurodicus rugipericulatus</i> Martin (Hemiptera)		2016 Tamil Nadu	Central America	Coconut, guava, mango, drumstick, jackfruit	Young ones and adults suck the sap from leaves by remaining ventral surface of the leaves	<b>Parasitoid</b> <i>Encarsia</i> sp.	Srinivasan et al., 2016
Fall armyworm	<i>Spodoptera frugiperda</i> (JE Smith) (Lepidoptera)		2018 Karnataka	America	Maize, Sorghum, Wheat, Groundnut, Rice, cotton, millet	Larvae consume leaves through scraping and skeletonization, resulting in a silvery transparent membrane. the larvae feed on the primordial shoot and tassel, causing the characteristic dead heart symptom.	<b>Parasitoids</b> <i>Telenomus</i> sp., <i>Trichogramma</i> sp.	Shylesha et al., 2018
Woolly whitefly	<i>Aleurotrixius floccosus</i> (Hemiptera)		2019	Neotropical	Guava, <i>Citrus</i> sp ecies	sucking the sap and secondly by excreting honey dew.	<b>Parasitoid</b> <i>Cales noacki</i>	Sundararaj et al., 2019
Neotropical whitefly	<i>Aleurotrachelus atratus</i> Hempel (Hemiptera)		2019 M.P./ Bangalore	Brazil	Coconut, Palm		<b>Parasitoid</b> <i>Encarsia</i> spp. <b>Predators</b> <i>Dichochrysa astour</i> , <i>Cybocephalus</i> spp	Selvaraj et al., 2019
Cassava mealybug	<i>Phenacoccus manihoti</i> (Hemiptera)		2020 Kerala	Africa	Cassava	Twisting of stem and reduced internodes, welling of the stem or shoot system, Stunted growth	Parasitoid wasp	

Mango soft scale	<i>Fistulococcus pokfulamensis</i> (Hemiptera)		2023 Karnataka	Mango	Insects that can damage trees by feeding on the sap in branches	Ant, Chalcid parasitoid	Joshi, <i>et al.</i> , 2023
Apple leaf blotch minor	<i>Leucoptera malifoliella</i> (diptera)		2023 kashmir	Apple	dark green circular patches on upper surface of leaf, In maturity it also develops on lower surface of the leaf, Small black acervuli are visible on the surface of leaf.	Apple leaf blotch minor	—

### Conclusion

The incursion of insects was a consequence of globalization, and the invasive insect pests inflicted significant harm on indigenous flora and fauna, leading to the extinction of certain species. When these species lack their natural predators that control their population in their

native habitat, they can proliferate extensively and cause damage to economically crucial plant species and crops. Therefore, it is crucial to be aware of recent invasive insect pests to safeguard crops and prevent economic losses.

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