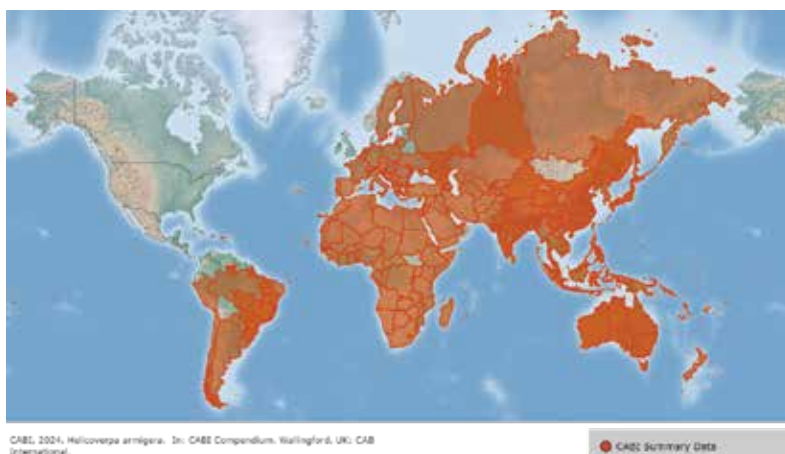


Helicoverpa armigera: An emerging pest of menthol mint in India

Menthol mint (*Mentha arvensis* L.), an important medicinal and aromatic crop extensively cultivated across various states in India, holds substantial economic importance, particularly for smallholder farmers due to its profitability and high demand for essential oil in industries such as pharmaceuticals, cosmetics, and flavours. The cultivation of menthol mint in India faces a significant threat from *Helicoverpa armigera* (Lepidoptera: Noctuidae), commonly known as the American bollworm, which inflicts severe damage during the early to mid-vegetative growth stages. This nocturnal pest defoliates the crop, impacting yields and profitability. Implementing integrated pest management strategies, including cultural, mechanical, biological, and chemical controls, is crucial to mitigate its impact and ensure sustainable menthol mint production.

MENTHOL mint, scientifically known as *Mentha arvensis* L., belonging to the Family Lamiaceae, is commonly referred to as Japanese mint. It holds significant importance as both an aromatic and medicinal crop, cultivated across several states in India, including Uttar Pradesh, Uttarakhand, Bihar, Punjab, Haryana, and Madhya Pradesh. This aromatic perennial herb is extensively grown during the summer season, serving as a valuable industrial cash crop. Its cultivation is particularly favoured by smallholder farmers due to its capacity to yield substantial profits in a relatively short period, primarily through the extraction of essential oil from its aboveground herbage. The essential oil derived from menthol mint, along with its derivatives, commands a high demand across various industries, including pharmaceuticals, cosmetics, food, tobacco, flavours, and perfumery. In India, menthol mint is cultivated across approximately 3.25 lakh hectares, resulting in the production of 65 thousand tonnes of menthol mint essential oil. India stands as the leading producer and exporter of this essential oil, holding a notable 80% share in the global market. The cultivation of menthol mint typically occurs as a short-season crop from February to June. Farmers employ two methods of cultivation viz. direct sowing of suckers and transplanting of nursery-raised seedlings. The commercial cultivation of menthol mint faces numerous challenges, including the impact of climatic factors such as rainfall and high temperature, as well as high water requirements and biotic stresses. These biotic stresses encompass insect pests, diseases, and weeds, all of which contribute to lower productivity levels. Among the insect

pests, lepidopteran pests cause defoliation in menthol mint crops which hinders the vegetative growth of the crop. Among the different lepidopteran pests, *Helicoverpa armigera* is emerging as a major problem in menthol mint cultivation. *Helicoverpa armigera*, commonly known as the American bollworm or cotton bollworm, is a significant agricultural pest in India. It has a wide distribution across the country and is found in various agro-climatic regions, including both rainfed and irrigated areas. In India, *H. armigera* inflicts damage on a broad range of crops, posing a significant threat to agricultural productivity and food security. Some of the major crops targeted by this pest include cotton, chickpea, pigeon pea, soybean, maize, sorghum, pearl millet, tomato, marigold, and tobacco. In the 1970s, a moderate incidence of *H. armigera* on menthol mint was reported in Punjab, India. Since 2019, this pest has again emerged as a serious pest of menthol mint in



Global distribution of *Helicoverpa armigera* (Source: CABI)

major growing areas of Uttar Pradesh. Severe defoliation by *H. armigera* during the early to mid vegetative growth stage of the menthol mint crop has led farmers to use various groups of insecticides to manage this pest. In Uttar Pradesh, the severe outbreak of this pest has been noticed during the months of March to May with defoliation of the vegetative state of the menthol mint. Owing to its wide distribution in the tropics and subtropics besides high adaptability, *H. armigera* can infest over 200 plant species and pose a serious threat to crops. Currently, it is emerging as a serious pest of menthol mint in the Indo-Gangetic plains of India and causing a significant economic impact on menthol mint growers.

Effective pest management strategies are crucial to mitigate its damage to ensure sustainable menthol mint production.

Favourable factors for outbreak

A high temperature of 40-43°C, low relative humidity, lack of rainfall and drought stress resulting from rainfall shortages favours the outbreak of *H. armigera*. Winds help in the migration of moths to long distances. In north India, the pest migrates from *rabi* crops (e.g. chickpea, potato, vegetable crops) and weed host plants to menthol mint during the growing season (March-June).

Nature of damage

Helicoverpa armigera damages the menthol mint plants by defoliating the seedlings and the leaves. The severe incidence of *H. armigera* on the menthol mint is noticed during March to May. The early instars (I to III instars) larvae feed on the terminal growing leaves and the later instar larvae (IV and V instars) defoliate the lower leaves of the plants. The severe infestation of this pest is observed during the early vegetative to mid-vegetative growth stage (up to 60 days old crop) of the menthol mint. This pest is nocturnal in nature, the larvae feed on the leaves during the night, while the adult (moth) feeds, mates and migrates at night and during day time rests/hides at the base of the plant or under leaves surface of the lower canopy. A single larva appears on each plant during the early vegetative growth stage (up to 30 days from transplanting) of the crop and later 2-3 larvae are also observed in the mid-vegetative to maturity growth stages of the menthol mint crop. During the early growth stage of the crop, the



Early instar larvae of *Helicoverpa armigera*



Irregular holes

Drying of terminal shoots

Bushy top

Damage symptoms caused by young larvae of *Helicoverpa armigera* during early growth stage of menthol mint



Older larva of *Helicoverpa armigera*

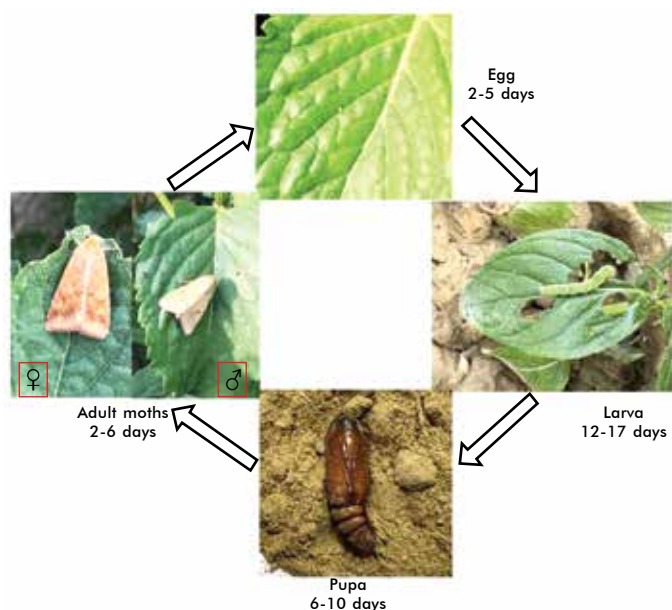
irregular holes or drying of terminal leaves or bushy top are the damage symptoms caused by the young larvae. The older larvae defoliate the leaves of the plant.

Biology

The pest is active throughout the growing season of the menthol mint crop but its damage is observed during the early to mid-vegetative growth stage. The pest may complete 3-4 generations during the crop season. The period of development is as follows: Egg: 2-4 days; Larva: 13-17 days; Pupa: 7-10 days; adult longevity: 2-6 days and fecundity: 600-800 eggs.

Integrated pest management

Monitoring: The pest is active throughout the mint growing season; the pest activity is noticed during the months of March to June. Pest monitoring should be followed from March by installing pheromone traps @ 5/acre or light trap @ 1/acre.



Lifecycle of *Helicoverpa armigera*

Cultural control: Deep ploughing after the harvest of *rabi* crops/winter crops exposes pupae/larvae present in the soil for predation by birds. Before transplanting the menthol mint, weeds near the area earmarked for menthol mint, may be destroyed which provide shelter and act as a reservoir for migration/carryover of larvae.

Mechanical control : Hand collection and destruction of larvae during early vegetative growth stage. As the moths

of *H. armigera* are attracted towards light, therefore, light traps can also be utilized for mass trapping of the moths during the March-April.

Biological control: Release of egg parasitoid *Trichogramma chilonis* @ 100,000 per hectare or release and conservation of larval parasitoid *Campoletis chloridae*. Installation of bird perches to increase the activity of birds in the menthol mint fields. Spray of *Ha-NPV* or *Bacillus thuringiensis* formulations may provide good control against this pest. Utilization of biopesticides during early vegetative growth stages of the crop could help in conservation of natural enemies (egg and larval parasitoids, predators) which play important role in controlling *H. armigera*.

Chemical control: Spray neem oil @ 4 mL/litre or 5% NSKE (Neem Seed Kernel Extract) or any other neem-based product after 10 days of transplanting. Two sprays should be done at the early vegetative growth stage to get effective results. Spray Emamectin benzoate 5% SG @ 0.5 gm/L or Flubendiamide 20% WDG @ 1 g/L. For effective results, spraying should be done during evening hours.

For further interaction, please write to:

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SUSTAINABLE DEVELOPMENT GOALS RELATED TO FRUITS AND VEGETABLES

SDGs 2 3

Health benefits of fruit and vegetables
Harness the goodness

Fruit and vegetables have multiple health benefits. They strengthen the immune system, combat malnutrition and help prevent non-communicable diseases.

SDGs 2 3

Diversified diet and a healthy lifestyle
Live by it, a diverse diet

Adequate amounts of fruit and vegetables should be consumed daily as part of a diversified and healthy diet.

SDGs 2 8 12 13 14 15

Food loss and waste
Respect food from farm to table

Fruit and vegetables are worth more than their price. Maintaining their quality and assuring their safety across the supply chain, from production to consumption, reduces losses and waste and increases their availability for consumption.

SDGs 1 2 12 15

Sustainable value chains
Foster sustainability

Sustainable and inclusive value chains can help increase production, and help to enhance the availability, safety, affordability and equitable access to fruit and vegetables to foster economic, social, and environmental sustainability.

SDGs 1 2 3 4 5 8 11 12 15

Highlighting the role of family farmers
Growing prosperity

Cultivating fruit and vegetables contributes to a better quality of life for family farmers and their communities. It generates income, creates livelihoods, improves food security and nutrition, and enhances resilience through sustainably managed local resources and increased agrobiodiversity.

Source: Fruit and vegetables – your dietary essentials, FAO background paper, FAO, Rome