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# Battling the Bugs: A Comprehensive Guide to Managing Insect Pests in Mustard Cultivation

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Mustard (*Brassica spp.*) is an essential global oilseed crop known for its adaptability and resilience in diverse climatic conditions. Primarily cultivated for its seeds, which contain 30-45% oil and 20-25% protein, mustard significantly contributes to agricultural practices by enhancing soil fertility and reducing pests and diseases through its allelopathic properties (Bahl *et al.,* 2021). It is considered sustainable, thriving in suboptimal soils with minimal inputs, thus supporting food security and agricultural diversity (Mishra *et al.,* 2020). Mustard cultivation supports millions of farmers, particularly in India, Canada, and the EU, serving as a vital income source.

Despite of global importance, mustard possess serious threat due various biotic and abiotic factors. There are various factors which limits the mustard production in the country and needs the critical attention towards them. These factors are non-adoption of improved package of practices and production technologies, susceptibility of mustard varieties to various pest and diseases and unmanaged crop growth. As every crop has to suffer from biotic and abiotic stresses, mustard is likely to get affected by insect pest like Aphids, Painted bug, Diamondback moth, Mustard Sawfly which are considered to be a major pest in mustard and minor pest includes, Green Peach Aphid, Pea Leaf-minor, Bihar Hairy Caterpillar and Cabbage butterfly. These pests threaten the crop right from sowing until end of crop season. These insect-pest can cause yield losses of 20% to 50% by damaging plants (Singh *et al.,* 2022). Additionally, pests can compromise seed quality by causing discoloration and

reducing oil content while increasing susceptibility to diseases.

## Need of the Hour

Current research trends focus on breeding high-yielding and disease-resistant varieties through genomics (Kumar *et al.,* 2023) and developing integrated pest management (IPM) practices to reduce reliance on chemical pesticides while improving yield and quality (Singh *et al.,* 2022). To address these challenges, IPM strategies are essential for effectively managing pest populations while minimizing environmental impact. These strategies may include cultural practices such as crop rotation and the use of natural predators. Overall, effective pest management is crucial for maximizing mustard yield and quality while promoting sustainable agricultural practices that protect both the environment and public health.

## Insect-pest of Mustard

Mustard crops face several significant insect pests that can adversely affect their yield and quality. The major pests include:

### 1. Mustard Aphid

a. **Scientific name:** *Lipaphis erysimi,* **Family:** Aphididae, **Order:** Hemiptera

b. **Life stages and identification:** Aphids are small, soft-bodied, pearl-shaped insects that have a pair of cornicles.

c. **Symptoms and nature of Damage:** Both nymphs and adults suck sap from leaves, buds, and pods, causing yellowing, curling, and drying of leaves. This leads to weak pods and small seeds. They also secrete honeydew, which promotes sooty mold and reduces photosynthesis.

d. **Losses caused to plant:** When the ETL is crossed, the losses can range from 20-45% under natural field condition.

### 2. Mustard Saw Fly

a. **Scientific name:** *Athalia lugens proxima,* **Family:** Tethredinidae, **Order:** Hymenoptera

b. **Life stages and identification:** The larva is greenish black and feeds on mustard leaves during the morning and evening and make holes. The adult insect is small, orange-yellow, and features black markings and smoky black veins.

c. **Symptoms and nature of Damage:** Grubs alone are destructive, bite holes into leaves preferring young growth and skeletonize the leaves completely. When infested mature plants, seed setting is affected.

d. **Losses caused to plant:** Mustard sawfly can cause damage from 5 to 18 % as reported in many parts of the country.

### 3. Painted Bug

a. **Scientific name:** *Bagrada hilaris,* **Family**: Pentatomidae, **Order:** Hemiptera
b. **Life stages and identification:** The adult is black with orange spots, red and yellow markings when turn to adult.
c. **Symptoms and nature of Damage:** Nymphs and adult bugs suck sap from leaves and developing pods, causing young plants to wilt and dry up, while also excreting a resinous material that spoils the pods; infestation at maturity leads to pod curling and leaf shriveling.
d. **Losses caused to plant:** Painted bugs reduce the mustard crop yield by 30-40%, causing up to 50% pod damage and decreases seed quality.

4. **Diamondback Moth**

a. **Scientific name:** *Plutella xylostella,* **Family**: Plutellidae, **Order:** Lepidoptera
b. **Life stages and identification:** Larva is yellowish green, with fine erect black hairs scattered all over the body and adult are small greyish brown having pale whitish narrow wings with yellow inner margins.
c. **Symptoms and nature of Damage:** Larvae cause whitish patches on leaves by scraping epidermal tissues, giving them a withered appearance, and later bore holes. They can completely consume leaves and also damage pods by feeding on developing seeds.
d. **Losses caused to plant:** Diamondback moths can cause up to 40-50% yield loss in mustard, with severe infestations damaging up to 60% of leaves and affecting pod quality.

**Integrated Pest Management (IPM) Strategies**

IPM is a systems approach that combines a wide array of crop production and protection measures to minimize the economic losses caused by pest. Hence, use of low or judicious dose of pesticides, integrated with other means like growing pest tolerant cultivars, sanitation, crop rotation, use of bio-agents and plant extracts seems to be best method of pest management without environmental pollution.

| Insect-pest | Management |
|---|---|
| **Aphids** | • Early sowing, preferably up to third week of October.<br>• Apply any of the following insecticides when pest levels reach 50-60 aphids per 10 cm of the central shoot, or when 40-50% of the plants are infested. For foliar sprays, use 625-1000 ml of oxydemeton-methyl 25 EC, dimethoate 30 EC, , quinalphos 25 EC, or malathion 50 EC; or 940-1500 ml of chlorpyrifos 20 EC in 600-1000 L of water per hectare, depending on the crop stage. For granular |

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|---|---|
| | insecticides, apply 10 kg of phorate 10 G or 33 kg of carbofuran 30 per hectare, followed by light irrigation. |
| **Mustard Saw Fly** | • Early sowing<br>• Administer the first irrigation 3-4 weeks after sowing to significantly lower the bug population.<br>• Apply 1.0 L of malathion 50 EC or quinalphos 25 EC mixed in 500-600 L of water per hectare once in October and again in March-April. |
| **Painted Bug** | • Early sowing.<br>• Spray the crop with malathion 50 EC @1000 ml or dimethoate 30EC @ 625 ml in 600- 700 liter water |
| **Diamondback Moth** | • For control of grown up larvae apply 5% malathion dust @ 37.5 kg/ha |

To effectively manage insect pests in mustard crops, a variety of strategies can be applied. Start by selecting tolerant varieties like JM-1 and RK-9501 for aphids, and aim to sow the crops before October 20 to reduce damage. Use yellow stick traps to monitor aphid populations and promptly remove affected plant parts. It's important to conserve beneficial insects such as ladybird beetles (*Coccinella septempunctata*, *Menochilus sexmaculata*, *Hippodamia variegata*, and *Cheilomones vicina*), which can consume 10 to 15 aphids each day, along with syrphid flies (*Sphaerophoria spp.*, *Eristallis spp.*, *Metasyrphis spp.*, *Xanthogramma spp*., and *Syrphus spp.*). The braconid parasitoid *Diaretiella rapae* and lacewing (*Chrysoperla carnea*) also play a significant role in controlling aphid populations.

For managing mustard sawflies, practice summer ploughing to eliminate pupae, maintain clean cultivation practices, and ensure proper irrigation during the seedling stage to drown larvae. Regularly collect and destroy sawfly grubs. To address painted bugs, deep ploughing can help eliminate their eggs, while early sowing and irrigation during the first four weeks after planting can mitigate pest pressure. Quick threshing of harvested crops and burning leftover crop residues will prevent pests from surviving into the next season.

For diamondback moths, install pheromone traps to keep track of their activity and regularly collect larvae. It is also beneficial to conserve parasitoids like *Cotesia plutellae* and *Diadegma insulare*, and apply malathion dust for controlling larger larvae. Additionally, using bitter gourd seed oil emulsion can serve as an anti-feedant. For chemical control options, consider spraying the crop with malathion 50 EC or quinolphos at the recommended concentrations mixed with water. By implementing these integrated pest management techniques, you can significantly reduce pest populations and safeguard mustard crops.

## Conclusion

In conclusion, effective insect pest management in mustard cultivation is crucial for enhancing crop efficiency and production. The integration of various strategies within an Integrated Pest Management (IPM) framework allows for a sustainable approach to controlling pest populations while minimizing environmental impact. Recently developed technologies insures management of insect-pest very reliable with reduced cost and environment friendly.

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