Biointensive Pest Management in Solanaceous Crops

Naina Pandey, Harpal Singh Randhawa and Harkanwaljot Singh
PAU Regional Research Station Gurdaspur
Corresponding Author: naina14pandey@gmail.com

Abstract

The article presents detailed guidelines for managing insect pests in solanaceous vegetable crops, namely brinjal, tomato, chilli, capsicum, and potato, with a focus on Integrated Pest Management (IPM) practices. It emphasizes the use of cultural methods, such as timely weed removal, crop hygiene, and balanced fertilization, alongside biological approaches like neem-based extracts for sustainable pest control. Specific chemical insecticides are recommended for key pests such as shoot and fruit borers, fruit borers, aphids, whiteflies, and mites, with guidance on safe application intervals and waiting periods to minimize ecological impact. The article also highlights pest surveillance techniques and the role of preventive measures, such as the selection of pest-tolerant varieties and removal of alternate host plants, in reducing pest populations. By integrating non-chemical and chemical strategies, the article advocates for an environmentally sound approach to managing pest-related threats in solanaceous crops, aiming to improve yield quality, prevent resistance development, and support long-term agricultural sustainability.

Solanaceous vegetable crops—comprising brinjal (*Solanum melongena*), tomato (*Solanum lycopersicum*), chilli and capsicum (*Capsicum spp.*), and potato (*Solanum tuberosum*)—are among the most important components of India's horticultural sector. These crops are valued not only for their wide culinary use but also for their high nutritional content, including essential vitamins, minerals, and antioxidants. (ICAR-IIHR, 2021). As per the Final Estimates released by the Ministry of Agriculture & Farmers Welfare for the year 2022–23, the combined production of major solanaceous crops in India stood at approximately 93.5 million tonnes, with potato contributing 60.14 million tonnes, tomato 20.43 million tonnes, and brinjal 12.93 million tonnes. Despite their agronomic and economic significance, the productivity and quality of these crops are often compromised by a broad spectrum of insect pests that thrive under diverse agroclimatic conditions. (PAU, 2023; CABI, 2022). Tender foliage and succulent fruits make these crops particularly susceptible to pest infestation, leading to considerable yield losses and degradation in marketable quality. (Sharma et al., 2016). In response to these challenges, this article provides detailed information on the identification, damage symptoms, and integrated pest management strategies for the major insect pests affecting solanaceous vegetables, with an emphasis on sustainable, non-chemical approaches to ensure safe and profitable crop production.

Major insect-pests

Pest	Host	Damaging Symptom	Non-Chemical Control Measures	Chemical Control Measures
Shoot and Fruit Borer (*Leucinodes orbonalis*) for Fruit borer (Helicoverpa armigera) For tomato	Brinjal, chilli, tomato	Bores into terminal shoots causing wilting; later bores into fruits making them unfit for market	All the infested fruits should be picked and destroyed.	Spray 50 ml Coragen 18.5 SC (chlorantraniliprole) or 50 ml Tracer 45 SC (spinosad) Proclaim 5 SG (80 ml), Sumicidin 20 EC (100 ml), Ripcord 10 EC (200 ml), or Decis 2.8 EC (160 ml) per acre in 100–125 L of water; repeat every 15 days Waiting period: 3 days (Proclaim), 7 days (Coragen)
Hadda Beetle (*Henosepilachna vigintioctopunctata)*	Brinjal	Adults and grubs skeletonize leaves by feeding, reducing photosynthesis	Collect and destroy skeletonized leaves along with beetles and grubs	Spray 50 ml Coragen 18.5 SC (chlorantraniliprole) or 50 ml Tracer 45 SC (spinosad) in 100 litres of water per acre.

Thrips	chilli	They suck the sap from leaves and lower the yield	Neem fruit aqueous extract @ 5 % Method of preparation Neem fruit aqueous extract: Take fresh neem fruits, dry in shade and make a course powder by grinding. Mix 5 kg of fruit extract powder in 100 litre of water and keep it for 12 hours. Filter the material in muslin cloth and spray it.	Omite 57EC (Propargite) @ 200 ml/acre or Oberon 22.9 SC (Spiromesifen) @ 100 ml/acre
Spider Mites (*Tetranychus spp.*)	Brinjal, Chilli, Capsicum	Colonies under silky webs on lower leaf surfaces;	Same as done for thrips	Same for the thrips
Aphids (*Myzus persicae*) Aphid (*Aphis gossypii*) for tomato	Chilli, tomato	Sap-sucking leads to leaf curling, yellowing, and reduced plant vigor	Eradicate weeds growing on field bunds, waste lands, road side and irrigation channels/ canals as they serve as reservoir for these pests • Judicious use of nitrogenous fertilizers, as higher doses make the plant prone to attack	Spray the crop with 300 ml Metasystox 25 EC (oxydemeton methyl) in 80-100 litres of water per acre as soon as aphid appears. Give another spray after 10 days.
Whitefly (*Bemisia tabaci*)	Chilli, brinjal, tomato	Sap-sucking leads to leaf curling, yellowing, and reduced plant vigor	Do regular surveillance on alternate host crops for timely management of whitefly and same as said in thrips, aphid and mites. Use nitrogenous fertilizers judiciously, as their excessive use encourages multiplication of these insect pests.	For whitefly, spray 400 ml of Malathion 50 EC in 100 litres of water before fruiting. Eradicate weeds growing on field bunds, waste lands, road side and irrigation channels/canals as they serve as reservoir for whitefly and aphids
Jassid (*Amrasca biguttula*),	Brinjal	infested plants become pale and finally bronze. Leaves curl, turn pale bronze and dry up as a result of Jassid attack the crop is stunted and has blighted appearance	Same as for white-fly	Same as for Aphids
Cutworm (*Agrotis sp.)*		causes considerable damage from February to March by cutting the young plants at the ground level and later on by making holes into the tubers.	Weed control in and around the field before planting reduce cutworm problems through reduction of early season host plants. Hot weather ploughing reduces the population of immature stages. A number of birds feed on insects that get exposed upon ploughing	-

Pest Management in Brinjal

Brinjal is highly vulnerable to several insect pests that can significantly impact yield and quality. The most serious among them is the Shoot and Fruit Borer, which lays eggs on leaves and young fruits. The emerging larvae bore into shoots and fruits, causing wilting and internal damage. Regular removal of infested parts and timely spraying of insecticides like Coragen or Proclaim helps manage the pest effectively.

The Hadda Beetle feeds on leaf tissues, leading to skeletonization. Infested leaves should be destroyed, and insecticidal sprays can be used as needed. Spider Mites, common in dry conditions, cause leaf discoloration and webbing. They can be controlled with Omite 57 EC, alongside maintaining adequate irrigation.

Whiteflies, prevalent during the monsoon, suck plant sap and promote sooty mold. Early monitoring and treatment are crucial. In severe cases, Pegasus 50 WP can be sprayed. Eco-friendly alternatives like PAU Neem Extract, prepared by boiling neem leaves and branches, are also effective.

Monitoring pest populations, particularly whiteflies and jassids, should be done early in the day, following the Economic Threshold Level (ETL) guidelines. Avoiding excess nitrogen and removing weeds and alternate host plants further helps reduce pest pressure. An integrated approach combining cultural practices, timely chemical application, and biological options ensures sustainable pest management in brinjal.Insect pest of tomato: The text outlines pest management strategies for two specific insect pests affecting crops: whiteflies (Bemisia tabaci) and aphids (Aphis gossypii), as well as fruit borers (Helicoverpa armigera). Whiteflies and aphids sap nutrients from leaves, reducing crop yield, and can be controlled by applying 400 ml of Malathion 50 EC diluted in 100 liters of water before the fruiting stage, alongside the removal of weeds that harbor these pests. Careful use of nitrogenous fertilizers is also advised to prevent pest proliferation. For fruit borers, which damage fruits leading to rot, three insecticide sprays should be applied at two-week intervals starting at flowering, using specific insecticides diluted in water. Additionally, infested fruits should be collected and buried, and ripe fruits should be harvested before insecticide application, with attention to waiting periods after treatment.

Integrated Pest Management of Chilli and Capsicum

Chilli and capsicum crops are susceptible to several insect pests that can significantly reduce both yield and quality. Among the most damaging is the fruit borer, whose larvae bore into fruits, making them unfit for consumption. To manage this pest, regular monitoring is crucial. In case of infestation, spray 50 ml of Coragen 18.5 SC (chlorantraniliprole) or 50 ml of Tracer 45 SC (spinosad) in 100 litres of water per acre. It is essential to pick and destroy all infested fruits before spraying, and to harvest ripe fruits regularly to prevent further spread.

Sucking pests like thrips, mites, aphids, and whiteflies also pose a major threat by feeding on plant sap, leading to leaf curling, stunted growth, and yield reduction. For mite control, spraying *Neem fruit aqueous extract @ 5%*, Omite 57EC (Propargite) @ 200 ml, or Oberon 22.9SC (Spiromesifen) @ 100 ml per acre can be effective. To prepare neem extract, grind 5 kg of shade-dried neem fruits into a coarse powder, soak in 100 litres of water for 12 hours, filter with a muslin cloth, and spray.

Preventive measures play a vital role in pest management. Always maintain field hygiene by removing weeds from bunds, roadside areas, and irrigation channels, as they serve as alternate hosts. Avoid excessive use of nitrogenous fertilizers, which can make plants more vulnerable to pests. Additionally, observe a waiting period of 7 days after spraying acaricides to ensure food safety. A balanced approach combining timely interventions, biological control, and cultural practices ensures sustainable pest management.

Pest Management in Potato Crop

Potato is a widely grown crop but is prone to damage by several insect pests, especially during the autumn and spring seasons. In the autumn crop, jassids are the first major threat. They cause leaf curling, bronzing, and drying, which stunt the plant and give it a scorched look. Later in the season, aphids become a serious concern. They suck plant sap and act as carriers of viral diseases, especially dangerous in seed production. To control them, spray 300 ml of Metasystox 25 EC (oxydemeton methyl) in 80–100 litres of water per acre when aphids are first noticed. Repeat the spray after 10 days, but avoid spraying within three weeks of harvest.

In the spring crop, cutworms cause significant damage by cutting young plants at ground level and later boring into tubers. Early season weed control and deep summer ploughing help by destroying larvae and pupae and exposing them to natural predators like birds. Aphids can still be problematic in spring, so timely sprays and field monitoring are essential.

Apart from chemical control, cultural practices play a vital role. Keeping the fields and bunds weed-free reduces alternate pest habitats. Also, overuse of nitrogen fertilizers should be avoided, as lush growth tends to attract more aphids. By combining timely insecticide application with proper field hygiene and crop monitoring, pest damage can be effectively minimized, ensuring healthy crop growth and improved yield.

Conclusions: Plants in natural environments face vulnerabilities from biotic factors like pests and diseases, impacting crop cultivation. Damage from insect and pathogen attacks can lead to significant crop yield losses, sometimes resulting in total eradication of certain crops. Losses from pests and diseases affect the quantity, quality, and economic value of food and fruit crops. Integrated Pest Management (IPM) is proposed as a sustainable alternative, combining biological, cultural, physical, and chemical control methods. (Sharma et al., 2016; NCIPM, 2020). IPM aims to keep pest populations below economically damaging levels while minimizing health and environmental impacts. Current pest and disease management strategies are often undermined by the unscientific use of pesticides, leading to resistance, resurgence of pests, and environmental concerns (Furlong et al., 2013). Solanaceous crops are prone to pest infestations due to their pulpy and succulent fruits, which can be directly consumed by insects or serve as vectors for pathogens. Above mentioned practices help farmers to organic and high yield quality and quantity.

References

CABI. (2022). *Leucinodes orbonalis* (eggplant fruit and shoot borer). Retrieved from https://www.cabi.org/isc/datasheet/30956

Furlong, M. J., Wright, D. J., & Dosdall, L. M. (2013). Diamondback moth ecology and management: problems, progress, and prospects. *Annual Review of Entomology*, 58, 517–541.

ICAR–Indian Institute of Horticultural Research (IIHR). (2021). *Package of Practices for Solanaceous Vegetables*. Bengaluru: ICAR-IIHR.

National Research Centre for Integrated Pest Management (NCIPM). (2020). *Pest Surveillance and Management in Vegetable Crops*. New Delhi: ICAR–NCIPM.

Punjab Agricultural University (PAU). (2023). *Crop Protection Recommendations 2023-24*. Ludhiana: Directorate of Extension Education, PAU.

Sharma, H. C., Arora, R., & Pampapathy, G. (2016). Integrated pest management in vegetable crops: constraints and opportunities. In *Sustainable Management of Insect Pests in Agriculture* (pp. 53–73). Springer.

* * * * * * * * *