

Insect pests of Lettuce and their management

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Abstract

Lettuce is a leafy vegetable and the quality of the crop can be reduced by infestation of pests and diseases. The sucking pests which attack the crop are aphid, whiteflies and leafhoppers which are under the order Hemiptera and whereas Lepidopteraous, Coleopterous and Dipterous pests come under the category of chewing pests. In this article, different insect pests of lettuce is described along with their damage symptoms and management.

Introduction

Lettuce, *Lactuca sativa*, is an annual leafy vegetable belonging to the family Asteraceae. This is commonly served as leafy salad. Being a leafy vegetable, the quality of the product can be drastically decreased by the infestation by pests and pathogen, thus causing major economic loss to farmers. Even though the pests are not host-specific, they can cause huge loss depending on the season (Barriere et al., 2014). The insect pest can be categorized as sucking pests and chewing pests according to their mode of feeding.

Sucking insect pests

1. Aphid: These insects belong to the family Aphididae of the order Hemiptera. Aphids are small soft bodied insects not more than 5mm in size. There are different aphid species attacking lettuce. The aphids are green peach aphid (*Myzus persicae*), currant-lettuce aphid (*Nasonovia ribisnigri*), potato aphid (*Macrosiphum euphorbiae*), foxglove aphid (*Aulacorthum solani*) and lettuce root aphid (*Pemphigus bursarius*). They are phloem feeders and suck the plant sap using their stylet. The life cycle involves both sexual and asexual reproduction. The two morphological types, the alate (winged) and apterous (wingless) help in reproduction and dispersal of adult species. Apterous adults reproduce rapidly and alate ones disperse over short or long distances rapidly to non-infested host plants (Subbarao et al., 2017).

Damage symptom: The adults and nymphs suck sap from plant parts thereby causing reduction in plant development and stunting. Leaf chlorosis, distortion and plant wilting are the visible symptoms. The honeydew excreted by aphids causes sooty mould development on the leaf surface, impairing photosynthesis. Moreover, aphid body parts and exuviate can also contaminate lettuce heads. These insects cause indirect damage by serving as vectors for many plant viruses (Capinera, 2001).

Management: Aphids can be effectively managed by using neonicotinoid insecticides. The development of resistance in many aphid species to neonicotinoids forced to look for alternatives. Flonicamid and spirotetramet found highly effective against lettuce aphids. Different predators such as ladybird beetles and syrphid flies help in suppressing aphid population in the field (Parker et al., 2002).

2. Whiteflies: The adult insects are 1-3 mm size in the Family Aleyrodidae. *Bemisia tabaci* is the whitefly which is generally present in lettuce ecosystem. This is a highly polyphagous pest with more than 1000 host plants. Whitefly serves as a vector for *lettuce chlorosis virus*. Adult whiteflies are a small moth-like insect with a snowy white appearance, they inhabit mostly on the under surface of leaves. After emergence from the eggs, the first instar nymphs known as crawlers move to the feeding site and settle. The second and third instars are sessile and the fourth instar is called puparium.

Damage symptom: Both adults and nymphs suck sap from the plant parts. A large population of whitefly, during the early stages of the crop, can retard growth, delay crop maturity, and cause yellowing and stunting. Production of honeydew also causes sooty mould development leading to inhibition of photosynthesis (Subbarao et al., 2017).

Management: Seed treatment with neonicotinoids can manage the flies in the first 30 days of growth. Use of insecticides with a different mode of action can effectively manage the pests without the development of resistance problems.

3. Thrips: Thrips are minute, slender soft-bodied insects with fringed wings belonging to the Family Thripidae under the order Thysanoptera. Four thrips species are found infesting lettuce crop, viz., the western flower thrips (*Frankliniella occidentalis*), tobacco thrips (*F. fusca*),

onion thrips (*Thrips tabaci*), and bean thrips (*Caliothrips fasciatus*), among which western flower thrips are most common.

Damage symptoms: The adults and nymphs suck sap using their piercing and sucking mouthparts. They lacerate the epidermal tissues and then suck the sap. Development of scars, silvery appearance of the leaves *etc.* is the damaging symptoms observed the lettuce heads can also become unmarketable by the presence of insects and frass (Natwick et al., 2007). The bean thrips act as a vector for tomato spotted wilt and Impatiens necrotic spot virus.

Management: Natural enemies play a major role in managing the pest., green lacewings (*Chrysopa* spp. and *Chrysoperla* spp.), pirate bugs (*Orius* spp.), predatory mites, *etc.* occur naturally to kill the pest. Use of entomopathogenic fungi, *Beauveria* spp., *Lecanicillium* spp., *Metarhizium* spp., *Paecilomyces* spp., *etc.* can be applied in recommended doses for management of thrips (Subbarao et al., 2017). Crop sanitation by removing all plant residue will surely make a difference in the pest infestation severity. Timely application of a recommended dose of insecticides as and when necessary to prevent thrips damage.

4. Leafhoppers: Leafhopper, *Macrostelus quadrilineatus* is a minor pest of lettuce. The insects are small wedge-shaped with piercing and sucking type of mouthparts. They act as a vector for aster yellows in lettuce.

Damage symptom: They also damage the crop by sucking sap from different plant parts. A large migrant population can pose damage to lettuce crop and make them unfit for marketing. Plant bug (*Lygus* spp.) and seed bug (*Nysius raphanus*) are other sucking insects that are occasional pests of lettuce of minor importance.

Lepidopterous pests

1. Beet armyworm: *Spodoptera exigua* belonging to the family Noctuidae is a pest with a wide host range. Its activity varies with climatic conditions. The caterpillars are the damaging stage of the pest. The adult moth lays about 50–150 eggs per mass on lettuce leaves and the neonate larvae feed on leaves in an aggregate manner but disperse from the second instar. The life cycle can be completed in as few as 24 days, and six or more generations can be produced per year in locations with warm climates. Severe damage can be caused at the seedling stage and head formation stage where the larvae can bore from the bottom.

Management: Close monitoring is needed for the detection of the pests because the damage cannot be seen from above. Mechanical measures are most effective, such as, collecting the



egg mass, culling the affected heads *etc.* The Beet armyworms are attacked by several natural enemies, such as parasitic wasps (*Hyposoter exiguae* and *Chelonus insularis*) and the tachinid fly parasite (*Lespesia archippivora*).

Another armyworm species, *Mythimna unipuncta* **also attack the lettuce crop occasionally.**

2. Loopers: Cabbage looper (*Trichoplusia ni*) and alfalfa looper (*Autographa californica*) cause serious damage to lettuce also.

Damage symptom: The early instars skeletonize the under surface of leaves and the mature larvae bore into the head of the lettuce plant. At the seedling stage, the crop gets collapsed by a high population of looper larvae.

Management: The population of natural enemies in the field keep the population low. The egg parasitoids such as *Trichogramma pretiosum*, *Hyposoter exiguae*, *Copidosoma truncatellum*, and *Microplitis brassica* and larval parasites such as tachinid flies (*Voria ruralis*) are the major ones reported (Subbarao et al., 2017). Nuclear polyhedrosis virus (NPV) and *Bacillus thuringiensis* (Bt) sprays can be used for effectively managing looper pests. Spinosad is an insecticide with a novel mode of action can that effectively manage the pest.

3. Cutworm: There are many species of cutworms infesting lettuce plants. The Black cutworm (*Agrotis ipsilon*), variegated cutworm (*Peridroma saucia*), and granulate cutworm (*Feltia subterranea*) are the major species. Larvae are the damaging stage and they attack during the night and they hide in loose soil or leaf litter during the day. Larvae of most species curl into a characteristic C-shape when disturbed.

Damage symptoms: The larvae of these insects can destroy the field and give a grazed appearance. The larvae mostly migrate from weedy areas to the field. They cut off the seedling from the base just above the soil surface.

Management: Management is most effective when initiated before planting. Thorough monitoring of the field and premise for the cutworm larvae and removal of weeds near the fields. Larvae can be revealed by digging around the bases of injured plants and sifting the soil. A water-filled ditch can also prevent mass migrations from an adjacent field by acting as a barrier

The corn earworm *Helicoverpa zea* and gram pod caterpillar, *H.armigera* are also found infesting the lettuce crop occasionally.

Dipterous insects

1. Leaf miner: The insects belong to the family Agromyzidae. The leaf miner species known to attack lettuce are the pea leafminer (*Liriomyza langei*), the serpentine leafminer (*L. trifolii*), and the vegetable leafminer (*L. sativae*).

Damage symptoms: The immature stage, maggots, cause damage by feeding mesophyll tissue between the upper and lower leaf surface layer and causing mines. The presence of these mines reduce the quality of lettuce and make them unmarketable (Palumbo et al., 2004). Adults also cause damage by puncturing the leaf surface with their ovipositor. These wounds can serve as infection points for secondary pathogens, including bacteria.

Management: Being a polyphagous pest on different vegetable crops, it is advisable o not to plant lettuce next to leaf minor affected vegetable fields. Application of insecticides is recommended for leaf miner infestation.

2. Seedcorn maggot: The seedcorn maggot (*Delia platura*) is a serious pest of lettuce crops belonging to the family, Anthomyiidae. It attacks the crop during stand establishment.

Damage Symptoms: The maggots burrow into the germinating seeds and prevent germination. Lettuce seedlings can also be killed by these immature stages. Poor stand establishment of the crop is the first visible symptom of pest damage. They prefer a wet and cool climate and will be most abundant during spring (Subbarao et al., 2017).

Management: When the symptoms are noticed, the seeds should be dug up and observed for the presence of maggots. The previous crop residues should be properly decomposed before the planting of the lettuce crop and the addition of non-decomposed organic matter should be avoided.

Coleopterous insects

1. Leaf beetles: Leaf beetles become an important pest in lettuce because of their feeding behaviour by making a small hole on the leaves, become unmarketable. They belong to the family Chrysomelidae and includes two species, the western spotted cucumber beetle (*Diabrotica undecimpunctata undecimpunctata*) and the banded cucumber beetle (*Diabrotica*

balteata). These beetle can overwinter as adults and become active during the whole crop season and they produce three generations in a year.

Damage Symptoms: Leaves get damaged by the grubs and the adults of the beetle, making irregular holes. Adults are more damage causing. They are found attacking the crop at every stage of the crop. The loss will be severe when the leaves are attacked at the seedling stage.

Management: The beetles can thrive well in many weed host plants, so killing the weeds are much important in managing the pest. Use of insecticides in the group pyrethroids are recommended for its control.

2. Flea beetles: This is also a Chrysomelid beetle found attacking lettuce. There are three species associated with lettuce namely, the palestriped flea beetle (*Systema blanda*) the striped flea beetle (*Phyllotreta striolata*), the western black flea beetle (*P. pusilla*), and the western striped flea beetle (*P. ramosa*).

Damage symptom: They also cause round or irregular shaped holes mostly on the undersurface of the leaves. Management is as same as leaf beetles.

3. Wireworm: Another Coleopterous insect attacking lettuce crop is wireworm belonging to the family Elateridae. The species of the pest is corn wireworm (*Melanotus communis*) found in Florida and Pacific Coast wireworm (*Limonius canus*) reported from the United States.

Damage: The habitat of the larvae of wireworms are the roots. They burrow into the root cortical region, hollowing out the core region, and causing the complete killing of the plant. The occurrence of multiple larval stages, which move up and down in the soil to get favourable temperature and moisture. The insect completes its life cycle in 2-6 years (Subbarao et al., 2017). The adults also cause damage by foliar feeding, but insignificant.

Management: Fallow flooding to kill the larvae is one of the important management practices. Rotation of lettuce with rice was found effective (Barsics et al., 2013).

Conclusion

Lettuce is a leafy vegetable which is gained importance in India in the recent past. Since the product is used fresh, insect damage and contamination by the frass cause severe economic loss. Besides the use of insecticides should be minimal since it's consumed as a salad. It is essential to practice integrated pest management strategies to get a profitable yield.

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