

# Striped flea beetle, *Phyllotreta striolata* : status and management in radish

**Raghavendra K V\*, Rekha Balodi, Subhash Chander and Sardana H R**

ICAR–National Research Centre for Integrated Pest Management, New Delhi 110 012

*Flea beetles [Phyllotreta striolata (Fabricius)] are the most abundant and harmful coleopteran pests of cruciferous vegetables causing considerable yield loss in many countries. For the past two years, striped flea beetle, Phyllotreta sp. infestation was found to be very serious on radish and mustard crops in different villages of Haryana and Delhi. The marketability of the produce was hampered due to the pest and the infested radish roots (edible part) fetched very low prices in the market leading to severe economic loss to the farmers. To combat the pest problem in radish, Integrated Pest Management (IPM) interventions were validated at Samora village of Nilokheri block in Karnal district of Haryana, in Farmers' Participatory Mode. It was observed that the IPM fields performed better in comparison to the non-IPM fields, in terms of reduction in pest damage and avoidance of unwarranted insecticide application and also fetched more prices in the market than the radish grown in non-IPM fields. Altogether, farmers obtained a higher yield of quality products by following IPM interventions in radish in the study area. Farmers fetched higher prices in the market and were satisfied by the IPM interventions.*

**Keywords:** Flea beetle, IPM interventions, Radish

Vegetables ensure food and nutritional security of the country, besides enhancing the per capita income of the farmers. Therefore, they play a major role in Indian agriculture. India ranks second in vegetable production and contributes 16.7% to the global vegetable growing area and 15.4% to production. Among the vegetables, cruciferous crops (cabbage, cauliflower, radish, turnip, mustard, knol-khol, kale, broccoli and collard greens) are abundantly grown throughout the country and occupy a significant position in the agro-ecosystem. They have great economic and commercial value due to their nutritional, medicinal, agro-industrial, bio-control and crop rotation properties and play a significant role in feeding the population. These crops face various challenges every year. Insect pests and diseases cause enormous yield and economic losses, and pose threat to global agriculture. These vegetables are attacked by some

major insect pests among which, flea beetle [*Phyllotreta striolata* (Fabricius)], which was earlier considered as a minor pest on these crops, has now attained the status of a major pest.

Flea beetles are the most abundant and harmful coleopteran pests on cruciferous vegetables and show diverse adaptations to a wide range of environmental conditions and habitats. Flea beetles (Alticinae) of the genus *Phyllotreta* (Chevrolat) (Coleoptera: Chrysomelidae) are specialised herbivores of Brassicaceae and related plant families. Striped flea beetle is widely distributed in North America, Europe and Asia. *P. striolata* and *P. cruciferae* are two predominant species that cause considerable yield loss in many countries all over the world.

## **Economic loss due to striped flea beetle in radish**

For the past two years, striped flea beetle, *P. striolata* infestation

was found to be very serious on radish, *Raphanus sativus* L. (63% leaf infestation and 54% root infestation) and mustard crops in different villages of Haryana and Delhi leading to huge economic losses. The adult beetles were found to be feeding on leaves due to which shot hole symptoms appeared. Young stage (grub) feeds on the roots and rootlets of the plants by furrowing grooves, leading to growth retardation and death of plants. Also, due to the furrowed grooves owing to larval feeding on radish roots (edible part), the marketability of the produce was hampered and fetched a very low price.

## **Need for integrated approaches against flea beetles in radish**

Unfortunately, flea beetles have developed resistance to insecticides in several countries, and therefore management needs a comprehensive approach by integrating all ecologically feasible methods in crop protection. Since



(a)



(b)



(c)



(d)



(e)



(f)

(a) Adult flea beetles feeding on leaves; (b) Severely damaged aerial (shoots) parts due to adults; (c) Close-up view of infested leaves  
(d) Severely infested roots (economic part) due to grubs; (e) Healthy radish grown in IPM field; (f) Satisfied IPM farmer

most cruciferous crops, especially radish, is used as a vegetable for table use, except malathion 50% EC, no other insecticide application is recommended for the management of insect pests by the Central Insecticide Board and Registration Committee (CIBRC). Moreover, farmers use pesticides as the first

line of defence and frequently resort to indiscriminate and non-judicious use of pesticides for the management of flea beetles. Also due to scarcity of information, farmers tend to rely upon chemical pesticides to manage the beetles.

Injudicious use of chemical pesticides leads to several problems

such as pesticide residue in the harvested produce, environmental pollution, development of resistance/resurgence in pests, emergence of new pests, destruction of natural enemies and pollinators, and increased cost of production. Under these circumstances, a paradigm shift in the pest

management approach is needed through rationalization of pesticide use and integration of eco-friendly approaches to minimize excessive reliance on pesticides. Hence, it is imperative to develop, validate and implement comprehensive approaches consisting of cultural practices, mechanical practices, bio-control agents, botanicals, chemical pesticides (with appropriate dose, and need based application) in an integrated manner to manage flea beetles infesting and harming cruciferous crops.

### Synthesis and validation of deliverable IPM technology against flea beetle in radish

Keeping in view the need for IPM approaches for flea beetle management, an extensive literature survey both at the national and international levels was done by ICAR–National Research Centre for Integrated Pest Management, New Delhi, which led to preparing the IPM interventions. These interventions were validated at Samora village of Karnal district, Haryana state in Farmers' Participatory Mode (FPM). The village is considered to be very famous for radish production in the state of Haryana. The study was taken up in a 10-acre area under IPM i.e. 10 farmer holdings of 1 acre each and a 5-acre area under non-IPM i.e. 5 farmer holdings of 1 acre each. The critical IPM inputs were provided to the selected IPM farmers and the effect of IPM technology on radish was compared with the farmers' practices. The main intention of IPM approaches was to promote the cultivation of pesticide-free radish without hampering the productivity of the crop. In addition, awareness was created through a series of Farmer Field Schools (FFS) among the farming community about the adoption and advantages of IPM

technology in sustainable vegetable production.

### IPM interventions for the management of striped flea beetle in radish

- Deep summer ploughing to expose overwintering stages of *P. striolata* (adult stage) to intense sunlight and natural enemies.
- Application of well decomposed enriched farmyard manure @2t/ha, enriched with *Metarhizium anisopliae* (Con. =  $1 \times 10^8$  cfu/g) @2 kg/t.
- Soil application of 5–6 quintals of neem cake per hectare to the main field before sowing.
- Growing 5–6 rows of sorghum or maize all around the radish field atleast 2 months before sowing radish seeds as a barrier crop.
- Intercropping a bold seeded variety of mustard as a trap crop @10:1 ratio.
- Installation of yellow sticky traps @10 traps/ha, 12–15 cm above the plant canopy. Locally available empty tins painted yellow, coated with grease or castor oil on the outer surface may also be used as yellow sticky traps.
- Timely intercultural operations for maintaining weed-free fields since many weeds act as an alternate host for flea beetles.
- Drenching the root zone with biological control agents i.e. entomopathogenic fungi *Metarhizium anisopliae* or *Beauveria bassiana* (Con. =  $1 \times 10^8$  cfu/ml or g) @8–10 ml or g/litre.
- Spraying of neem oil (Azadirachtin 5% EC) @2 ml/litre.
- Need based dusting of malathion 5%D @25 kg/ha or spraying of malathion 50% EC @1.5 ml/litre.

- Need based spray of chlorantraniliprole 18.5% SC @0.25 ml/litre or cyantraniliprole 10.26% OD @1.2 ml/litre or spinetoram 11.7% SC @0.9 ml/litre.

It is important to note that the spray volume required per hectare in radish crop is 500 litres.

There is a lack of reports for Economic Threshold Level of *P. striolata* on radish. A previous study reported that ETL for *P. cruciferae* on canola has been found to be 15–20% leaf area damage, which can be followed for *P. striolata* in radish.

### SUMMARY

It was observed that the IPM fields performed better in comparison to the non-IPM fields in terms of reduction in pest damage and avoidance of unwarranted insecticide application. Due to IPM interventions, the radish grown in the IPM fields was damage-free and fetched more price in the market than the radish grown in non-IPM fields. The farmers sprayed a considerably higher number of sprays in non-IPM fields and even after many insecticidal sprays, the radish crop was seriously damaged by the flea beetles. However, on the contrary, the radish grown in IPM fields required only one round of chemical insecticide spray. Overall higher yield of quality produce was obtained by following IPM practices in radish in the study area. The farmers fetched higher prices in the market and were delighted by the interventions. Integrated Pest Management and related interventions can help farmers raise quality produce and increase their income.

\*Corresponding author's e-mail: raghavendra.kv@icar.gov.in

### Know Krishi Unnati Yojana

The *Krishi Unnati Yojana*, a central sector scheme, is envisaged as umbrella programme for focusing on food security, by merging schemes on Soil-health Card, Integrated Scheme on Agricultural Co-operation and Agricultural Marketing, National Mission on Agriculture Extension, Horticulture Development, Price Stabilization Fund, National Mission on Sustainable Agriculture and other programmes.