

# Sustainable Management of Striped Flea Beetle in Radish

Kerur Vishwanath Raghavendra, Rekha Balodi and Subhash Chander  
ICAR-National Research Institute for Integrated Pest Management, New Delhi



**V**egetables play a crucial role in Indian agriculture by ensuring food and nutritional security and improving farmers' incomes. Among vegetablesthem, cruciferous (*Brassicaceae*) crops such as cabbage, cauliflower, radish, turnip, mustard, knol-khol, kale, broccoli, and collard greens occupy an important place due to their nutritional, medicinal, agro-industrial, biocontrol, and crop rotation benefits. However, recent changes in cropping patterns, ecosystems, climate, and the widespread cultivation of high-input varieties have altered pest infestation scenario, leading to increased losses in cruciferous crops. Insect pests now pose a major threat, causing substantial yield and economic damage annually. Notably, flea beetles (*Phyllotreta* spp.), once considered minor pests, have emerged as highly destructive. Flea beetles are significant coleopteran pests of cruciferous vegetables, well adapted to diverse environments. The striped flea beetle, *Phyllotreta striolata* (Fabricius), is a serious pest of brassica crops and is distributed across North America, Europe, and Asia. Recently, severe infestations of *P. striolata* were recorded on radish (*Raphanus sativus* L.) and mustard in several villages of Haryana and Delhi NCR, causing 63.02% leaf and 53.96% root damage. Adult beetles create shot-hole symptoms on leaves, while larvae feed on roots, forming grooves that reduce plant growth. Due to the furrowed grooves owing to larval feeding found on radish roots (edible part), the marketability of the produce is hampered and these infested radish roots (edible part) fetched no value in the market.

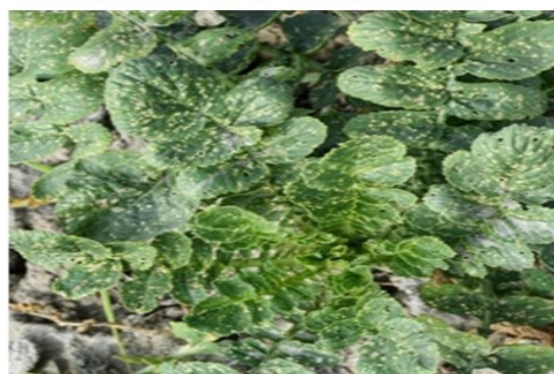
Compounding the problem, flea beetles have developed resistance to insecticides in various countries, and *P. striolata* lacks effective natural enemies or parasitoids. In India, only Malathion 50 EC is recommended for radish, prompting farmers to resort to indiscriminate pesticide use. Such practices result in pesticide residues, environmental pollution, pest resistance, resurgence, new pest outbreaks, destruction of natural enemies and pollinators, and higher production costs. This situation highlights the urgent need for a shift toward sustainable pest management. To address these challenges, it became essential to develop and validate an Integrated Pest Management (IPM) strategy combining cultural, mechanical, biological, botanical, and chemical methods for sustainable management of flea beetle in radish. Therefore, a IPM module was developed, validated and disseminated during Rabi 2020 and 2021 under a Farmer Participatory Approach (FPA) for managing the striped flea beetle in radish at Samora village of Karnal District, Haryana (29° 49' 16.8"N 77° 00' 41.4"E).



Samora village is considered to be the leading producer of good quality radish for local markets and the menace of striped flea beetle, *P. striolata* was found to be very serious in this village. In the baseline survey it became evident that 55-60 per cent farmers take up radish cultivation during *Rabi* season (first week of October – mid December) in this village. Also, since *Rabi* 2018-19, there incurred a huge economic loss in radish cultivation due to very serious infestation of flea beetles wherein they could not obtain even half of their expected yield and also opined that the radish which were infested by the flea beetle grubs fetched very less market value because of the deterioration of the radish quality due to grooving. Farmers used six to eight rounds of synthetic insecticides as first line of defense and frequently resorted to indiscriminate and non-judicious use of insecticides for management of flea beetles in radish and other cruciferous crops. Yet, farmers could not fetch a satisfactory result in flea beetle management. Accordingly, Samora village of the Nilokheri block, Karnal District, Haryana, was chosen for the seasonal incidence study and validation trials, following which the developed technology was disseminated over 173 hectares in Samora and adjoining villages.

### IPM module

IPM module comprising of 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 @ 2.50 t/ha, enriched with *Metarhizium anisopliae* Sorokin (Con. =  $1 \times 10^8$  cfu/g) @ 2 kg/t; soil application of 0.50 – 0.62 t of neem cake per ha to the main field before sowing; growing 5–6 rows of sorghum/maize all around radish field at least two months before sowing of 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 @ 12 traps per ha, 12–15 cm above the plant canopy; timely intercultural operations for maintaining weed free fields; drenching the root zone with entomopathogenic fungi, *Metarhizium anisopliae* (Con. =  $1 \times 10^8$  cfu/ml or g) @ 8–10 ml or g/L; spraying of Neem oil 0.50% @ 5 ml/L or 5% Neem Seed Kernel Extract @ 500 gm of kernels/10 L or commercial formulation (Azadirachtin 0.03% WSP 300 PPM) @ 05 ml/L; need based dusting of malathion 5% D @ 25 kg per ha or spraying of malathion 50 EC @ 1.5 ml/L.

(a) Healthy radish leaves in T<sub>1</sub> - IPM fields(b) Infested radish leaves in T<sub>2</sub> - FP fields(c) Healthy radish in T<sub>1</sub> - IPM fields(d) Infested radish in T<sub>2</sub> - FP fields

## Validation of IPM Module

The IPM strategy evaluated against *P. striolata* in radish was effective with less leaf (10.99%) and root (12.93%) damage due to *P. striolata* compared to Farmers practice with 20.47% leaf and 39.43% root damage and also recorded 14.95 t/ha yield with cost: benefit ratio of 1:3.83 compared to Farmers practice (10.00t/ha yield and 1:1.60 C: B ratio). IPM strategy also reduced average number of insecticide sprays from 6.11 to 3.57 sprays (41.51% reduction), which clearly evince that the IPM strategy so validated can be adopted by the farmers as an economically viable option for management of *P. striolata* in radish. IPM strategy recorded the maximum Cost: Benefit ratio of 1:3.83 with 28.71 percent reduction in cost of cultivation as compared to Farmers practice (cost: benefit ratio - 1:1.60) indicating that IPM strategy effectively reduced the pest incidence in the radish crop and contributed to higher yield and enhanced farmers' income by reducing the cost of cultivation and increasing the yield per unit area as compared to Farmers practice (FP).

## Impact of IPM on Radish cultivation

During field survey it was found that flea beetle, *P. striolata* infested various cruciferous crops like radish (*Raphanus sativus* L.), cabbage (*Brassica oleracea* L. var. *capitata*), cauliflower (*Brassica oleracea* L. var. *botrytis*), mustard (*Brassica juncea* L.) and knol-khol (*Brassica oleracea* L. var. *gongylodes*) where the infestation was found to be more than their economic thresholds. All the cruciferous crops surveyed were infested by *P. striolata* and the reason behind it is that the striped flea beetle, *P. striolata* and crucifer flea beetle, *P. cruciferae* belonging to the family Chrysomelidae are attracted to and stimulated to feed on cruciferous plants due to the presence of glucosinolates in the plants. It was found that, the *P. striolata* once noticed infesting the radish crop remained

active throughout its growing season up to the final harvesting of the crop (*i.e.*, from 42<sup>nd</sup> SMW - third week of October) to 50<sup>th</sup> SMW - third week of December). Further, important weather parameter affecting the radish infestation was temperature. Both maximum and minimum temperature showed a significant negative relationship with leaf infestation due to adults and root infestation due to grubs of *P. striolata*.

The IPM strategy adopted against *P. striolata* in radish was highly effective in terms of reducing pest infestation, higher economic yield, reduced insecticide consumption and reduced cost of cultivation in comparison to the FP which envisage to adopt IPM strategy for effective management of *P. striolata* in radish. The radish crop produced from IPM fields fetched higher price in the market as compared to FP proving IPM is a socially acceptable and economically feasible approach for pest management. However, there was scanty information available/awareness regarding IPM strategies against *P. striolata* management in radish. Thus, farmers started relying upon chemical insecticides, which failed to attain the satisfactory results. In this circumstances, the IPM strategy comprising of deep summer ploughing, application of well decomposed farm yard manure enriched with *M. anisopliae*, soil application of neem cake, growing sorghum/ maize as a barrier crop, intercropping mustard as a trap crop, installation of yellow sticky traps, drenching the root zone with biological control agent *M. anisopliae*, spraying of neem oil and neem based dusting or spraying of malathion was validated and found that the strategy collectively resulted in making IPM effective and economical in dealing the menace of *P. striolata* in radish. Every single intervention of IPM mentioned above had their significant role in providing the satisfactory results.

To conclude, the IPM strategy thus validated against *P. striolata* in radish performed significantly effective in tackling the insect pest menace in comparison to the Farmers practice. Farmers got benefitted in terms of reduction in pest incidence, avoidance of unwarranted insecticidal sprays, obtaining higher yield and higher prices in the market for the produce by following IPM interventions in radish in Nilokheri Block of Karnal District Haryana.



### ICAR Certification of the Technology

Integrated Pest Management module for striped flea beetle, *Phyllotreta striolata* infesting radish (*Raphanus sativus* L.)-ICAR-CS-NCIPM Technology-2024-031.