Cabbage Stem Flea Beetle in Winter Oilseed Rape in Europe

Recommendations for Sustainable Production

Insecticide Resistance Action Committee

www.irac-online.org

Introduction and Background

Flea beetles are economically important pests of oilseed rape (OSR), *Brassica napus,* in Europe. The most important species is cabbage stem flea beetle (CSFB), *Psylliodes chrysocephala,* (Coleoptera: Chrysomelidae). Several *Phyllotreta* species also occur (Zheng et al 2020).

Adult beetles infest plants at emergence, feeding on cotyledons, leaves, shoots and meristems (Picture 1). Damage is visible as 'shotholes' on leaves, deformities, or seedling death. Adults live for ~5-7 months, continually migrating and laying eggs (single generation). If a crop stand is established, plants are susceptible to infestations of larvae. Immatures are briefly exposed outside petioles for short periods of time before tunneling into stems as a 3rd instar (Picture 1), reducing plant vigor and yields. Some established thresholds may be available for adults and larvae. Check with local advisors for recommendations based on available control measures.

In the Europe, flea beetle infestations are of even more concern due to the decreasing availability of insecticides. Increasing regulatory restrictions for product registrations are a key factor in the availability of effective insecticides. Of the remaining classes of chemistries available, selection pressure is high and resistance is present. The situation presents the need to adopt all available crop management practices to produce a crop with the least reliance of insecticides.

Picture 1. CSFB adults feeding on OSR petioles and larvae feeding in stem. (Photographs used with permission from Corteva)

Insecticide Resistance Management

The table below are Modes of Actions approved for CSFB management as foliar spray or seed treatment. The number of MoAs may vary by country. Please check local regulatory status.

MoA	Primary Site of Action	Chemical Sub-group or Exemplifying Active
1	Acetylcholine esterase inhibitors	1B: Organophosphates
3	Sodium channel modulators	3A: Pyrethroids, Pyrethrins
4	Nicotinic acetylcholine receptor agonists	4A: Neonicotinoids; 4D Flupyradifurone
28	Ryanodine receptor modulators	Diamides
UN	Compounds of unknown/uncertain MoA	Azadirachtin

Pyrethroid resistance in Europe is now widely reported following 30 years of use. Research has revealed CSFB populations have developed target site resistance (kdr-L1014F). Another uncommon mutation (skdr-L925I) appears to have a greater impact on pyrethroid field performance. Regions with reduced pyrethroid field activity correlate to high frequency of mutations. Multiple locations are known where field failures occur in the absence of *kdr* mutations suspected due to metabolic resistance mechanisms like P450 mediated-detoxification (Zimmer et al. 2014, Willis et al. 2020). No information on resistance to the other MoA has been published. Consult local experts to confirm sensitivity of other MoA.

Integrated Pest Management

A number of IPM strategies have been attempted with varying levels of success. There is no certainty that one will prevent flea beetle impact, however implementation of some may lessen the impact. A review by Ortega-Ramos et al. 2021 has described IPM strategies, summarized knowledge gaps, and proposed future research needs.

Outlined here are an abbreviated list of some IPM strategies:

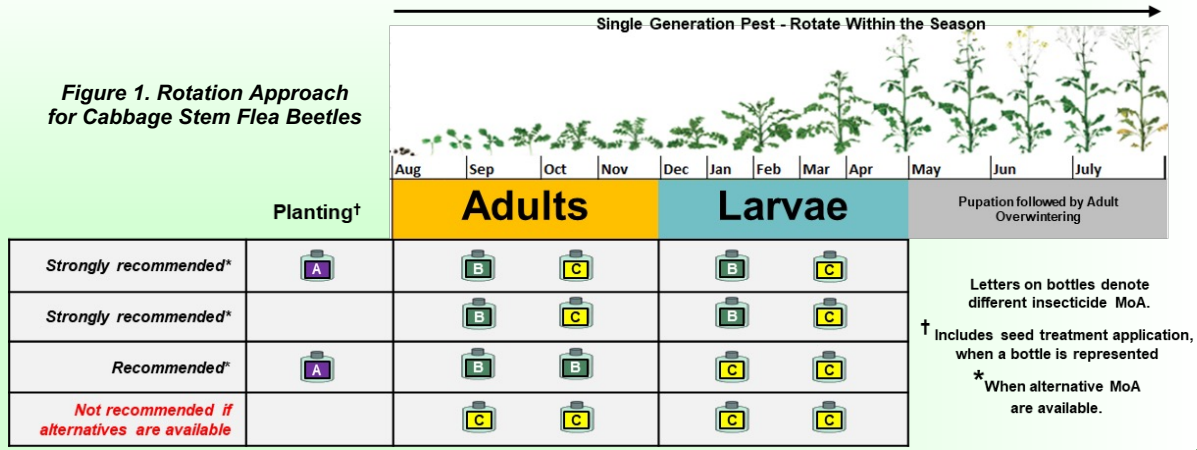
Pre-sowing
- Use trap crops to reduce pressure on OSR crop.
- Use cover crops for promoting soil health benefits.
- Seed Treatments (including nutritionals for achieving stand).
- Natural enemy conservation, especially in headlands.

Sowing
- Use an optimal seed rate.
- Early sowing to ensure emergence before CSFB migration.
- Late Sowing to reduce larval pressure and potentially reduce adult damage.

In Season
- Monitor adults for optimizing insecticide timing.
- Apply insecticides at established thresholds. Rotate MoA that are locally available and use available MoA for the most sensitive life stage (see window rotation scheme).
- Encourage and improve activity of natural enemies.

Rotation Approach for Cabbage Stem Flea Beetle

Figure 1. Rotation Approach for Cabbage Stem Flea Beetles



References

Ortega-Ramos et al. 2021. Integrated pest management strategies for cabbage stem flea beetle (*Psylliodes chrysocephala*) in oilseed rape. GCB Bioenergy DOI: 10.1111/gcbb.12918

Willis et al. 2020. Investigating the status of pyrethroid resistance in UK populations of the cabbage stem flea beetle. Crop Protection 138: 105316.

Zheng X et al. 2020. A Global Survey on Diseases and Pests in Oilseed Rape—Current Challenges and Innovative Strategies of Control. Frontiers in Agronomy. 2:590908.

Zimmer, C.T., A. Muller, U. Heimbach, and R. Nauen. 2014. Target-site resistance to pyrethroid insecticides in German populations of the cabbage stem flea beetle. Pesticide Biochemistry and Physiology 108:1-7.

Note: For a comprehensive list of existing insecticides classified by MoA group visit the IRAC website (http://www.irac-online.org/teams/mode-of-action). In the "window rotation scheme", use as many effective MoA groups as locally registered/available and always follow product labels for specific directions of use.

January 2023, Poster Version 1

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