ADDRESSING THE INCREASING CROP LOSS FROM CABBAGE STEM FLEA BEETLE (CSFB) IN OILSEED RAPE (OSR)

Introduction

CSFB *(Psylliodes chrysocephala)* has emerged as a significant pest in the cultivation of oilseed rape (OSR). Since neonicotinoid seed treatments were initially banned in the UK, in May 2013, this has had a detrimental impact on hectarage, with lower average yields, a hole in rotations for alternative break crops and a marked financial impact to farm businesses.

The figures for this are startling as average yields have dropped from 3.9 t/ha in 2011 & 2015 to 2.7 t/ha in 2024*, as well as the area significantly reducing, on average by 500k ha from the highs of 2012.

Meanwhile, input prices for OSR have risen, commodity price has fluctuated and as a country we have moved from exporter to importer. Increased environmental legislation on the part of successive governments and the growing resistance of Cabbage Stem Flea Beetle (CSFB) to pyrethroids, means the industry can no longer look to chemical inputs for the answer. There is no doubt a more holistic approach to CSFB control is needed.

With the industry in crisis and grower confidence in this key break crop at an all-time low, where does the future of oilseed rape in the UK stand?

COULD PLANT BREEDING PROVIDE A SOLUTION?

(*UK Gov website)

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1. CSFB: An Overview

1.1 Insect Profile

- **Scientific Name:** *Psylliodes chrysocephala*
- **Appearance:** Adult beetles are small (3-4 mm), with a metallic black/blue body and large hind femora. Larvae are 6-7 mm in length, dirty-white in colour, with a dark brown or black head
- **Hosts:** Primarily oilseed rape (OSR) and other brassicas such as cabbage, mustard, and turnip.
- **Geographical Presence:** Europe, North Africa, Asia, and Canada.

1.2 Lifecycle and Feeding Behaviour

The CSFB undergoes several life stages: adults migrate to OSR crops, feeding on cotyledons and true leaves, creating shot-holing damage. Larvae then mine petioles, side stems, and the main stem, leading to structural damage and reduced plant vigour. The damage inflicted by both adults and larvae can lead to total crop loss under severe infestations, impacting plant health and subsequently yield.

1.3 Plant impact

- **Adult CSFB damage:** Initially observed after plant emergence as shot-holing damage caused by feeding, this can lead to entire crop loss.
- **Larval CSFB damage:** Visual indicators of this first appear in late autumn, but the severe crop impact is evident in spring at the time of stem extension in the form of stunted growth and bushy plants which lead to extended and uneven flowering.
- Adult flea beetle damage can be chemically controlled to an extent, however larval damage cannot be mitigated against because the insecticides approved for use on CSFB are contact acting and it is not possible to target the larvae inside the stems and petioles.

1.4 Economic Impact

The damage from CSFB results in:

- **Reduced Yield:** Growers complain about depleted yields at harvest in fields with signs of CSFB presence this has an inevitable impact on their overall farm profitability.
- **Increased Disease Susceptibility:** Damaged stems provide entry points for fungal pathogens like Stem Canker and Cylindrosporium, increasing the risk of secondary infections leading to yield loss.
- **Heterogeneous Development:** CSFB damage leads to uneven plant growth, resulting in asynchronous flowering, this causes reduction in yield as well as having a significant impact on quality which inevitably affects profitability.

2. Factors Contributing to Increasing CSFB Pressure

2.1 Climate Change

Warmer autumn temperatures and milder winters have created more favourable conditions for CSFB to thrive. These environmental shifts extend the activity period of the beetles, resulting in larger populations.

2.2 Ban on Neonicotinoids

The ban on neonicotinoid seed treatments, which were once effective in controlling flea beetle populations during early crop development, has compounded the issue. This has increased the vulnerability of OSR crops to early infestation and extended damage.

2.3 Reduced Efficacy of Chemical Controls

The decrease in the availability of effective insecticides and the growing resistance to pyrethroids, which are the primary chemical control agent for flea beetle, has further complicated the management of this pest. Resistance is rapidly increasing, making traditional chemical solutions less effective. (C.E. Willis et al., Crop Protection 138 (2020) 105316)

3. Current Management Practices – IPM Strategy

3.1 Crop Establishment

Optimising crop establishment is critical in mitigating flea beetle damage. This includes:

- Tillage and seedbed preparation appropriate to soil type – to aid moisture retention and ensure good seed to soil contact.
- Correct sowing depth and rolling – seed shouldn't be sown too deep and rolling helps to consolidate seedbeds and locks moisture into soils which are likely to dry out quickly
- Adjust sowing rates and sowing dates to conditions
- Nutrient management – provide nutrition at sowing to encourage rapid establishment.

These practices aid crops to grow away from adult flea beetle attack and improve plant resilience during early growth stages.

3.2 Insecticide Application

CSFB populations can no longer be effectively controlled by spraying alone, therefore researchers and growers alike have adapted to meet the challenges of increased resistance of CSFB to insecticides by:

- **Monitoring:** Regular monitoring of flea beetle populations using traps to track migration and populations, as well as plant assessments.
- **Thresholds:** Insecticide – specifically pyrethroid - application should be considered and adjusted accordingly when thresholds are met.
- **Resistance Management:** Overuse of pyrethroid spray contributes to increased resistance. The continued application of a single active substance becomes less effective and more costly over time.

4.1 Genetic solutions for Integrated Pest Management (IPM) Strategy

Responding to the issues faced by the arable industry and the importance of an IPM approach when growing OSR, leading plant breeders Limagrain UK have adapted their highly successful OSR breeding programme to produce hybrid varieties offering genetic resilience to CSFB attack as part of an integrated crop management programme.

Limagrain's CSFB Resilience is a novel and exciting genetic approach that protects against CSFB. The success of resilience can be defined by noticeably reduced CSFB damage at the end of the growing season.

Limagrain's CSFB Resilience is expressed as a grouping of genetic characteristics including:

- **Autumn Dynamic Growth:** These varieties have strong early vigour, which allows them to escape early CSFB attacks.
- **Spring Stem Elongation:** Rapid development post-winter and fast stem elongation helps crops overcome damage caused by overwintering larvae.
- **Number of flea beetle larvae:** Certain varieties exhibit fewer larvae per plant, minimising damage to stems and enhancing overall crop health. Yield can decrease by between 50 and 70 kg/ha for each additional larvae per plant. (AHDB, 2020)
- **Severity of larval damage:** Some varieties show less severe damage symptoms, such as stunted growth and bushy plants.

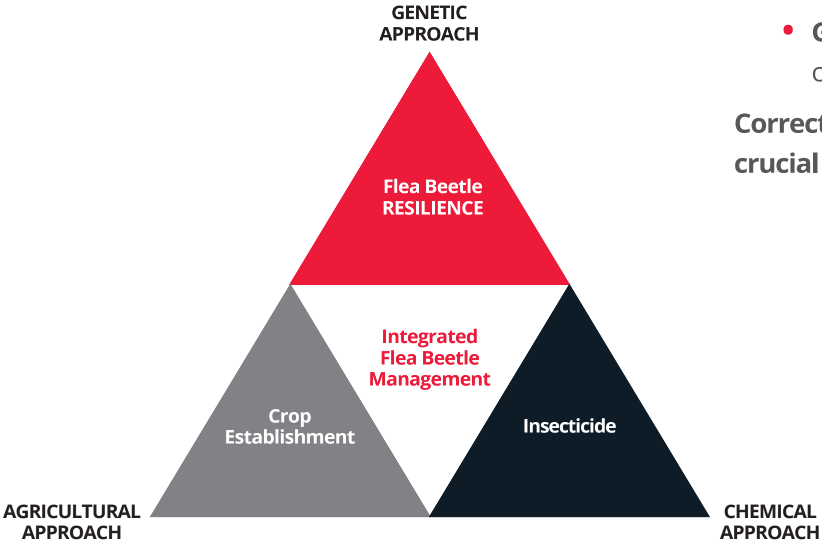
4.2 Varieties offering CSFB Resilience

Limagrain's hybrid varieties LG Avenger and LG Aviron exhibit the highest levels of CSFB resilience. Their high yields demonstrate the value of the Resilience across extensive UK and European trials.

4.21 Trials Results

As a breeder, Limagrain assesses vigour and growth habit over multiple years and sites across both the UK and Europe.

Both LG Avenger and LG Aviron score exceptionally highly in UK and independent European trials conducted by Terres Inovia across consecutive years, demonstrating the best possible measure for CSFB resilience.



However, for this resilience to be fully expressed, trials have shown the importance of the genetics being supported by a fully integrated pest management programme incorporating:

- **Cultural Control:** Optimising crop establishment and managing tillage practices to reduce CSFB habitat.
- **Chemical Control:** Timely insecticide applications based on threshold monitoring and resistance management.
- **Genetic Control:** Planting OSR varieties that offer genetic resilience to the CSFB threat.

Correct variety choice as a part of this IPM strategy is crucial to the overall success of the OSR crop.

5. Conclusion

In response to the significant challenges of growing a profitable OSR crop as a result of climate change, reduced chemical controls and increasing resistance, Limagrain has adapted its breeding approach to produce varieties that offer genetic resilience to CSFB attack, supported by, and as part of, an integrated pest management programme.

By choosing to grow a Limagrain variety that offers CSFB RESILIENCE, farmers can mitigate the impact of this pest and therefore enhance the long-term sustainability and profitability of OSR.

[1] Scale runs from 1-9 with 9 showing the character to a higher degree.