

THE POTENTIAL OF NATURAL ENEMIES TO SUPPRESS RICE LEAFFOLDER POPULATIONS

PhD student: Joop de Kraker

General

Rice leaffolders (*Cnaphalocrocis medinalis* and *Marasmia* species) are insects that attack rice plants and are considered serious pests in many Asian countries. Farmers often spray insecticides to control them. However, spraying may not always be necessary. Rice plants can tolerate some damage, and many natural enemies already help control these pests.

This study looked at how natural enemies — especially local predators — can reduce rice leaffolder populations and limit crop damage.

What the researchers did

The research began by observing leaffolder populations in unsprayed rice fields in the Philippines. The scientists studied how pest numbers changed over time. They then carried out experiments to measure:

- How many eggs died
- Which predators were responsible
- How much damage the pests caused

They also used computer models to combine all the findings. These models helped explain what happened in the fields and predict what might happen under different conditions, such as changes in fertilizer use or predator numbers.

What they found in the field

In eight unsprayed rice fields:

- Egg numbers peaked when the rice plants were growing many shoots (maximum tillering stage).
- Larvae (caterpillars) peaked later, around the booting stage.
- Larval numbers ranged from 0.2 to 2 larvae per rice hill.

Surprisingly, survival from egg to larva was not clearly linked to how many natural enemies were present or how many eggs were parasitized.

However, high nitrogen fertilizer use made a big difference. More nitrogen led to:

- More eggs
- Better survival of larvae
- More plant damage

This happened partly because predator numbers did not increase as fast as pest numbers.

What killed most of the eggs?

About 60% of leaffolder eggs died in the field.

Most egg deaths were caused by predators eating the eggs. A smaller number died due to parasitic wasps (*Trichogramma* species). Very few eggs simply failed to hatch.

Two small cricket species were the most important predators:

- *Metioche vittaticollis*
- *Anaxipha longipennis*

Field observations showed that these crickets were responsible for more than 90% of the observed egg predation during two growing seasons.

Other predators, such as certain beetles and grasshoppers, played only a minor role.

Experiments showed that the crickets' ability to eat eggs mainly depended on how quickly they could find them. When more crickets were placed together, each cricket ate slightly fewer eggs — probably because they interfered with one another.

Importantly, the presence of other prey did not reduce egg predation much.

Do leaffolders really reduce rice yield?

The researchers used computer simulations to explore this question.

The results showed:

- In well-fertilized rice fields, the pest levels observed in unsprayed fields did not cause major yield loss.
- If no natural enemies were present, yield losses could reach economically damaging levels.
- When natural enemies (egg predators and parasitoids) were included in the model, yield losses dropped below economic damage levels.

Depending on their numbers, the predatory crickets reduced leaffolder damage by 5% to 60%, with an average reduction of 35%.

What does this mean?

The study shows that natural enemies play a very important role in controlling rice leaffolders. Spraying insecticides may not always be needed and could even harm these helpful predators.

The findings suggest two key strategies:

1. Protect and conserve natural enemies to reduce the need for insecticides.
2. Optimize nitrogen fertilizer use — enough to support good yields, but not so much that it increases pest problems.

The study also shows that computer models combining crop growth and pest dynamics can help farmers and researchers understand how different factors affect rice yield.

Main message

Rice leaffolder control is not just about killing pests. Natural predators already do much of the work. By protecting these natural enemies and managing fertilizer carefully, farmers can reduce pesticide use, protect the environment, and maintain good rice yields.