

DEVELOPING BENEFICIAL NEMATODE-BASED BIOCONTROL SOLUTIONS TO FALL ARMYWORM IN AFRICA

Locations	Kenya, Rwanda, Switzerland
Dates	01/04/2024 - 30/03/2028

Summary

The fall armyworm is a major pest devastating more than 80 crops. However, it favours maize where it can cut yields by up to 90%. The pest has invaded Africa, Australia and Asia, and recently arrived in Europe. Existing pest management efforts against the maize pest include insecticides. But an overreliance on these has led to prolific increases in insecticide applications in maize cultivation in Africa, and detrimental health and environmental threats. The ineffective existing control method has highlighted the need for more effective, safer and more sustainable control practices. An expert team from the University of Neuchatel, icipe, Dudutech Bioline, the Rwanda Agriculture and Animal Resource Development Board and CABI are developing practical, safe and effective

techniques of entomopathogenic nematodes as biological control agents against armyworm caterpillars to help mitigate the impacts of fall armyworm on food security in Africa. This is supported by the Swiss Solution-oriented Research for Development Program (SOR4D).

The problem

The fall armyworm *(Spodoptera frugiperda)* is a voracious insect pest that has invaded Africa, southern and eastern Asia, as well as Australia and has recently started to enter southeastern Europe. Its caterpillars can feed on a broad spectrum of staple crops but are particularly destructive to maize, causing huge crop losses. CABI research has revealed that fall armyworm costs 10 of Africa's maize-producing economies between $2.2bn to $5.5bn a year in lost harvests.

As maize is one of the three major carbohydrate providers to humans, this invasive maize pest is threatening food security on these continents.

Efforts by farmers to manage the pest are being made; however, existing control methods are insecticides. With an overreliance on these and the unprecedented increase in applications in maize cultivation, the method is proving ineffective. Furthermore, the health and environmental hazards posed by the toxins have prompted the need for safer and more sustainable control practices.

Entomopathogenic nematodes are a potential biocontrol option against fall armyworm. They are tiny insect-killing worms, also called beneficial nematodes, that have been used for nearly a century as biocontrol agents against insect pests. But their application against insect caterpillars aboveground has been challenging.

What we are doing

This project, "Biological control of the fall armyworm with entomopathogenic nematodes for enhanced food security in Africa" is aimed at developing practical, safe and effective application techniques of entomopathogenic nematodes (EPN) as biological control agents against fall armyworm caterpillars. By doing this, the need to use and rely on pesticides for control will be reduced.

Teams of leading scientists on EPN and expert researchers will collaborate and use their expertise in chemical ecology to produce a formulation that has minimal undesirable effects on the environment, native biodiversity and non-target insects. The team consists of EPN and armyworm experts from the University of Neuchatel, Switzerland, icipe, Kenya, Dututech Bioline, Kenya, the Rwanda Agriculture and Animal Resource Development Board (RAB) and CABI's centres in Switzerland and Kenya.

The project builds on recent successes in developing a novel application method for EPN against soil-dwelling insects using biodegradable agents, such as gels. This approach will be adapted and optimized for aboveground application against the fall armyworm pest in this project.

Once developed, the formulation will be taken to the fields by teams with extensive experience in pest management who will liaise with farmers and local extension workers in Kneya and Rwanda to conduct field tests. This will ensure rapid implementation and adoption of the biocontrol strategy. The most promising formulation will then be mass-produced.

CABI's role in this project will focus on application techniques and biocontrol product development. Working in collaboration with RAB, CABI will also validate the project findings with Rwandan farmers.

In addition to the biocontrol agent, the project will engage female and young farmers, encouraging them to adopt the strategy to enhance household resilience and create new job opportunities.

The work is linked to the CABI-led PlantwisePlus programme which encourages smallholder farmers to make greater use of safer biological control agents to fight crop pests as part of an Integrated Pest Management plan. It is also connected to biocontrol work being conducted by CABI and the University of Neuchatel with the Rwanda Agriculture and Development Resources Board for invasive species management.

Results so far

So far, results from Rwanda and Switzerland show that many different nematode species and strains are highly virulent to fall armyworm.

Initial results show that gel formulations may be most appropriate to formulate EPN to be applied into the leaf whorls where the armyworms mainly feed. Gel-formulated EPNs reach higher, or similar control efficacies, as standard pesticides. In some countries with overlapping continuous generations of armyworm, such as Rwanda, multiple applications of EPNs are needed as with pesticides.

Donors

Swiss National Science Foundation (SNSF), Swiss Development Cooperation (SDC) as part of the Solution-orientated Research for Development Program (SOR4D)

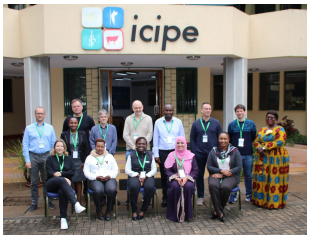
Partners

University of Neuchâtel, Switzerland, International Centre of Insect Physiology and Ecology (icipe), Dudutech Bioline, Rwanda Agriculture and Development Resources Board (RAB)

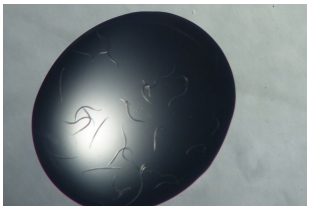
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