

EXTENSION CIRCULAR

Department of Agricultural Research Services (DARS) | February 2026



Ministry of Agriculture, Irrigation
and Water Development

Detain Bio-pesticide: An Entomopathogenic Biological Control of Fall Armyworm on Maize Production in Malawi

Introduction:

In recent years, maize production has faced increasing threat from biotic stresses, particularly from Fall Army Worm (FAW), which have caused severe yield losses and significant economic damage. First reported during the 2016/2017 cropping season, FAW has caused significant yield losses and economic damage. Its rapid reproduction, nocturnal feeding behavior, and increasing resistance to conventional pesticides make it difficult to control, posing a serious challenge to smallholder farmers.

Although many farmers have traditionally depended on chemical pesticides to manage FAW, this approach raises concerns regarding environmental safety, human health and affordability.

In response to these challenges, the Department of Agricultural Research Services (DARS), in collaboration with the International Centre of Insect Physiology and Ecology (ICIPE), evaluated and released an entomopathogenic bio-control product known as Detain. Detain has been developed as a safer, environmentally friendly, and economically viable pest management option for suppressing FAW populations.

Description of Detain Biopesticide

Detain is an oil-based biopesticide containing the entomopathogenic fungus *Metarhizium anisopliae* ICIPE 7. It controls Fall Armyworm by attaching to and penetrating the larval cuticle, where it produces toxins that ultimately kill the pest. Field evaluations have demonstrated that Detain provides effective FAW control and contributes to increased maize yields. Economic analysis indicates Benefit–Cost Ratios (BCRs) ranging from 1.6 to 1.9, reflecting strong profitability compared to untreated fields. Its strong knockdown effect action, combined with environmental safety, makes Detain a viable and sustainable option for FAW management.

Benefits of using Detain Biopesticide

- Application of Detain increases FAW mortality, reducing leaf/cob damages as synthetic pesticides.
- It is safe for human health and the environment since it does not harm non-target organisms like natural enemies or cause pollution.
- Detain provides a sustainable and cost-effective alternative for pest management, helping to mitigate pesticide resistance, environmental degradation, and biodiversity loss, while aligning with national agro ecological objectives
- It is a sustainable and cost-effective pest management alternative to mitigating issues of pesticide resistance, environmental, and biodiversity loss, aligning with national agroecological goals.

Circular #.: 300126-170226-023- BPT



Fig 1, fall armyworm larvae destroying maize the plant

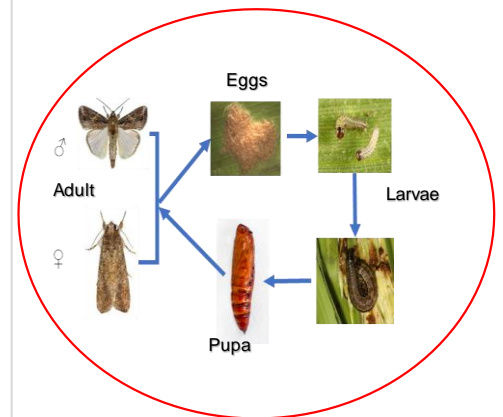


Fig 2, Life cycle of Fall armyworm on maize the plant



Fig 3, Detain product and a dead Fall armyworm larvae

This Extension Circular was developed based on evidence presented at the Agricultural Technology Clearing Committee and thereafter approved by Ministry of Agriculture, Irrigation and Water Development in Malawi.

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When to Apply

- Scout fields regularly and apply Detain only when FAW infestation is detected. The product is most effective when larval populations are low and caterpillars are at early growth stages (1st and 2nd instars).
- Apply Detain as a foliar spray late in the evening or early in the morning. This timing targets active larvae and protects the live fungal spores from degradation by direct sunlight.
- Do not apply Detain when rainfall is imminent, as rain may wash off the product and reduce its effectiveness.

NOTE: FAW infestation can occur at any stage of crop growth, particularly when maize leaves are tender. Timely detection and early application are critical for effective control.

APPLICATION PROCEDURE

How to Apply Detain

- Thoroughly wash the sprayer before use to remove any residues from previously applied chemical pesticides.
- Use clean water from a borehole or well when preparing the spray solution.
- Shake the Detain bottle thoroughly to ensure that fungal spores are well suspended in the oil formulation before mixing.
- Dilute Detain at a rate of **2 ml per litre of water** as follows:
 - 32 ml in a 16-litre knapsack sprayer
 - 40 ml in a 20-litre knapsack sprayer (*This equivalent to 400 ml of Detain and 200 litres of water per hectare*).
- Pour the measured quantity into the sprayer and mix thoroughly. Continue shaking the mixture during application to maintain even distribution of spores.
- Direct the spray into the maize whorl (funnel), where FAW larvae feed and hide, to ensure maximum contact and effectiveness.

Safety and Handling Precautions

- Wear appropriate personal protective equipment (gloves, apron, mask, hat, and boots) during mixing and application.
- Prepare only the quantity required for immediate use. Do not store mixed solution for more than four (4) hours, as product viability decreases over time.
- Store the product in a cool, dark, dry, and well-ventilated place out of direct sunlight. Close containers tightly after use to avoid contamination and loss of efficacy.



Fig 4, Maize crop heavily infested with fall armyworm (un-treatment)



Fig 5, Maize cobs applied with Detain product

For additional information contact:

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