

PACER®
Metarhizium anisopliae
Biotermiticide/ BioInsecticide
(Regd in Central Insecticides Board, Govt of India)
APPROVED FOR USE IN ORGANIC AGRICULTURE

Introducing PACER®

PACER® is a biological insecticide based on a selected strain of naturally-occurring entomopathogenic soil fungus *Metarhizium anisopliae* (NCIM 1311) that infects and kills termites, locusts and larvae and adults of many soil insects like root grubs and root weevils; ants and larvae of lepidopterous insects.

PACER® contains spores and mycelial fragments of *Metarhizium anisopliae*. It is formulated as Wettable Powder with CFU count of 1×10^8 / g. PACER® is registered by Indian Pesticides Regulatory Authority - Central Insecticides Board, Govt of India. PACER™ is approved for use in Organic agriculture.

A Historical Brief

The Entomopathogenic property of Metarhizium anisopliae was first discovered in 1879 by Elie Metchnikoff in experimental tests to control the wheat grain beetle, *Anisoplia austriaca*. It is also known as the green muscardine fungus owing to the green colour of the sporulating colonies produced by it. It was formerly known as *Entomophthora anisopliae*.

Mode of Action

Conidial penetration: The conidial spores get attached to the host by entering through the host's spiracles and pores of its sense organs and start germinating. Surface growth on cuticle occurs to a limited extent where the fungus derives nutrition from the lipids in the cuticle. The fungus produces an appressorium (a swelling on the end of the germ tube) which marks the start of invasion of insect. The appressorium produces a penetration peg that enters the external skeleton (cuticle) of the host. The fungus produces a lateral extension of hyphae inside insect body which proliferate and start feeding on insect's internal contents.

Enzyme production: Fungal extracellular enzymes mainly the proteases help penetration of insect cuticle through localized hydrolysis. PACER® mycelia produce secondary metabolites and destruxin- a mycotoxin cyclodepsipeptide, that helps the fungus overcome the host defences as the host tends to produce melanin – a dark compound as a defence mechanism.

Growth: Hyphae continue to grow till mycelia fills the entire insect's body. After consuming internal contents (haemolymph) the fungus breaks out of insects cuticle and starts sporulating making the insect appear fuzzy. After its death the host is seen to be enveloped by a mat of green conidia. PACER® infects the insect on contact and does not need to be consumed by the host to cause infection.

Environment factors: *Metarhizium anisopliae* is sensitive to temperature extremes. The spore viability decreases as storage temperatures increase and virulence decreases at low temperatures. The fungus needs high humidity for releasing and multiplication of spores.

Infection establishes between 24 to 48 hours. The infected insect may live for three to five days after hyphal penetration and after death of host insect pest, the conidiophores bearing conidia are produced on cadaver.

PACER® has unique Horizontal Transfer Effect (HTE) unlike any chemical termiticide. Normal chemical termiticides when drenched on soil enter mostly vertically down in soil and partially horizontally. Only the termites coming in direct contact with the chemical termiticide get killed without affecting the large travelling colony and queen who remain safe in their soil haven. However, PACER® being a BioTermiticide has a Horizontal Transfer Effect and start multiplying horizontally due to availability of moisture and target pests. Termites being social insects, have a definite pattern of movement in colonies and finally all workers reach the termitarium where the Queen resides. PACER® being a microbial product starts pathogenising the workers and as the workers move in colonies and touch each other, the spores get transferred from one worker to another and thus the spores finally reach the Queen also. The queen produces as many workers by parthenogenesis and hence only killing the workers is not effective. It is important that the spores reach and infect the queen in the termitarium. Thus the entire colony of termites get pathogenised and PACER® offers long term control.

Method of Application

Soil Application: Mix PACER® @ 5g/ L of water and decant the supernatant liquid and apply through drip irrigation, flood irrigation, spraying on soil , drenching the root zone.

PACER® can also be mixed with organic fertilizers , vermicompost / neem cake and applied to root zone.

Termitarium application: Destroy the termitarium and drench the termitarium area with liberal quantity of water with PACER® Suggested dilution is 5 g/L of water.

Foliar spray: Mix PACER® @ 2.5 Kg in 1000 L of water and spray to control termites in Groundnut.

Mix PACER® @ 5 g / L of water and spray for control of Lepidopterous pests / Caterpillar pests and locusts.

The spray volume depends upon the crop canopy.

Target Pests

Termites , Root Grubs ,Locusts , Root weevils , Ants , Beetles and Caterpillar pests

Crops

PACER® is suitable for application on Cereals , Millets , Pulses, Oilseeds, Fibre Crops , Sugar Crops , Forage Crops , Plantation crops ,Vegetables, Fruits, Spices , Flowers , Medicinal crops , Aromatic Crops , Orchards and Ornamentals

Compatibility

PACER® is compatible with BioPesticides and not with Chemical Fungicides.

Shelf Life

PACER® is stable for a period of 12 months from the date of manufacturing.

Mass Composition

CONSTITUENT	W/W %	FUNCTION
<i>Metarhizium anisopliae</i> (Spores and Mycelia)	01.15%	Active
Moisture	08.00% max	Inactive
Carrier Powder - Kaolin	90.85%	Inactive

Biological Composition

CONSTITUENT	CFU/g.	FORMULATION
<i>Metarhizium anisopliae</i>	1*10 ⁸	Wettable Powder

Other Formulations available

<i>Metarhizium anisopliae</i> CFU/g	1*10 ⁹	Soluble Powder
<i>Metarhizium anisopliae</i> CFU/ml	1*10 ⁹	Liquid
<i>Metarhizium anisopliae</i>		Lyophilized

Free from Salmonella, Shigella , E.Coli

Cautions for handling and use of product

1. Avoid inhalation and skin contact while diluting as there could be spillage / splashes of the product
2. Mixing and spraying equipment is to be thoroughly rinsed with water and detergent before using the same equipment for spraying other pesticides.
3. Surplus spray solution should not be disposed in crop lands / stagnant water / flowing water where there is a possibility of causing pollution to natural resources
4. Do not eat / drink / smoke during application.
5. Direct incidence of PACER[®] may cause irritation and therefore it is recommended that the operator should use protective gear viz gloves, apron, mask, eye gear and hood.

Symptoms and Antidotes

Symptoms: Occasional symptoms include head ache and nausea.

Antidote: In the case of ingestion: symptomatic treatment is advised. In the case of contact with Eyes: Flush with water liberally for 20 minutes. In case of Skin contact, wash the affected area with plenty of water and soap.

Citations

There are many citations in public domain on effectiveness of *Metarhizium anisopliae* as a BioTermiticide

Commitment to Nature

- PACER[®] is approved for use in organic agriculture.
- PACER[®] is safe to use along with bio fertilizer inoculums like Agri Life Nitrofix[™] (Nitrogen Fixing bacteria) ; P Sol B[®] (Phospho bacteria) ; K Sol B[®] (Potash mobilizing bacteria); Zn Sol B[®] (Zinc mobilizing bacteria) ;S Sol B[®] (Sulphur solubilizing bacteria) : Si Sol B[™] (Silica solubilizing bacteria) : Fe Sol B[®] (Iron / Ferrous solubilizing bacteria) : Mn Sol B[™] (Manganese solubilizing microbe) and Agri Life Agrivam[®] (Vesicular-arbuscular mycorrhiza)
- PACER[®] is safe to natural parasites , pollinators and predators.
- PACER[®] can be used as an effective component in IPM programmes, thereby leading to a reduction in use of chemical pesticides and creating a safer environment.
- PACER[®] does not lead to residue problems and doesn't cause resistance or resurgence problems.

Benefits from PACER[®]

- PACER[®] effectively controls most of the economically important pests such as Termites , root grubs , locusts, root weevils , ants and caterpillar pets
- Pest reduction leads to improved plant health and thereby increased crop productivity.
- PACER[®] is pet friendly , eco friendly and infant friendly