

SHEATHGUARD™

Pseudomonas fluorescens

BioFungicide / BioNematicide

(Being Regd in Central Insecticides Board, Govt of India)

APPROVED FOR USE IN ORGANIC AGRICULTURE

Introducing SHEATHGUARD™

SHEATHGUARD™ is a biological fungicide, bio nematicide and a Plant growth promoting rhizosphere bacteria (PGPR) based on a selected strain of naturally-occurring beneficial soil bacteria *Pseudomonas fluorescens* (IIHR PF-2). SHEATHGUARD™ protects crops from various fungal diseases like sheath blight of rice, sheath blight of banana and diseases caused various pathogenic fungal species.

SHEATHGUARD™ is also a BioNematicide that controls nematodes like Root knot nematode, cyst nematode ,and citrus nematode

SHEATHGUARD™ contains vegetative cells of *Pseudomonas fluorescens* . It is formulated as Wettable Powder with CFU count of 1×10^8 / g. SHEATHGUARD™ is being registered by Indian Pesticides Regulatory Authority - Central Insecticides Board, Govt of India. SHEATHGUARD™ is approved for use in Organic agriculture.

A Historical Brief

Sheath blight was first described in Japan by Miyake in 1910, but was first noted by Yano in 1901. Reinking (1918) and Paolo (1926) found a very similar disease in the Philippines. Park and Bertus (1932) reported the disease in Sri Lanka and Wei (1934) in China.

The control of Sheath Blight using *Pseudomonas fluorescens* is of recent origin reported by Sakthivel et al in 1986 where 117 isolated strains of *Pseudomonas fluorescens* were used to assess its efficacy as a bio control agent.

Mode of Action

Substrate Competition for Nutrients: SHEATHGUARD™ colonizes and absorbs maximum nutrients available at the target site and thereby controls the pathogens by starving them for food.

Mycoparasitism: SHEATHGUARD™ controls spore production by pathogenic plant fungus is inhibited. SHEATHGUARD™ produces hydrogen cyanide and siderophores (iron chelates) pyocheline and pyoverdine which it uses to outcompete with many pathogenic bacteria for iron necessary for growth and suppress pathogens in the rhizosphere.

One of many byproducts of plant cells includes active oxygen such as superoxide which are toxic to microbes. SHEATHGUARD™ secretes superoxide dismutases to convert superoxide to hydrogen peroxide and catalases to convert peroxide to water. The presence of these enzymes contribute to *Pseudomonas fluorescens* present in SHEATHGUARD™ tolerant to oxidative stress and not lose its bio control efficacy.

Toxin production: It helps suppress the pathogens through secretion of antibiotic compounds and secondary metabolites like pyrrolnitrin, pycocyanine and 2,4 Diacetyl phloroglucinol (DAPG) that are antagonistic to the pathogens and signal gene expression to neighboring cells inhabiting the rhizosphere.

SHEATHGUARD™ produces antibiotics such as pyrrolnitrin, pyoluteorin, and 2,4-diacetylphloroglucinol that inhibit phytopathogen growth. SHEATHGUARD™ also produces exopolysaccharides which protect against bacteriophages or dehydration as well as for defense against the host immune system. It also produces lytic enzymes such as chitinases and β – 1,3 glucanases that degrade chitin and glucan present in the cell wall of pathogenic fungi and also degrades HCN and other toxins produced by pathogens.

Method of Application

Seed treatment: Mix 10 g of SHEATHGUARD™ with 10 g of crude sugar in sufficient water to make a slurry to treat 1 Kg seed. Coat the seed with this slurry so as to have a uniform coating all over the seeds. Dry the seeds in shade for 30 minutes and sow the treated seeds within 24 hours. SHEATHGUARD™ works as PGPR and bio fungicide and bio nematicide.

Nursery bed treatment: Apply SHEATHGUARD™ @ 50g / sq mt along with FYM @ 2 Tonnes / acre to the soil before transplanting for crops such as capsicum , tomato , brinjal, cabbage , cauliflower , crassandra., carrot and onion.

Polyhouse treatment: Apply SHEATHGUARD™ @ 50g / sq mt at an interval of 3 months for crops such as capsicum , tomato, brinjal , okra , carnations , and gerbera. This will work as BioFungicide / BioNematicide

Soil application: Apply enriched FYM @ 2Kg/ plant before planting and at an interval of 3 months after planting for crops such as rose , papaya , acid lime and banana. This will work as BioFungicide / BioNematicide

FYM enrichment: : Mix 1 Kg of SHEATHGUARD™ with 1 Tonne of FYM /compost. This should be left under shade for 15 days with adequate moisture. Mix thoroughly at an interval of 5 days to enrich the FYM /compost with the bio agent. This will work as BioFungicide / BioNematicide

Note :SHEATHGUARD™ should not be used in mushroom farming as it causes disease in mushrooms.

Target Diseases

Sheath Blight of Rice , Banded Leaf and Sheath Blight of Maize. Disease caused by *Rhizoctonia* spp and *Xanthomonas* spp.,

Crops

SHEATHGUARD™ 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

SHEATHGUARD™ is compatible with BioPesticides and not with chemical Fungicides.

Shelf Life

SHEATHGUARD™ is stable for a period of 12 months from the date of manufacturing.

Mass Composition

CONSTITUENT	W/W %	FUNCTION
<i>Pseudomonas fluorescens</i>	01.00%	Active
Carboxy Methyl Cellulose	00.50%	Inactive
Moisture	08.00% max	Inactive
Carrier Powder – Talc	Q.S	Inactive

BIOLOGICAL COMPOSITION

CONSTITUENT	CFU/g.	FORMULATION
<i>Pseudomonas fluorescens</i>	1*10 ⁸	Powder

OTHER FORMULATIONS AVAILABLE

<i>Pseudomonas fluorescens</i> CFU/g	1*10 ⁹	Soluble Powder
<i>Pseudomonas fluorescens</i> CFU/ml	1*10 ⁹	Liquid
<i>Pseudomonas fluorescens</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 is to be disposed in crop lands and not in stagnant water / flowing water
4. Do not eat / drink / smoke during application.
5. Direct incidence of SHEATHGUARD™ 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 and vomiting may be induced. In the case of contact with Eyes: Flush with water liberally for 20 minutes. In case of Skin contact, was the affected area with plenty of water and soap.

Citations

There are many citations in public domain on effectiveness of *Pseudomonas fluorescens* as a BioFungicide , BioNematicide and Plant growth promoting rhizosphere bacteria (PGPR)

Commitment to Nature

- SHEATHGUARD™ is approved for use in organic agriculture.
- SHEATHGUARD™ is safe to bio fertilizer inoculums – 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 bacteria) and Agrivam (Vesicular-arbuscular mycorrhiza)
- SHEATHGUARD™ can be used as an effective component in IPM programmes, thereby leading to a reduction in use of chemical pesticides/ fungicides and creating a safer environment.
- .SHEATHGUARD™ does not lead to residue problems and doesn't cause resistance or resurgence problems.

Benefits you can experience

- SHEATHGUARD™ effectively controls one of the most economically important fungal diseases Sheath Blight , disease caused by *Xanthomonas* and controls phytophagous nematodes.
- Pathogenic fungi load reduction leads to improved plant health and thereby increased crop productivity.
- SHEATHGUARD™ is earthworm friendly , pet friendly , eco friendly and infant friendly