Bio Management of Cardamom Plantation

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Soil Management

Improving organic matter content

Mulching

Soil parameter/ soil Microbes	Microbial population (cfu/g of soil)	
	Eco-friendly cultivation	Intensive cultivation
PH	5.6	4.3
Organic carbon	4.3	2.1
Trichoderma	1.16×10^7	0.27×10^7
P. fluorescens	4.12×10^4	3.41×10^3
Azospirillum	0.63×10^7	0.41×10^7
Phosphate solubilising bacteria	3.05×10^6	1.83×10^6
Total fungi	6.71×10^5	5.50×10^5
Total bacteria	9.80×10^7	6.10×10^7
Total *Actinomycetes*	5.49×10^6	4.8×10^5

Compost making and enriching the soil

✓Make compost by yourself.

✓Spread Farmyard manure or any farm waste as a heap @ 4 feet width and 3 feet height under shade.

✓Add 500 ml of **Green compos** containing cellulolytic and lignolytic fungi, bacteria and actinomycetes per tonne.

✓ **Rock phosphate** should be incorporated at 1% level to narrow down crude protein ratio of substrate.

✓ Cover the top with mulch. Keep the compost heap moist.

✓ Within 45-60 days the height of compost heap comes down to about 1.5 feet and the compost is ready for application to the plant.

✓Nitrogen content of compost prepared in this way with rock phosphate is **2 times** that of normal compost.

Bio NPK

Apart from one or two application of recommended dose of chemical NPK in soil (which can be applied in Aug and Oct) Bio NPK can be applied during April and November.

Dosage : 500 ml of Bio NPK per 200 litres of water (one barrel)

Bio NPK Composition

1) Nitrogn
   Azospirillum brasilense
2) Phosphorus
   Aspergillus awamori
3) Potash
   Frateuria aurantia
4) Zinc
   Bacillus subtilis

Bio & Nano secondary and micronutrients

➢Foliar spray of secondary and micronutrients can be done once in April and second time in August.

➢These bio micronutrients and secondary nutrients combination shall be on leaf only if chemical micronutrients and secondary nutrients are not sprayed.

Micronutrients composition

1) Iron 4.0 %
2) Zinc 1.2 %
3) Boron 0.6 %
4) **Magnesium 0.5 %**
5) Manganese 1.2 %
6) Molybdenum 0.1 %
7) Copper 1.0 %

[VAM] Vesicular Arbuscular Mycorrhiza

⋆ VAM can be applied for better root growth and nutrient absorption during April and November.
⋆ Do not apply VAM if available soil phosphorous is high or if rock phosphate is applied in the soil.
⋆ VAM will be effective only applied alone when soil phosphorous is very low .

⋆ It makes available the micronutrients and helps the plant in more nutrient uptake.

⋆ It increases the uptake of secondary nutrients.

⋆ **Recommendation : 50-100 gram per plant.**

Plant growth enhancers

Green Zyme

✓It is a seaweed derivative.

✓It enhances the rate of photosynthesis and promotes faster growth of plants.

✓ It lengthens the flowering season and improves fruit size and quality.

✓**Soil application 4 to 8 litre per acre (1 to 2 litre per barrel – 200 litres)**

Green Hume

- ✓Available at a concentration of 12% humic acid.
- ✓Application of Green hume results in **rapid growth of active roots.**
- ✓It is rich in organic and mineral substances essential for plant growth.
- ✓It **buffers the soil pH** and has the ability to resist the change in hydrogen ion concentration.
- ✓**Soil application 4 to 8 litre per acre (1 to 2 litre per barrel – 200 litres)**

Green Fulvic Acid

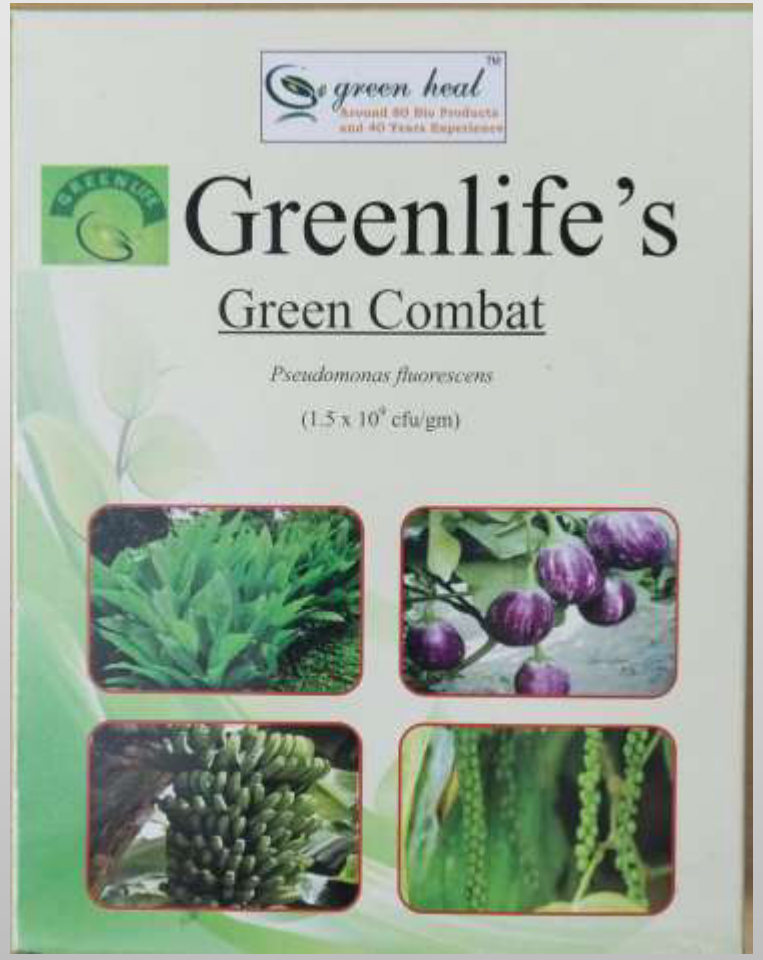
- ✓As a foliar spray, fulvic acid increases the plant's oxygen uptake capacity.
- ✓It is a powerful organic electrolyte and it enhances cell division.
- ✓It has a unique capacity to dissolve minerals and trace elements.
- ✓It can interact with sunlight to enhance photosynthesis.
- ✓Fulvic acid offers drought protection and detoxify pollutants in the soil.
- ✓ Fulvic acid dissolves silica and responsible for increase in stomatal opening and assists plant respiration.
- ✓It stimulates the plant's immune system.
- ✓**Soil application 4 to 8 litre per acre (1 to 2 litre per barrel – 200 litres)**

Green Spike

- ✓Contains 20% essential amino acids.
- ✓It improves photosynthesis and vegetative growth in plants.
- ✓ It increases flowering, fruit set and yield.
- ✓Compatible with all pesticides & fungicides.
- ✓**Soil application 4 to 8 litre per acre (1 to 2 litre per barrel – 200 litres)**

Bio management of Fungal diseases in Cardamom

Soil application with talc formulation of *Pseudomonas fluorescens* (Green Combat), *Trichoderma harzianum* (Green Harz), *Bacillus subtillis* (Green Dual).

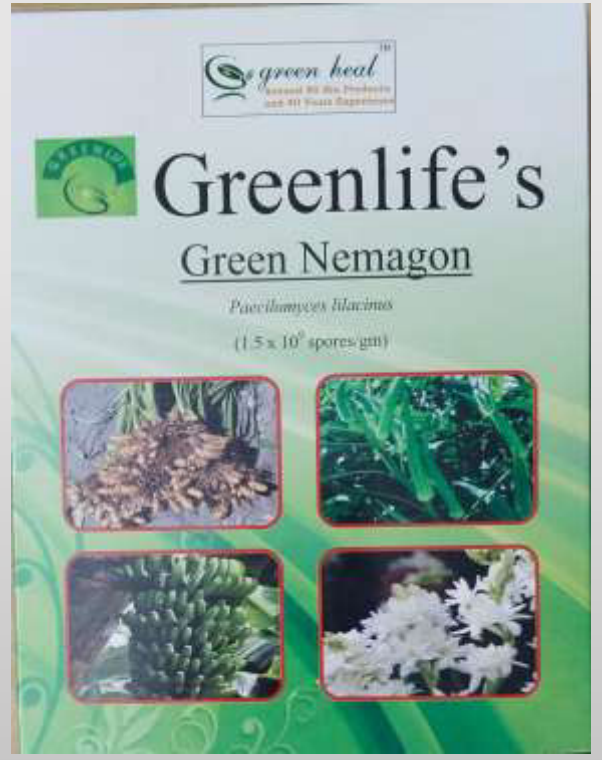


Bio management of Fungal diseases in Cardamom

During April and November, application of compost (1-2 kg or more) along with talc formulation of *Trichoderma harzianum* + *Pseudomonas fluorescens* + *Bacillus subtilis* 100 g+ application of Neem cake 300-500g + bone meal 300-500g per plant in soil around the plant over the mulch after receiving at least 1" summer rain in April/after cessation of N.E.monsoon in Nov-Dec

Soil nematode management

Soil application with talc formulation of *Paecilomyces lilacinus* (Green Nemagon)and *Pochonia chlamydosporia* (Green Neemafree).



Liquid bio pesticides for soil application to manage fungal infection and nematode infestation

If the farmers wish to add bio pesticides for fungal disease control the following can be added either directly in the soil or through fertigation.

Pseudomonas fluorescens (Green Combat), *Trichoderma harzianum* (Green Harz) and *Bacillus subtillis* (Green Dual) for fungal diseases.

Paecilomyces lilacinus (Nemagon) and *Pochonia chlamydosporia* (Green Neemafree) for root knot nematode control.


Green
Combat
Pseudomonas fluorescens


GREEN
HARZ


GREEN
DUAL
Bacillus subtilis


Green Nemagon


GREEN NEMAFREE
(Pochonia chlamydosporia)
Precautions:

Foliar spray of Potassium Phosphonate

For enhancing cardamom plant resistant to fungal diseases, potassium phosphonate at the rate of 300 ml per 100 litres of water may be sprayed on the leaf thrice in a year namely April, September and December.

Leaf blight

Liquid bio pesticides for foliar pest

Management of Thrips

- Foliar spraying of *Beaveria bassiana, Metarhizium anisopliae* and *Verticilum lecanii* combination during summer month from Feb to May at the rate of 5 to 10 ml per litre once in 30 days (1 to 2 litres per barrel of 200 litres).

- This combination of biopesticide can also be mixed with chemical insecticides also Quinalphos @ 200ml and Profenofos @ 100 to 200 ml/200 litres of water.

Borer & Whitefly management

Foliar spray of *Beauveria bassiana* and *Metarhizium anisopliae* combination @ of 5 to 10 ml per litre once in 30 days (1 to 2 littres per barrel of 200 littres) for cardamom borer larva and moth control and whitefly nymph and adult control

This combination of biopesticide can also be mixed with chemical insecticides, Quinalphos @ 200ml and Profenofos @ 100 to 200 ml/200 litres of water.

Borer moth infested/killed by *Beauveria*

Whitefly nymph killed by *Verticillium*

Management of root infesting mealy bug and stem infesting scale insect

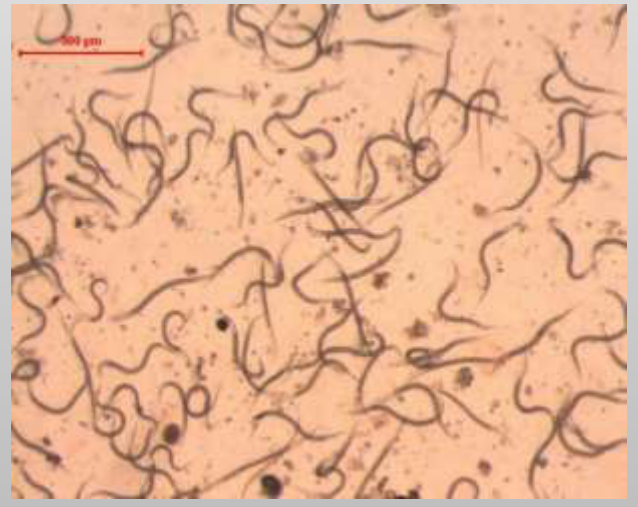
Can be managed with spary of *Verticilum lecanii* 2 litres + Actino 300 ml per 200 litres of water .

Root grub beetles infected by *Beauveria* and the Grubs infected by *Metarhizium*

Root grub adult beetle

White grub

EPN for management of root grubs



Information about GREENLIFE BIOTECH LABORATORY

All the bio pesticides and fertilizers are prepare by Greenlife biotech laboratory are supplied as fresh material with high spore count. Supply will take 10 to 15 days after getting the farmer requirement. EPN can be supplied on advance booking either in April and August .

Certification agencies for our bio products

Certified by INDOCERT , Aluva, Kerala.

❖**Competitive rate for all bioagents**

All our products are much cheaper than IPL Biologicals limited, T.Stanes and company limites and Netsurf etc...

❖**Our Bio products are exported to United Kingdom, Egypt, British Gayana, Rwanda.**

THANKING YOU

Honey bee the major pollinator on cardamom

Left: Rock bee Middle Indian honey bee Right: Bee-hive inside cardamom plantation

Natural Enemies of Cardamom Pests

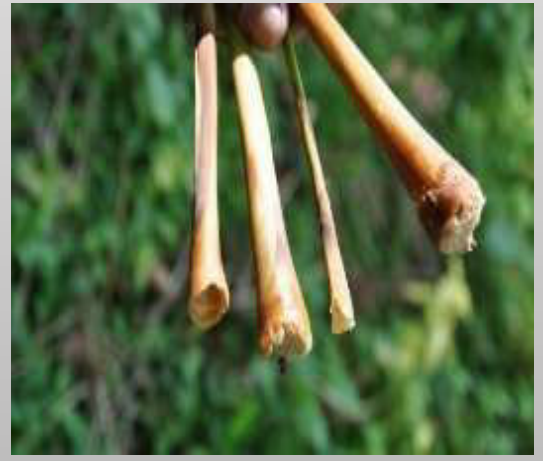
Natural enemies of borer pest

Borer larva inside capsule (completely eating seeds inside) is parasitized by a tiny wasp like parasitoid

FUNGAL DISEASES

Azhugal by Phytophthora

Clump rot by Pythium/Rhizoctonia or Fusarium



Clump rot due to excess soil application at plant base and excess irrigation

Walk out due to Clump rot and Azhugal Excess irrigation resulting in excess moisture at plant base leading to clump rot

TOP: Panicle damaged by Borer

BOTTOM: Panicle damaged by Fusarium (Panicle Blight)

Fungal diseases of cardamom
Leaf shredding due to leaf rot caused by Phtopthora

LEFT: Leaf Blotch during rainy season (Casued by Phytopthora)
RIGHT: Leaf Blight during winter season (December & January) (Caused by Phytopthora)

Tiller break due to stem rot(Fusarium) /Borer damage

Katte virus affected Cardamom leaf

புதிய இயற்கை வேளாண்மை பற்றிய புத்தகம் விற்பனைக்கு

ஆசிரியர் - முனைவர் S. ஈஸ்வரமூர்த்தி

நேரில் விலை:ரூபாய் 100

தபால் மூலம்:ரூபாய் 150

முன்னுரை
இயற்கை வேளாண்மையின் அவசியம்
இயற்கை வேளாண்மையின் பரிமாணங்கள்
அங்கக வேளாண்மை
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நோய் மேலாண்மை
முடிவுரை

நிர்வாக இயக்குனர்
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