



Root Rot Disease Management in Mulberry



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Diseases of Mulberry

Foliar Diseases

Bacterial

Fungal

Viral

Soil-borne Diseases

Root knot
Nematode

Root rot

Quantitative and qualitative impact due to diseases on plants

Quantitative impact

- ✓ Drying of leaves
- ✓ Reduction due to necrosis
- ✓ Pre mature defoliation
- ✓ Mortality of mulberry
- ✓ Reduction in leaf area
- ✓ Reduction in total yield



Qualitative impact

- ✓ Reduction in total protein
- ✓ Reduction in sugars
- ✓ Reduction in fibre content
- ✓ Reduction in chlorophyll
- ✓ Photosynthetic rate
- ✓ Increase in transpiration
- ✓ Reduction in moisture

Impact of mulberry diseases on silkworm

Qualitative impact

- ✓ Increase / decrease in larval duration
- ✓ Reduction in larval size
- ✓ Reduction in silk ratio
- ✓ Reduction in filament length
- ✓ Increase number of breaks



Quantitative impact

- ✓ Reduction in ERR
- ✓ Reduction SCW
- ✓ Reduction in SSW
- ✓ Reduction in fecundity
- ✓ Reduction in egg recovery

Soil-Borne Diseases of Mulberry

- ✓ Root rot disease in mulberry :

Charcoal root rot : *Macrophomina phaseolina*

Dry root rot : *Fusarium solani* & *F. oxysporum*

Black root rot : *Lasiodiplodia theobromae*

(Sharma et al. 2003)

- ✓ The Root Knot Nematode (RKN) in mulberry

-*Meloidogyne incognita* (Kofoid & White) Chitwood

Symptoms of root rot disease



Partial wilting



Complete wilting

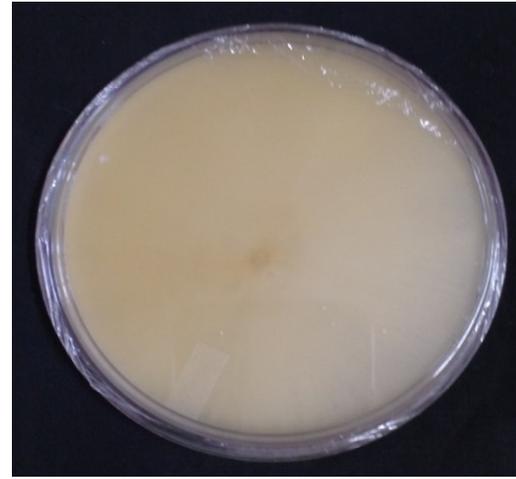
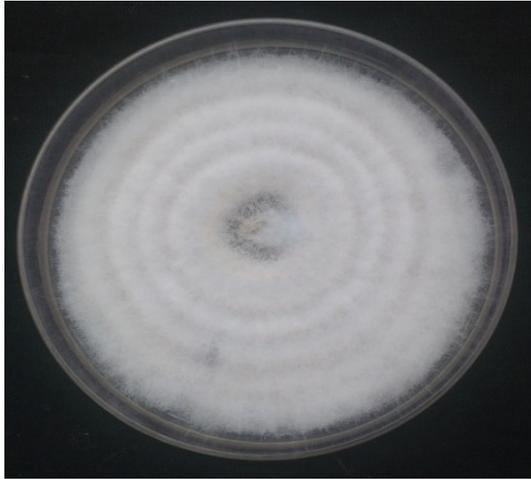


Dried plants



Rotted roots

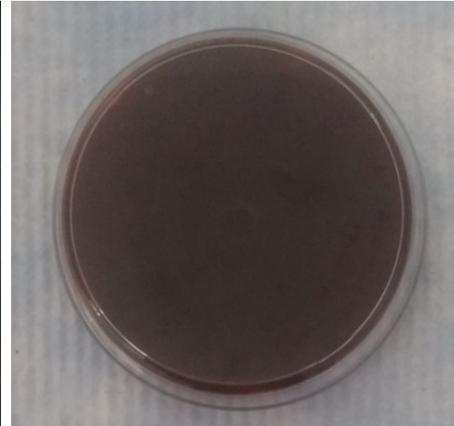
Morphological characterization



Fusarium solani

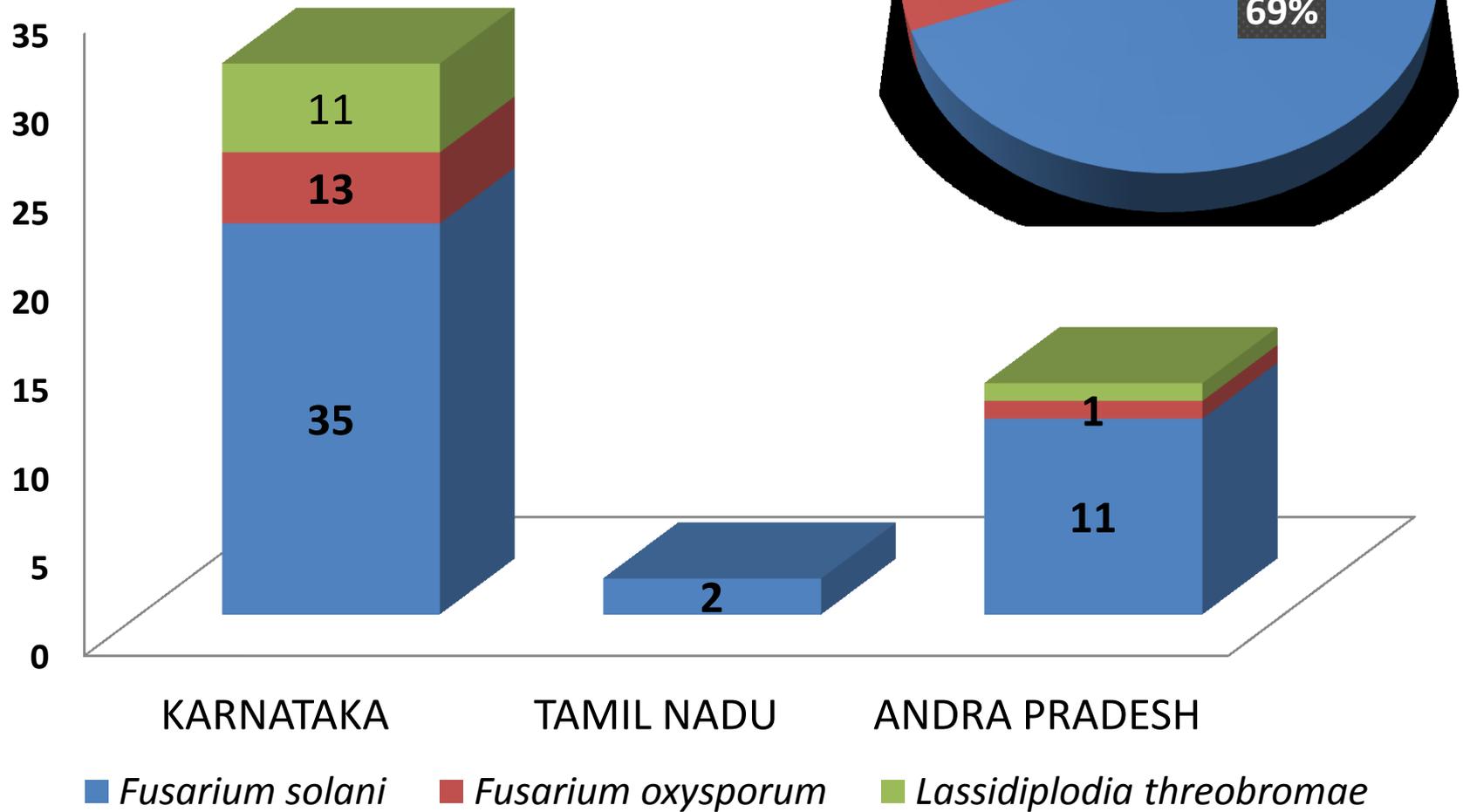


Fusarium oxysporum



Lasiodiplodia theobromae

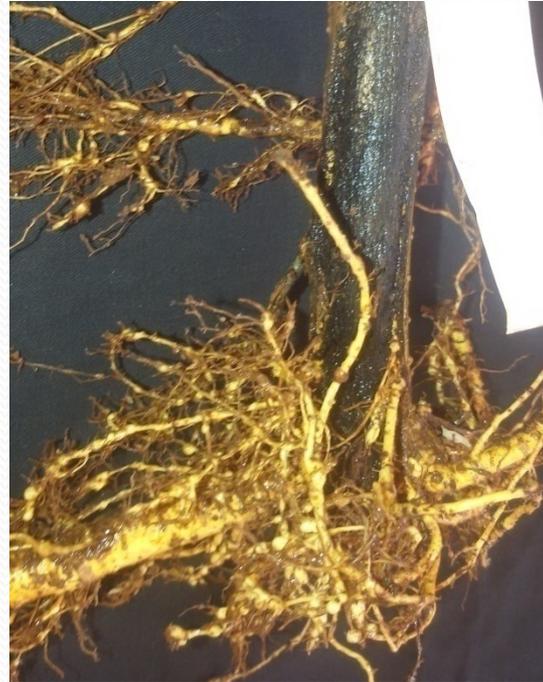
Distribution



Symptoms of root rot under glasshouse



Root Knot nematode symptoms



Contd...



Inoculated

Control



Inoculated

C

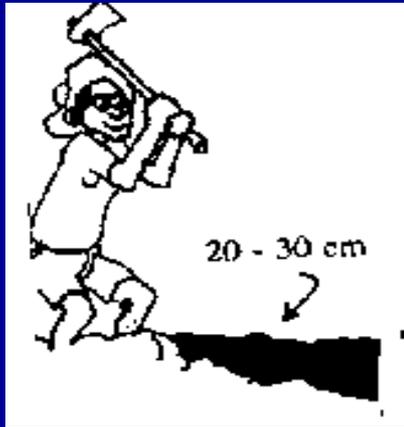
Integrated Root Rot Disease Management

- ✓ **Physical method**
- ✓ **Cultural method**
- ✓ **Application of soil amendments**
- ✓ **Biological method**
- ✓ **Chemical method**
- ✓ **Host Plant Resistance**

Soil solarization

Soil solarization is a practice used to manage weeds, nematodes, diseases and insects in soil.

The soil surface is covered with plastic mulching sheets, which allows sunlight to pass through and heat the soil



1. Dig the garden bed to a depth of 20 - 30 cm, pulverize and level



2. Water the surface to a depth of 15 - 20 cm.

3. Cover the entire surface of the garden with clear plastic (0.04, 0.06 mm).



4. Seal all sides by covering the edges of the plastic with soil



5. Keep the plastic in place for 10-15 days.

Cultural control

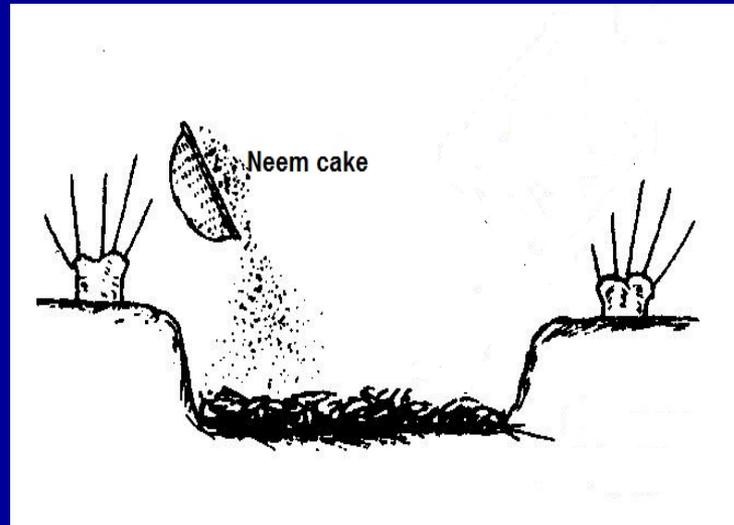
90% of plant disease control can be possible through proper cultural methods and sanitation.

- ✓ **Ploughing**
- ✓ **Digging**
- ✓ **Spacing**
- ✓ **Intercropping**
- ✓ **Irrigation**
- ✓ **Fertilization**
- ✓ **Crop rotation**
- ✓ **Sanitation**



Soil amendment

Amendments of soil with non-edible oil cakes are known to suppress various soil-borne pathogens and nematodes.

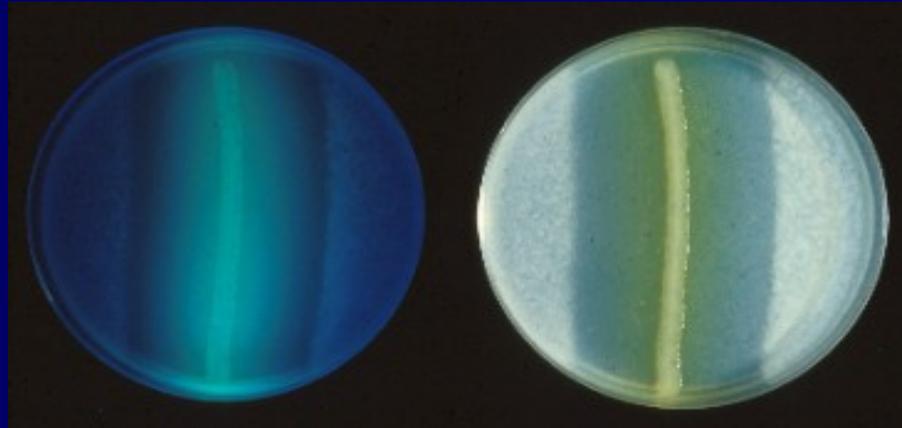


Application of 2MT Neem oil cake per ha/yr in 4 split doses control the soil-borne pathogen population in mulberry gardens.

Biological control

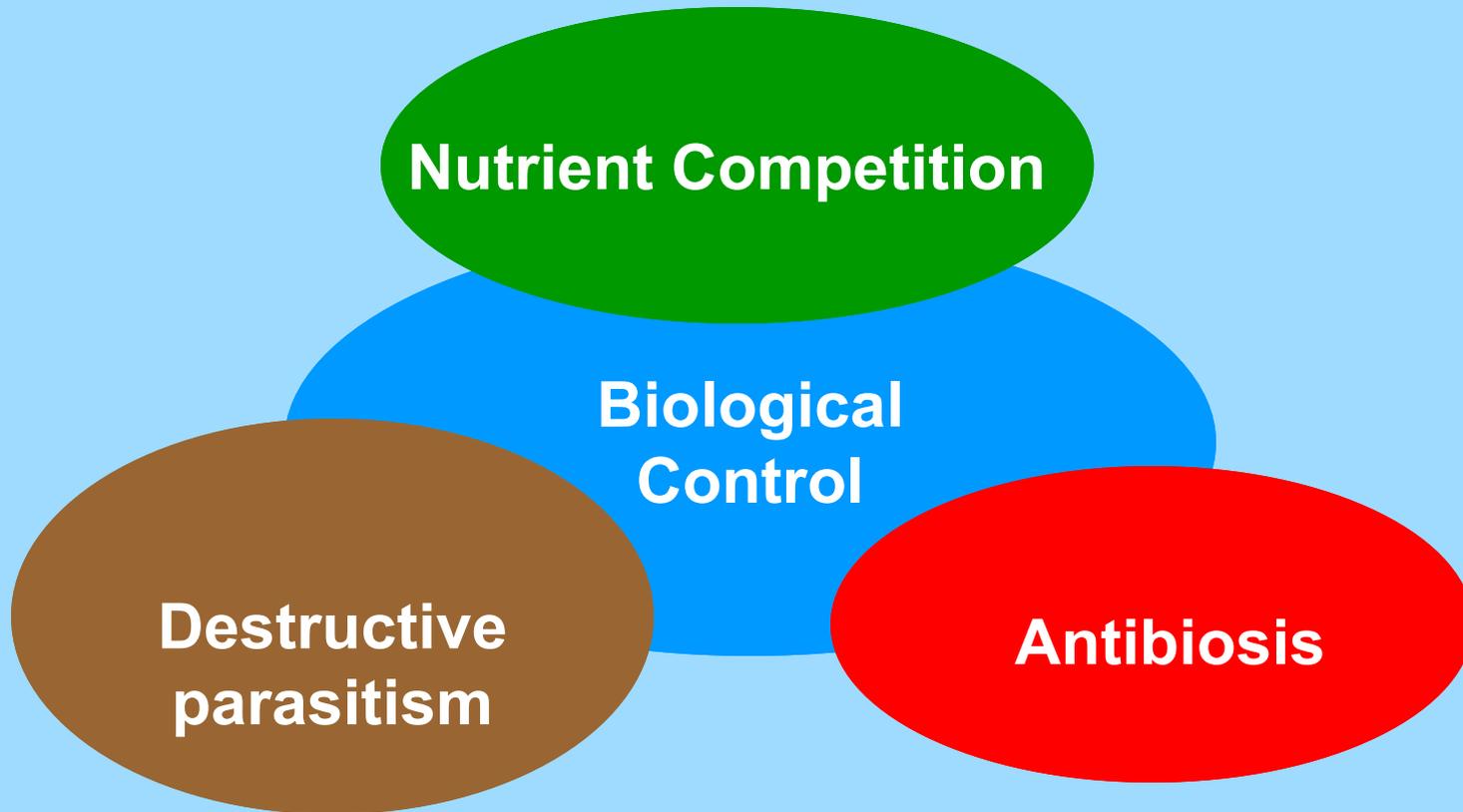


*Trichoderma
harzianum*



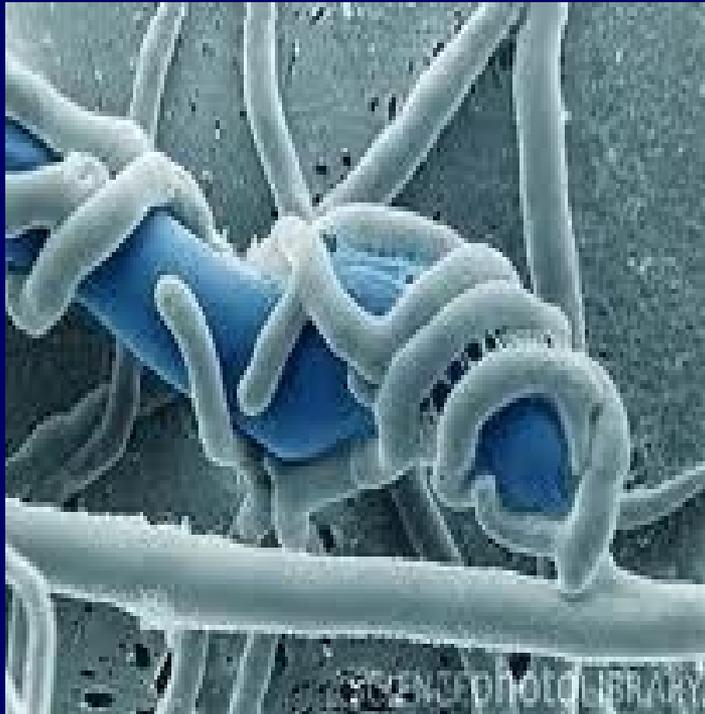
Control of *Rhizoctonia solani* by *P.
cepacia* D1

How does Biological Control work?



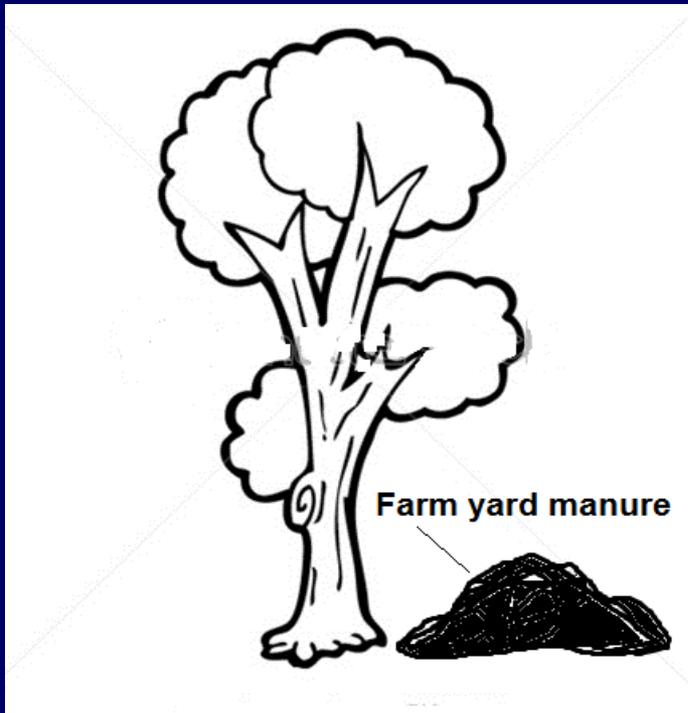
Trichoderma

An excellent biocontrol agents of fungal pathogens



Coiling of *Trichoderma* hyphae around the plant pathogen
Rhizoctonia solani

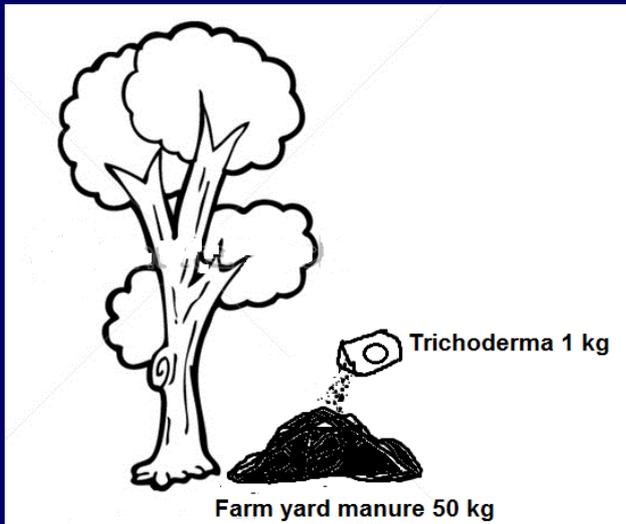
Multiplication of *Trichoderma* and application in the mulberry field



1. Take 100 kg farm yard manure

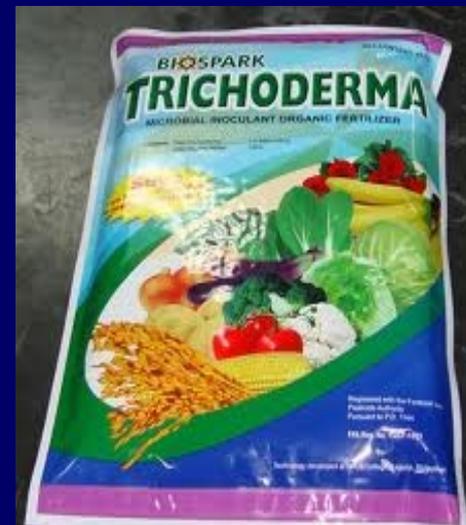
2. Heap the farm yard manure under the shade of a tree





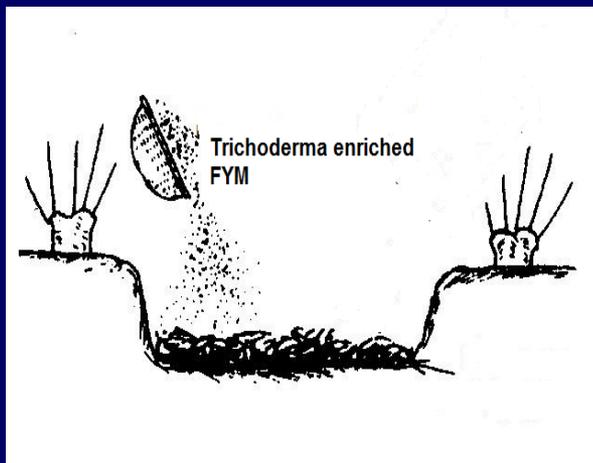
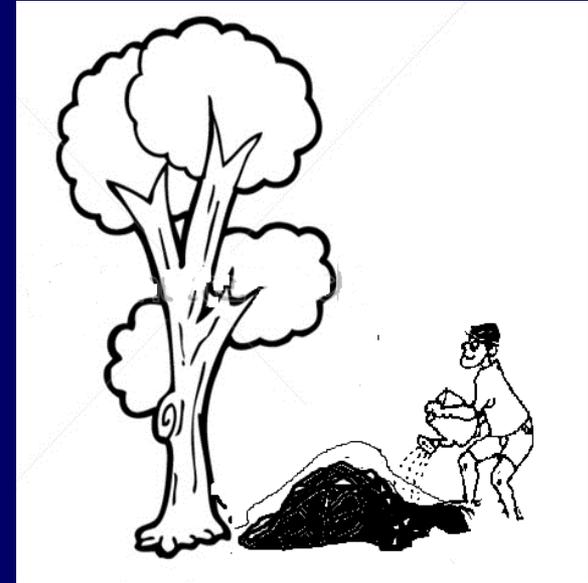
3. Take 1 kg *Trichoderma harzianum* (biocontrol agent)

4. Mix thoroughly the *Trichoderma* with farm yard manure



5. Cover the farm yard manure with gunny cloth

6. Sprinkle water on the gunny cloth alternate days and maintain moisture about 20%



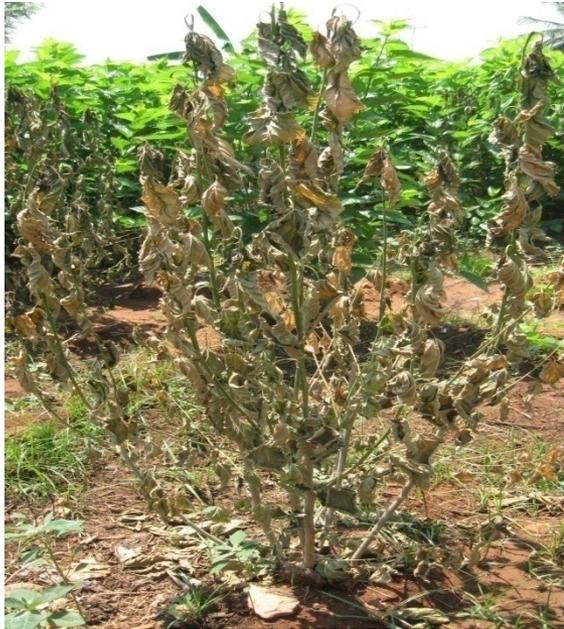
7. Open the gunny cloth after two weeks

8. Mix the farmyard manure thoroughly

9. Apply in the mulberry field

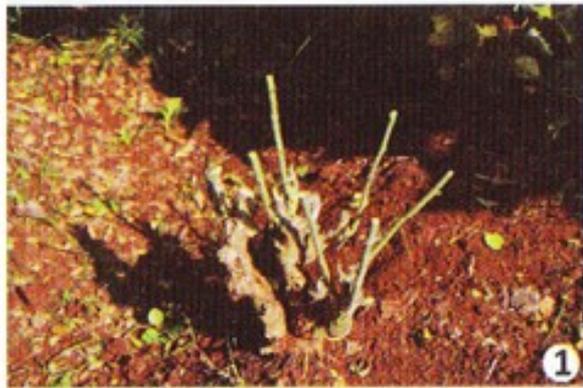
Rot-fix

A broad spectrum environment friendly formulation for control of root rot disease



It is a combination of 50% plant component, 8% organic chemicals, 39.5% organic and naturally found carrier material and only 2.5% inorganic chemical.

Method of application of **ROTfix**



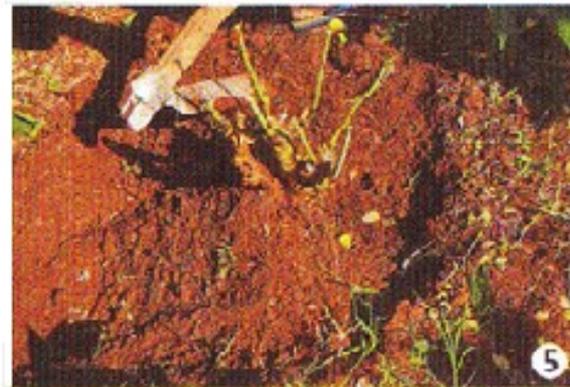
Prune the plant 30 cm above the ground



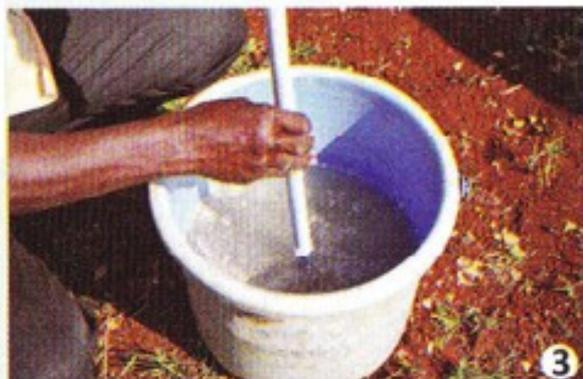
Pour 2 l **Rotfix** solution completely drenching the cut stump



Dig and remove soil 20-30 cm around the plant



Cover with soil immediately



Mix 10g **ROTfix** in 2 litre water



Press the soil firmly around the plant

**Before
application**



**After
application**



**Before
application**



After application



Method of Application



Prune the plant
30 cm above the
ground

Pour 2 l ROT *fix*
solution, drenching
the stump



Dig and remove
soil 20-30 cm
around the plant

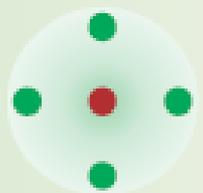


Cover with soil
immediately



Mix 10g ROT *fix*
in 2 litre water

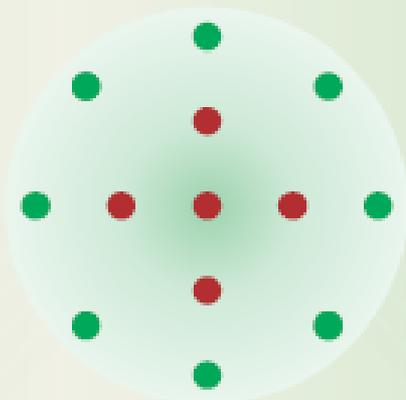
Press the soil
firmly around the
plant



Plants to be treated during
initial stage of infection

Plants to be
treated in case of
severe infection

- Uninfected plant
- Infected plant



ROT *fix*

**A broad spectrum environment
friendly formulation to control
root rot disease of mulberry**



ROT *fix*

*A broad spectrum environment
friendly formulation to control
root rot disease of mulberry*



A Product of CSRTI-Mysuru

Precautions

- Keep the contents in air tight packs
- Keep the product away from the reach of children
- Do not expose the product to direct sunlight

Instructions

- Remove dead mulberry plants, burn and expose the soil to sunlight
- Replant with new saplings, after dipping roots in 0.4 % **ROTfix** solution for 20 min.
- Treat the surrounding plants also, to prevent spread of the disease
- Treat at the initial stage of infection, when the plants show symptoms such as drying of leaf margins and withering
- Water the treated mulberry plants 2-3 days after application
- Repeat treatment after 30 days if plants do not revive
- Apply compost/manure sufficiently to increase soil organic carbon content
- Keep the soil moisture level above 40% to prevent the spread of disease
- Before taking up new mulberry plantation, expose the soil to sun light by deep digging and ploughing

ROTfix

A broad spectrum environment friendly formulation to control root rot disease of mulberry



ROTfix

A broad spectrum environment friendly formulation to control root rot disease of mulberry



A Product of CSRTI-Mysuru

Mulberry Disease Info: A Unique portal all about mulberry diseases

The screenshot shows a web browser window with the following elements:

- Browser Tabs:** Mulberry Diseases Database - Home, ecp.csrtimys.res.in, csrtimys.res.in
- Address Bar:** localhost/muldata/index.php/en/
- Website Header:**
 - Logo of the Central Silk Board, India.
 - Mulberry Disease Info** (Main Title)
 - A unique portal all about mulberry diseases* (Subtitle)
 - Search bar with a magnifying glass icon.
- Navigation Menu:** Home, FOLIAR DISEASES, ROOT DISEASES, DISEASE CALENDARS, DISEASE INCIDENCE, DISEASE DIAGNOSIS, BIBLIOGRAPHY
- Main Content Area:**
 - A large banner image of a research building with a stone monument in the foreground. The monument is inscribed with "GOLDEN JUBILEE YEAR 2011", "CSRI", "1961", and "MYSORE".
 - Navigation arrows (left and right) on the banner.
 - Caption: "Description slide 1"
- Left Sidebar:**
 - Breadcrumbs: "You are here: Home"
 - Menu items: Forecasting & Forewarning, Research Projects Concluded, Technologies/ Recommendations, FAQs, Related links
- Main Text Area:**
 - Home** (Section Header)
 - Text: "Mulberry (*Morus spp.*) is cultivated in many countries across the world for its foliage which is the only food for silkworm *Bombyx mori* L. Mulberry cultivation in India, the second biggest producer of silk and the largest consumer has increased over years and is projected to reach 2.4 lakh ha, a whopping 32.60% increase over the present mulberry area by the end of 2017."
 - Text: "The tropical climate of India allows for luxuriant growth of mulberry. This perennial crop is exposed to several disease causing pathogens, fungal, bacterial, mycoplasma, viral, nematode, leading to deterioration of production and quality of"
- Right Sidebar:**
 - NEWS FLASH** (Section Header)
 - Text: "Powdery mildew may occur during October-January. Manage powdery mildew with application of 0.2% Bavistin if the disease is severe. Avoid water stagnation in the mulberry garden."
- Windows Taskbar:** Includes search bar, application icons (Chrome, Firefox, etc.), system tray with date (25-09-2018) and time (10:05).



Mulberry Disease Info

A unique portal all about mulberry diseases

[Home](#)[FOLIAR DISEASES](#)[ROOT DISEASES](#)[DISEASE CALENDARS](#)[DISEASE INCIDENCE](#)[DISEASE DIAGNOSIS](#)[BIBLIOGRAPHY](#)

Description slide 2

You are here: [Home](#)

[Forecasting & Forewarning](#)[Research Projects](#)[Concluded](#)[Technologies/](#)[Recommendations](#)[FAQs](#)[Related links](#)

Home



Mulberry (*Morus* spp.) is cultivated in many countries across the world for its foliage which is the only food for silkworm *Bombyx mori* L. Mulberry cultivation in India, the second biggest producer of silk and the largest consumer has increased over years and is projected to reach 2.4 lakh ha, a whopping 32.60% increase over the present mulberry area by the end of 2017.

The tropical climate of India allows for luxuriant growth of mulberry. This perennial crop is exposed to several disease causing pathogens, fungal, bacterial, mycoplasma, viral, nematode, leading to deterioration of production and quality of feed. The quantum loss in terms of foliage and loss in cocoon crop due to inferior quality feed are considerable. Many studies were carried out during the last four decades on different aspects of mulberry diseases including etiology, predisposing factors, resistance/ susceptibility reactions, management strategies etc. This portal is a unique compilation of information aimed at beneficiary researchers, teachers, students, sericulturists and policy makers who frequently need to source information.

Disease forewarning

yellowing of followed premature defoliation takes place. The disease will be severe in mulberry plants growing under shades and also where the soil moisture content is very high. The disease causes deterioration in the nutritive value of mulberry leaves which are unfit for silkworm rearing. Rearing with mildew infected leaves weaken the silkworm and the worms would be prone to

NEWS FLASH

Powdery mildew may occur during October-January. Manage powdery mildew with application of 0.2% Bavistin if the disease is severe. Avoid water stagnation in the mulberry garden.



Thank you