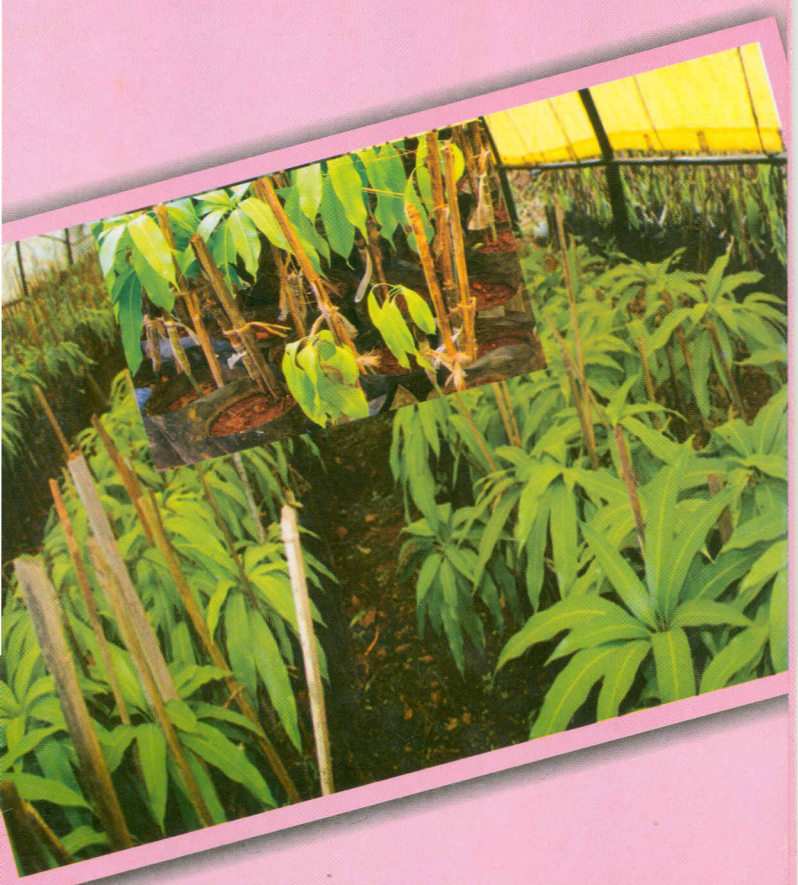
Extension Folder No. 35
2009

# Management of seedling mortality in Mango nursery



ICAR

**ICAR RESEARCH COMPLEX FOR GOA**

ELA, OLD GOA - 403 402 , GOA

## Introduction

Mango has been cultivated in India for thousands of years and is the most popular fruit crop which is considered as king of fruits. Nearly 50 per cent of all tropical fruits produced worldwide are mangoes. India accounts for almost half of the world mango production, followed by China, Mexico and Thailand. Mango is the major fruit crop of Goa, covering the largest area under fruit crops (4000ha) with an average production of 10t/ha. In mango, lot of variability exists in Goa. Since only a few systematically planted orchards are present in the State and keeping in view the huge demand among consumers, efforts are being made to popularize mango cultivation on commercial orchard scale. Among the mango varieties, Alphonso, Benishan or Benishaan and Kesar are considered the best mango varieties in India. Commonly exported, Alphonso is grown primarily in the Konkan region of Maharashtra. In Goa, the local cultivar *viz*. Mankurad is the most important popular variety. In addition to this, Hilario (also called as Mangilar), Malgeush, Mussarat are also commonly grown and preferred.

## Diseases in mango in nursery

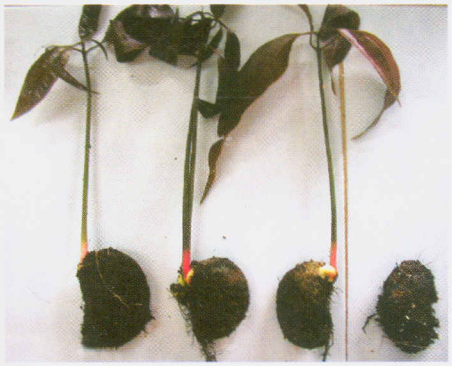
Mango seedlings are severely affected due to root rot caused by fungal pathogens as recorded during the last 3-4 years in several nurseries in the State. Both the root stocks and the grafts are damaged resulting in death of seedlings and grafts. In literature, more than 50 fungal diseases have been reported and root rot is caused by many fungal species.

Early stage of wilting in mango nursery

## I. Rotting of mango stones (seeds) and wilting of root stocks

### Symptoms

- Due to infection, the stones fail to germinate if infected in the early stage or the germinated seedlings wilt
- The first signs of infection, though usually undetectable, are dark-brown lesions on the stem at or just beneath the soil level
- The first visible symptoms are progressive yellowing and wilting of the leaves
- The fungus produces abundant white thread-like fluffy mycelium on and around the stones and on the soil surface
- Relatively uniform size sclerotia are produced on the mycelium. Sclerotia are round and white when immature then becoming dark brown to black. Mature sclerotia resemble mustard seeds
- Once infected, seedlings are very susceptible and die quickly. Older plants that have formed woody tissue are gradually girdled by lesions and eventually die
- Infected tissues are pale brown and soft, but not watery



Wilting of mango root stocks

Development of sclerotia on the rotten stones

### Pathogen

The failure in germination or seedling death is caused by *Sclerotium rolfsii. S. rolfsii,* an omnivorous, soil-borne fungal pathogen, which causes disease on a wide range of agricultural and horticultural crops. *S. rolfsii* has an extensive host range of at least 500 species in 100 families which are susceptible. The most common hosts are the legumes, crucifers, and cucurbits. The fungus persists in many weed hosts as well. *S. rolfsii* primarily attacks host stems, although it may infect any part of a plant under favorable environmental conditions including roots, fruits, petioles, leaves, and flowers. The disease is soil borne and the fungus survives in the soil for many years. The incidence of rot is prevalent during monsoon seasons as well as when the poor quality stones with flesh are planted during rains in an open area.

## II. Wilting or death of mango grafts

Severe mortality was observed in one month old mango grafts of Amrapali and Mankurad. The mortality of grafts is up to 30% and all the varieties are susceptible.

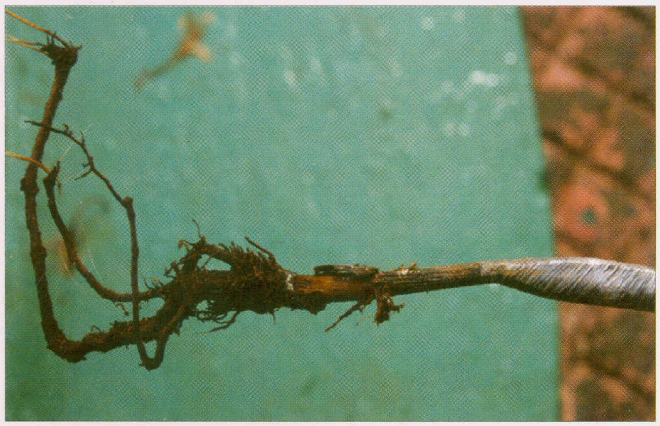
### Symptoms

- Sudden wilting of grafts followed by withering of terminal leaf flush
- Shredding of stem portion near the ground level and rotting of main roots
- Discolouration and death of secondary roots
- As a result complete death of grafts occurs within 4 to 6 days of initial appearance of symptoms
- The above ground portion of the infected seedling comes out easily when pulled out

### Pathogens

*Macrophomina phaseolina* and *Rhizoctonia solani* are constantly associated with the death of grafts. Pathogenicity studies carried out at ICAR Research Complex for Goa, confirmed that these fungi are the casual organisms.

Typical wilt symptom of the young mango graft



Shredding of stem, roots in the infected graft

Severely infected nursery with dead grafts

***Macrophomina phaseolina* (Tassi) Goid** a soil-borne fungus which can infect the root and lower stem of over 500 plant species and is widely distributed. The fungus is an agriculturally important plant pathogen which causes inhibition of seed germination, wilting of seedlings, and root rot in several crop plants, like soybean, tobacco, ground

nut, and beans. This fungus produces microsclerotia in root and stem tissues of its hosts that enable it to survive in soil. Microsclerotia of *M. phaseolina* are jet black in color and appear smooth and round to oblong or irregular. The pycnidial stage is not common on certain hosts. Pycnidia are initially immersed in host tissue, then erumpent at maturity. They are 100-200 m in diameter; dark to greyish, becoming black with age; globose or flattened globose; membranous to subcarbonaceous with an inconspicuous or definite truncate ostiole. Colour of colonies in culture range from white to brown or grey and darken with age.

***Rhizoctonia solani* Kühn** is one of the most important soil borne fungal pathogens which develops both in cultured and non-cultured soils, causing diseases in different crops such as rice, bean and tomato, among others. *R. solani* is reported to cause economic losses in soybean crops throughout the world. Many plants besides bean (*Phaseolus vulgaris*) are attacked by this pathogen. These include alfalfa, peanut, soybean, lima bean, cucumber, papaya, eggplant, corn and many more. Symptoms observed on soybean plants and associated with *R. solani* infection include damping-off, roots and hypocotyl rots, web blight and aerial blight.

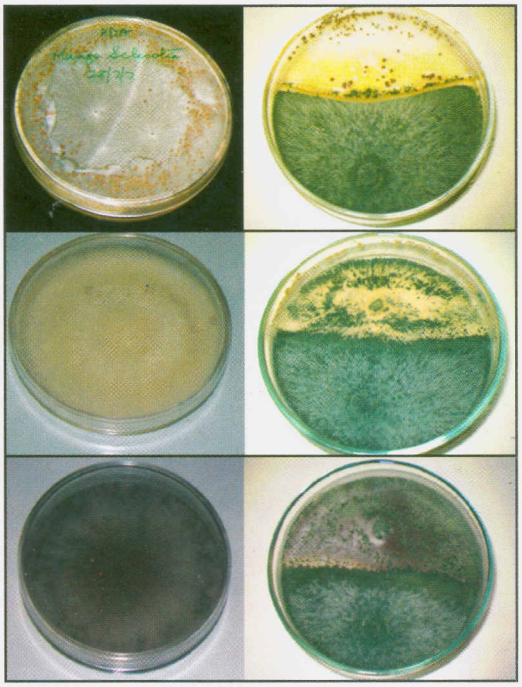
## Favourable conditions of disease development

- Poor quality stones without proper cleaning and drying
- Planting the stones and seedlings/grafts in the soils which are already saturated with the pathogen inoculum
- Poor drainage in the nursery plot

## Integrated management of seedling rot disease

### Preventive methods

1. Use clean and properly dried mango stones for raising root stock
2. Select disease free area for raising root stock
3. Provide optimum watering and avoid flooding
4. Use well decomposed farm yard manure to prepare nursery mixture
5. Use pathogen free soil mixture for planting the mango grafts
6. Don't reuse the soil from previous season for grafting
7. Solarize the soil during summer to reduce the population of pathogens
8. Treat the soil with talc based formulation of *Trichoderma* spp. @ of 50g/50kg of soil before placing the nuts
9. Apply talc based formulation of *Pseudomonas fluorescence* or *Bacillus* spp @ 10g/graft during planting



A

B

C

**Inhibition of A) *S. rolfsii*, B) *R. solani*, C) *M. phaseolina* by *Trichoderma* spp**

A

B

C

**Growth inhibition of A) *S. rolfsii*, B) *R. solani*, C) *M. phaseolina* by *Pseudomonas* spp.**

## Curative methods

Since the commonly available fungicides were not effective against *S. rolfsii* and shown little effect in controlling soil borne *R. solani*, it is recommended to use biological control agents which were found very effective in controlling the disease.

1. After grafting apply 5g of talc based formulation of *Trichoderma* spp per graft
2. If the disease is noticed in the grafts, apply 2.5g of talc based formulation of *Trichoderma* spp or *P. fluorescens* or *Bacillus* spp per plant by pouring the solution prepared using water
3. In case of severe infection the above treatment may be repeated after 20 to 25 days

**Reduced disease incidence in the bio-control treated nursery (after one month)**

**Reduced disease incidence in the bio-control treated nursery (after four months)**

**Published by**

Dr. V.S. Korikanthimath
Director
ICAR Research Complex for Goa
Old Goa, Goa - 403 402

**Material prepared by**

Dr. R. Ramesh
Scientist SS (Plant Pathology)

**Technical assistance**

Sidharth Marathe

**Website**

www.icargoa.res.in

**Telephone:**

0832-2284678/679, 2285381