



# PHYTOPHTHORA - A MENACE IN MONSOON TO COCOA (THEOBROMA CACAO L.)

*R. Thava Prakasa Pandian<sup>1</sup>, Shivaji Hausrao Thube<sup>2</sup>, S., Chaithra, M.I, Elain Apshara, S.3,*

Cocoa (*Theobroma cacao* L.) known as 'Food of the gods' is extensively cultivated as an intercrop/mixed crop in coconut and arecanut based cropping system in different parts of the country. Despite the importance attributed by cocoa in chocolate industry, its production is severely hampered by several biotic and abiotic factors, which directly or indirectly ruining the quality and quantity. Among the biotic factors, diseases are considered as the prime enemies and resulted in >30 per cent of the potential yield loss in cocoa (Chowdappa et al., 2016).

In India, diseases like black pod rot, stem canker, cherelle rot and vascular streak dieback (VSD) can be considered as the major problems to cocoa cultivation (Chandramohan and Kaveriappa, 1981; Chowdappa et al., 2014; 2016). Among them, diseases caused by the Oomycete genus *Phytophthora* i.e. black pod and stem canker are considered as dreadful and destructive based on the extent of damage and nature of disease.

## 1. Black pod disease or pod rot:

**Causal organism:** *Phytophthora palmivora*, *P. capsici* and *P. citrophthora*.

In India, black pod was reported in 1965 and is the major disease of cocoa responsible for yield loss ranging from 30 to a maximum of 90 per cent (Chowdappa, 1996). In our country, it occurs in all the cocoa growing areas of South India during the South-West monsoon period, when humidity is high and the temperature is constantly optimum and the maximum incidence will be observed during July-August. It attacks pods at all the stages of development.

### Symptoms:

- ◆ Initially, small, circular water-soaked lesions were noticed on the pod (Fig. 1).
- ◆ Later it turns to dark brown colour and covers the entire pod. A white thread like mycelial growth consisting of numerous sporangia of the pathogen will be seen on the pod surface.
- ◆ Pods adjacent to each other get infected (horizontal spread) (Fig. 2).
- ◆ Infection spreads from pods at the bottom to top of the tree also (vertical spread) (Fig. 3).
- ◆ In severe infection, discoloration of beans was also noticed (Fig. 4).



Fig. 1. Initial water soaked lesion on the pod surface

Fig. 2. Horizontal spread of black pod disease



Fig. 3. Vertical spread of black pod disease



Fig. 4. Sequence of treatment to stem canker infected bark

## Management

- ◆ Strict field sanitation practices including phytosanitation, removal and destruction of infected pods and fallen leaves should be followed.

- ◆ Regular pruning of the branches should be carried out in order to facilitate the entry of sun light.
- ◆ Prophylactic spraying of Bordeaux mixture (1 per cent) at 45 days interval starting from the onset of South- West monsoon helps in reduction of disease incidence.

## 2. Stem canker: *Phytophthora palmivora*

Stem canker of cocoa is first reported from India in 1978, where cocoa was grown as a mixed crop/intercrop in arecanut garden in Karnataka state (Chowdappa et al., 2014). *P. palmivora* is the only known species causing canker in India. The infection from pods spreads to the cushions and barks which ultimately resulted in stem canker. It can causes canker on the main trunk, jorquettes and fan branches. At later stages of infection, the entire stem or branches will be girdled and ultimately tree dies. It is very difficult to recognize cankers developed without any external symptoms on the bark. Such cankers can be recognized only in the advanced stages of the disease.

### Symptoms:

- ◆ Stem canker appears on surface of the stem as round to oval shaped dark brown discoloration (Fig. 1).
- ◆ Later reddish brown colour oozing will comes from the infected area (Fig. 2).
- ◆ Removal of the infected bark shows discoloration (Fig. 3a) and advanced stage of infection results in girdling of infected stem.
- ◆ If infection noticed at the collar region, it spreads fast and infects the root system. Hence, water and nutrient uptake will be severely impaired.



- ◆ Yellowing and wilting of the foliage will be noticed under severe infection.



Fig. 1. Canker lesion on the stem      Fig. 2. Oozing from the stem canker lesion      Fig. 3. (a) Infected bark show discoloration as compared to healthy bark

## Management

- ◆ Strict field sanitation practices should be followed as described earlier.
- ◆ Black pod infected pods should be removed and destroyed.
- ◆ Pruning before the onset of monsoon and application of 10% Bordeaux paste after pruning will avoid the infection.
- ◆ In case of mulching practices, trunk covering should be avoided or mulching 1 feet away from the trunk helps in disease reduction.
- ◆ Good drainage facilities should be provided to avoid further spread of the disease.
- ◆ Wound treatment and soil application with *Trichoderma* coir pith cake (TCPC), helps in long term management of the disease.
- ◆ High yielding cocoa trees and rare germplasm collection with advanced stages of canker disease can be rejuvenated by

cutting the whole tree below the canker lesion and allowing a fresh chupon to develop from the basal portion of the stem.

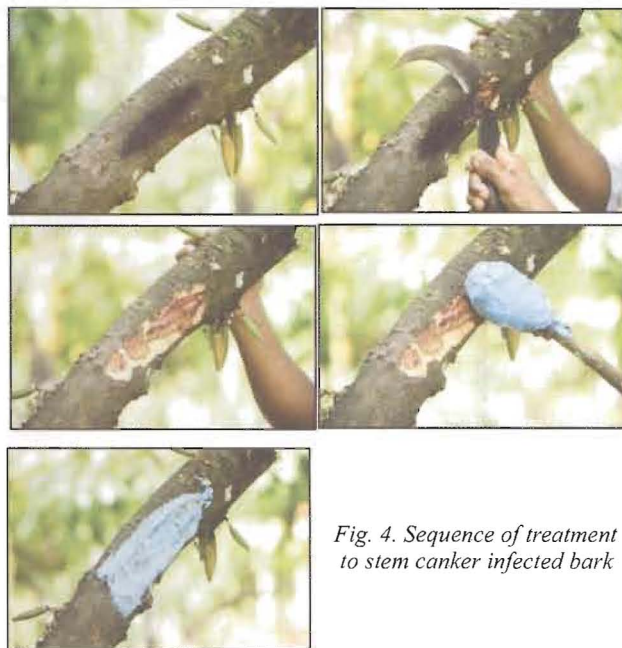


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## Reference:

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