

Phytophthora infections in Black Pepper and its management

Introduction

Black pepper cultivation is threatened by the onslaught of diseases and pests. Among several diseases which affect black pepper *Phytophthora* foot rot and slow decline which were earlier referred to as "quick wilt" and "slow wilt" respectively are very important. It is also a common knowledge that "Quick wilt" is caused by *Phytophthora* and "slow wilt" is caused by plant parasitic nematodes. Recent studies indicated that the "slow wilt" now called as slow decline is the result of feeder root damage caused by *Phytophthora* and two plant parasitic nematodes viz., *Radopholus similis* and *Melodogyne incognita* either alone or in various combinations. This article explains in detail about the infections caused by *P. capsici* in black pepper and the methods to manage the menace.

Symptoms

The fungus *P. capsici* (previously known as *P. palmivora* or *P. palmivora* "MF₄") infects all parts of black pepper vine and the

expression of symptoms depends up on the site of infection and extent of damage. Understanding the various types of symptoms caused would help in adopting appropriate control measures

Above ground symptoms

1. Leaf infections: On leaves one or more dark spots with characteristic fimbriate margins at the advancing edges could be seen during the rainy season. These spots enlarge rapidly with in two or three days and the leaves are shed before the entire leaf is covered by these spots.

2. Spikes: Spikes of all maturity are affected, black spots appear on the spikes at the point of attachment or any where on the length of the spike and are shed.

3. Tender shoots: The tender shoots arising at the base of the vines and trailing on the ground are affected causing blighting of the tender shoots. The fungus produces its spores on the affected portion which form a white coating on the lesions.

4. Branches: Infection may also occur on the main branch or lateral branch resulting in the yellowing and defoliation of the branches beyond the point of attack.

Below ground symptoms

When the below ground parts such as feeder roots and main roots are affected, the symptom expression is delayed till a considerable portion of the roots are damaged. The typical wilting symptom is expressed when the collar portion is affected.

Collar infections

This may occur either through the runner shoots or through the roots. Infection reaching the collar either through the runner shoots or through the roots of the upper tier which is closer to the soil level results in sudden wilting of the vine hence it was referred by the name "quick wilt" earlier. Whereas, the infection of collar through the roots of the lower tier of roots results in yellowing preceding wilting.

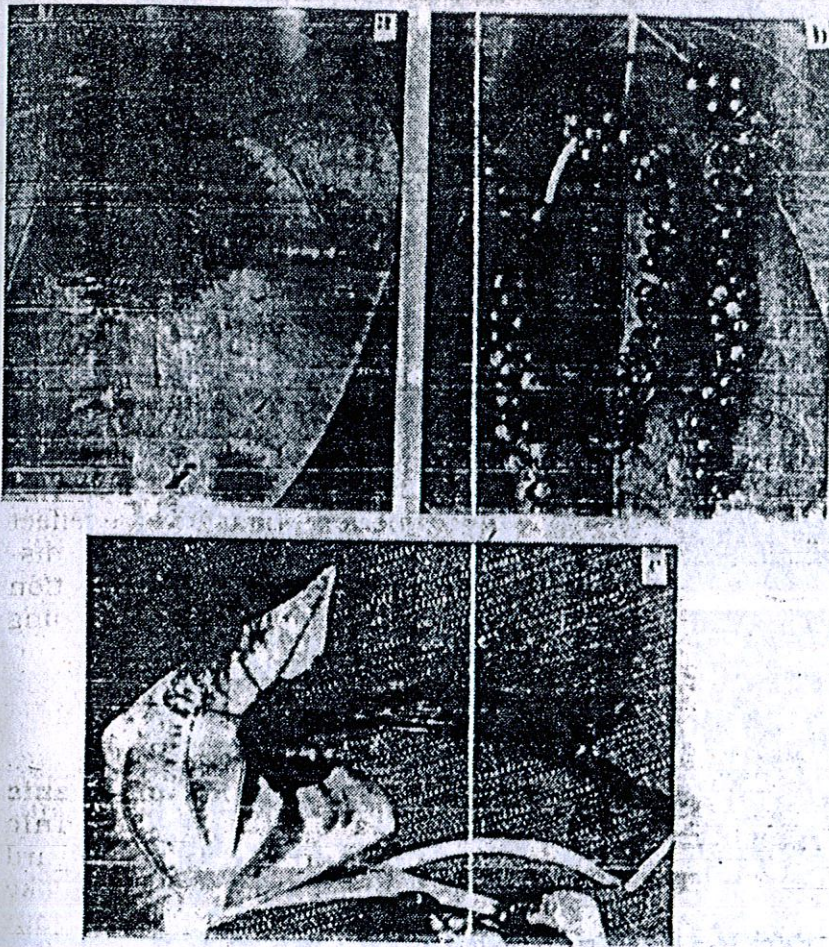


Fig.1. Aerial infections of *Phytophthora* in black pepper, a) Leaf infection showing typical fimbriate margins, b) Spike infection, c) Infection on tender shoots

Root infections

When *P. capsici* infection is confined to feeder root system, gradual yellowing of leaves and defoliation occur. Since the activity of *Phytophthora* is confined to the wet monsoon period, such yellowing vines may remain for more than one season showing varying degrees of yellowing and defoliation. Such symptoms were previously attributed to unfavourable soil conditions and also to infestation by plant parasitic nematodes and

was referred to as "Slow wilt" which is now called as Slow decline. Several years of experimentation have established that slow decline is due to feeder root damage caused either by *Phytophthora capsici* or by the burrowing nematode *Radopholus similis* and root knot nematode *Meloidogyne incognita* or by the combined effect of the fungus and nematodes. Infestation by nematodes followed by infection by *Phytophthora* results in rapid death of vines

showing slow decline symptoms. Correct diagnosis is essential in order to take appropriate control measures.

Managing *Phytophthora* Infections in black pepper

An integrated management strategy has been developed which include phytosanitation, cultural practices, chemical and biological control methods. Often the disease is introduced inadvertently through planting materials to new areas. The first and foremost is the avoidance of the introduction of the disease to new plantations. This could be achieved by collecting disease free planting material from healthy gardens.

Phytosanitation: The fungus takes several years to build up its inoculum. Being a wet weather pathogen, it multiplies only during monsoon period. During the inter-monsoonal dry period, it survives on dead plant debris in soil. The dead vines and severely yellowing vines are the potential source and focus of spread. The moment the disease is noticed on a few vines, such vines must be removed along with root system and destroyed. This would reduce the inoculum for the next season.

Cultural practices; Shade regulation : At the onset of monsoon, the branches of shade/support

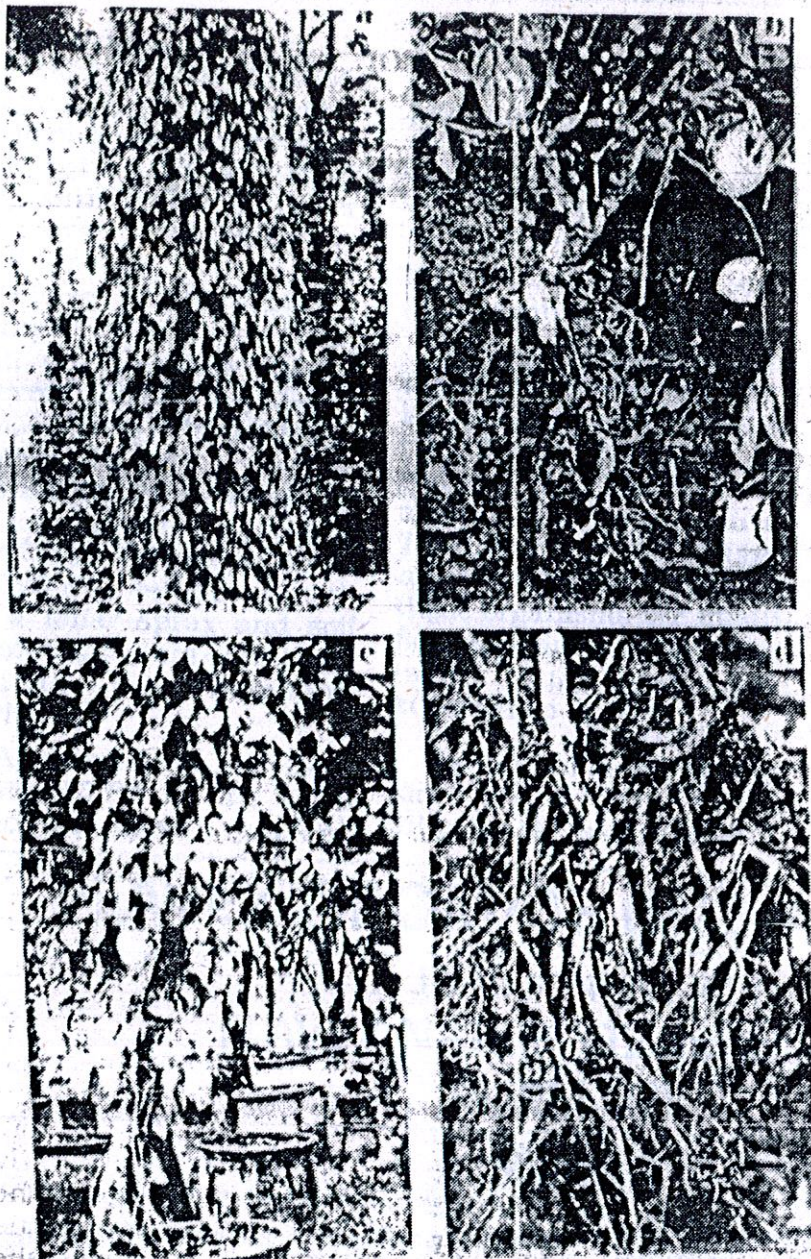


Fig.2. Collar infections in black pepper

a) Wilting due to collar infection at soil level, b) Root infection culminating in collar rot, c) Yellowing preceding wilting, d) Root system of yellowing vines showing complete destruction

trees should be lopped to allow better penetration of sunlight. This would reduce moisture build up and alter the microclimate under the canopy and

reduce the incidence of foliar infections.

Pruning of runner shoots : The tender runner shoots which trail on the ground are the ones which

get infected first. These runner shoots are meant for vegetative propagation and may be kept coiled around the basins and removed as and when required or may be tied back to the supporting trees so that these may grow as orthotrophic shoots. If it is not required, it may simply be removed.

Provision of drainage : Water stagnation, even if it is temporary for a short period, has adverse effect on the vine as this predisposes the vines to infection by *Phytophthora*. Providing adequate drainage and preventing water stagnation are important aspects of disease management.

Application of organic materials: Organic manures such as farmyard manure and oil cakes like neem oil cake, ground nut cake etc., may be applied @ 1kg/vine. These oil cakes besides serving as nutrient source also supports saprophytic microbial activity. This in turn reduces *Phytophthora* populations as *Phytophthora* has a low competitive saprophytic ability and could not compete with saprophytic organisms.

Minimum tillage : In black pepper, more than 50 per cent of feeder roots are confined to the top 60cm of the basins. Care must be taken to avoid damage to the feeder roots during various cultural operations.

Chemical control: In addition to the methods mentioned above, chemical control is also essential to control *Phytophthora* infections in black pepper. Wherever foliar infections are sever, Bordeaux mixture (1%) may be sprayed once during June and next by Aug-Sep. To prevent the soil population build up of *Phytophthora*, drenching with copper oxychloride (0.2 %) may be done. Systemic fungicide like Potassium phosphonate (0.3%) may be applied both as a foliar spray and soil drench @ 5 liters/vine twice during the monsoon period.

Application of Bordeaux paste (10 %) on the vines upto 1m was a practice

earlier. Based on the investigations and the information available on the collar infection, the recommendation of application of Bordeaux paste the collar portion is discontinued as it does not serve any useful purpose.

Biological control : As the *Phytophthora* inoculum is soil borne, the population build up could be reduced by the use of antagonistic fungi such as *Trichoderma* and *Gliocladium*. Efficient strains of these organisms are identified and are multiplied in large quantities and supplied to farmers.

As mentioned earlier, since *Phytophthora* infects all parts of black pepper, to

prevent the aerial infection, fungicidal spray is required whereas to suppress soil populations, biological control may be adopted. Biological control organisms are multiplied on inexpensive carrier media such as tea waste, coffee husk etc. As the biological control organisms survive on the organic matter in the oil, application of organic matter would enhance their population and suppress the population of *Phytophthora* in soil.

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