

## QUICK WILT (FOOT ROT) DISEASE OF PEPPER (*Piper nigrum* L.)

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In Kerala black pepper, *Piper nigrum* is affected by two major diseases. They are 'quick wilt' and 'slow wilt'. Of these, quick wilt is more serious since the infected vines succumb to the disease in 2-3 weeks. The incidence of wilt disease of pepper in Kerala was reported as early as 1906 by Butler and also by Menon (1946). But the causal agent was not known at that time. Samaraj and Jose (1966) isolated *Phytophthora*, and adopted Muller's (1936) identification of the fungus as *P. palmivora* var. *piperi* as the causal agent of the quick wilt of pepper occurring in Kerala.

A similar disease affecting pepper has also been reported from other parts of the world. Muller (1936) reported the disease from Indonesia. It is said to have taken a heavy toll of pepper plantations in Sarawak, Indonesia, Puerto-Rico, Jamaica, etc. The disease was named 'foot rot' of pepper because of the characteristic rotting symptoms manifested at the 'foot' region of the affected vines in a majority of the cases. Because of the sudden mortality caused by the disease it came to be known as quick wilt also.

### Identifying the disease

Quick wilt is prevalent in all the pepper growing tracts in Kerala and Karnataka. It makes its appearance during south-west monsoon. Mortality of the vines is high during July-September when relative humidity is high, rainfall heavy and temperatures low. The affected vines exhibit four major types of symptoms. The symptoms appear either individually or in combinations.

1. *Leaf infection*: Fast advancing watersoaked lesions with fimbriate margin are noticed starting from leaf tips, base of the lamina, leaf margin, or in the centre of the leaf. Lesions with concentric rings are also frequently observed (Fig. 2). Foliar

infections result in defoliation to varying degrees. The infection of spikes and berries results in spike shedding.

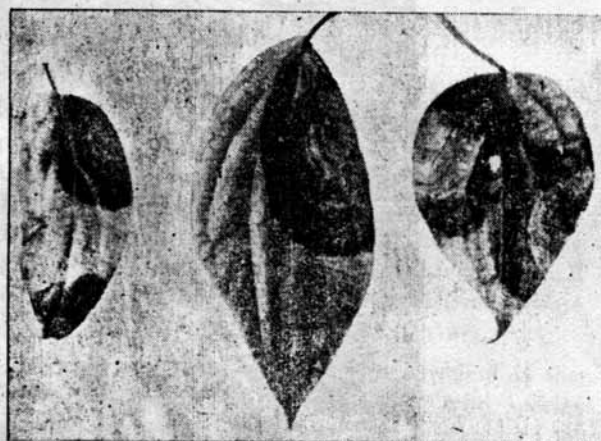


Fig. 1—Leaf Infection.

2. *Die back*: The aerial branches get infected at any point. The branches become discoloured at the site of infection and gradual rotting sets in. The rotting progresses upwards and downwards resulting in die back of the affected branches. In the early stages of infection leaves in the affected branch become pale yellow, and later deep yellow ultimately resulting in their drooping and falling off. The lateral branches of the affected vines break off at the nodes and fall off.

3. *Foot rot or collar rot*: The stem at the ground level, foot or collar region, contracts the infection (Fig. 2). This type of infection is fatal as it causes rotting and death of the vines in 2-3 weeks. The infected region appears discoloured and wet. In one standard itself it is likely that one vine is affected while the other is healthy thus giving an appearance of partial death. The affected portion also emits a noxious odour. The necrosis progresses downwards to the underground stem and then to the

root system. Occasionally one vertical half of the stem alone will be involved in the attack. This leads to the gradual death of the side branches arising from the affected portion.



Fig. 2—Pepper vine showing 'foot rot' and defoliation.

4. *Root rot*: It is not uncommon to see root rot alone without foot rot. The degree of damage viz., foliar yellowing, dropping of leaves, and defoliation, depends upon the number of main and lateral roots infected and the extent of rotting. The infection may start right on the main roots or on the feeder roots. In the latter case it progresses from the feeder root to the lateral roots and finally to the main roots. Thus the root system is weakened leading to the death of the vine.

#### *The causal organism*

This dreaded disease is caused by the fungus *Phytophthora palmivora*. This fungus is known to cause several other diseases of plantation crops, viz., fruit rot of areca (*Mahali*), bud rot of coconut, black pod of cacao, leaf fall of rubber *etc.* This mould thrives and multiplies in the soil or on the aerial vines when moist conditions and low temperatures prevail. The organism can multiply both sexually and asexually. But the asexual phase is more predominant and is the major source for rapid spread of the disease.

Under favourable conditions small pear shaped asexual bodies called sporangia, each with an apical papillum are produced on the affected tissues. Each sporangium produces number of zoospores which come out and swim in water. Each zoospore ultimately settles down on the plant surface, either on root or shoot system, and penetrates the tissues by producing germ tube. Thus infection starts. The germ tube subsequently produces mycelium which ramifies in the affected tissues resulting root rot. The chlamydozoospores and oospores also help in the survival of the fungus in the soil. The latter is the fusion product of antheridium and oogonium, the male and female reproductive structures of the fungus.

#### *Control*

1. The saying "prevention is better than cure" holds good in the case of quick wilt also. Since it is a soil-borne disease, once the pathogen establishes in a locality it is rather difficult to eradicate it

completely. Sufficient care should be taken not to transport nursery stocks or soil from diseased gardens to healthy ones.

2. Live or dead standards should not be transported from infected to healthy garden lest they carry the causal organism with the soil adhering to the roots or stem bases.

3. Farm implements used in diseased gardens should not be used in healthy gardens unless they are thoroughly cleaned and sun-dried.

4. Adequate provision for drainage is to be made since water logging predisposes the vines to infection.

5. Fresh planting may be made on hilly slopes and locations where pepper was not grown for the last one or two years.

6. Taking ample phytosanitary measures is always advantageous to avoid crop losses. The dead shoots may be removed to avoid disease recurrence. When the whole vine is dead, the entire plant along with its root system may be removed and burnt. The infected pit also may be burnt with trash in order to kill the fungus remaining in the soil and drenching with fungicides like Bordeaux mixture 1% be given before replanting.

7. If the infection has not spread to the root system, the aerial vines and the affected collar are to be cut off below the point of infection and Bordeaux paste applied to the cut ends.

8. Since the disease usually occurs during South-West monsoon period, to detect the disease in early stages of infection a careful watch of the plantation is a must. However, when pepper is grown as a mixed crop in arecanut gardens where regular irrigations are given from December onwards, the

disease is likely to occur in winter months (even after the monsoon), as well. The vines are to be protected by giving regular sprayings with Bordeaux mixture 1%. The sprayings are given in May-June as a premonsoon spray, in July-August and September-October periods. The main stems up to about 1 m from the ground level should be protected by swabbing with Bordeaux paste. Drenching the basins with Bordeaux mixture 1% or 0.1% ceresan wet @ 3-5 l/vine may be given to check the root rot infections.

#### The morrow

1. The role of plant parasitic nematodes like root knots, *Meloidogyne* sp. and burrowing nematodes, *Radopholus similis*, infesting pepper, in quick wilt incidence is yet to be understood to evolve effective control measures.

2. Control methods using fungicides so far did not appear very effective. The fungicides are to be applied only as a prophylactic measures. Once the vine is affected and the collar rot has set in, it is difficult to cure the affected vines by fungicidal application. Investigations are in progress to find out a suitable fungicide, either contact or systemic, which when applied not only protects the vines from disease incidence but also cures the affected vines.

3. A long range solution for this problem is the evolution of resistant varieties. A few wild species of pepper like *Piper colubrinum* are reported to be resistant to this disease in other countries. Root stocks of these resistant lines were tried in grafting with susceptible scions, but not with much success. Even if successful, the aerial vines are still prone to infection. Hence incorporating the resistance into the high yielding cultivated types by hybridisation will be the total solution to this vexed problem. The research work in this line is already in progress.

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