

Diseases of Pepper in India

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Ravages due to diseases play a major role in limiting pepper production in India. Though 15 fungi have been reported to be associated with pepper in India, only a few are economically important.

Quick wilt is the major disease of pepper in India. It is popularly known as foot rot in other countries and is reported to inflict considerable damage to plantations in Indonesia, Sarawak, Puerto Rico, Brazil and Jamaica (Holliday and Mowat, 1963). In India, the disease is noticed during the South West monsoon in all the pepper growing tracts of Kerala and Karnataka. The occurrence of pepper wilt in Wynad, Kerala was reported in 1906 by Butler. Though Venkata Rao (1929) isolated a *Phytophthora* sp. from pepper, he did not consider it a pathogen. The causative agent of wilt was first identified as *Phytophthora palmivora* var. *piperis* by Muller (1936) in Indonesia. In India, the pathogen was first isolated by Samraj and Jose (1966). They reported losses of upto 20% in plantations in Kerala due to the disease. But losses are higher in some endemic areas.

The disease is characterised by leaf infection, die-back of twigs and foot and root rot. The fungus also attacks spikes

causing their shedding. In foot rot, the stem at the ground level and above (upto about 1 m) contracts the disease. The affected bark decays and peels off. Depending on the degree of rotting, the infection results in partial or total death of the bush. In the initial stages, only a few leaves of the affected vines show yellowing. With the advancement of the disease, the entire foliage turns yellow. Death occurs within 10 — 21 days of infection. The rotting at the collar region progresses downwards to the root system. Exclusive root infection alone also occurs. Often, small feeder roots are infected first. By the time the main roots contract infection, the feeder roots will have disintegrated. The predisposing factors of infection are high humidity and rainfall, low temperature (20–22°C) and poor drainage. Generally the disease occurs during the South West Monsoon period. But, when pepper is grown on arecanut under mixed cropping systems, the pathogen will be active even after the monsoon, from October to January. Since arecanut is grown under irrigated conditions in northern Kerala, the microclimatic factors will be congenial for the growth of the fungus during the post-monsoon period also.

A proper solution to this problem can only be the evolution of resistant cultivars. Wild species of pepper like *Piper colubrinum* and *P. obliquum* have been reported to be resistant to foot rot (Turner, 1971). Ruppel and Almeyda (1965) reported partial resistance in *P. aduncum*, *P. scabrum* and *P. treleasanum* in Puerto Rico. Though grafting was tried using these resistant lines as root stocks, poor establishment under field conditions was a hurdle in accepting this technique. Even if grafting is successful, aerial vines are still prone to infection resulting in foliage decay, die-back of twigs and spike shedding. Hence, incorporating resistance into the high yielding cultivars by hybridisation will only be the ultimate solution to this disease.

An array of wild types of pepper is available in the forests of Western Ghats in India. With a view to locating resistance in them screening work has been taken up at the CPCRI Regional Station, Calicut. None of the types tested so far has been found to be resistant.

At present, we are recommending only prophylactic control measures against the wilt disease. This is done by spraying the vines and drenching the soil around the vines with Bordeaux mixture and applying Bordeaux paste in the collar region. This is done twice, in May-June and August. In the event of a prolonged monsoon, a third application is necessary. Field trials are in progress to find out the critical time of application of the fungicide.

Once the pathogen establishes in a locality, it is difficult to eradicate it completely since it is soil-borne. Sufficient care should hence be taken not to transport nursery stock or soil from diseased garden to healthy ones. Nambiar and Sarma (1975) stressed the importance of phytosanitary measures in diseased gardens to avoid further crop losses. This includes removal

and burning of completely wilted plants and their roots. Before gap filling, the planting pits should be treated with fungicides like 1% Bordeaux mixture or burnt with trash to kill the pathogen. Adequate provision for drainage is to be made in the garden, especially in mixed cropping systems.

The other important disease is "slow wilt". The disease was first reported from Wynad as early as in 1902. Krishna Menon (1949) reported mortality of upto 10% of the vines due to the disease. In Guyana, a similar disease called 'yellows' has been reported to inflict 30% loss to the crop. The disease is usually observed after the monsoon. The leaves of affected vines show general pallor and flaccidity and later fall off. After symptom expression, the vines decline slowly. The root growth is crippled as a result of attack and roots decay and perish.

Fungi like *Fusarium*, *Diplodia* and *Rhizoctonia* have been isolated from roots of affected vines (Krishna Menon, 1949). The root-knot nematode (*Meloidogyne incognita*) and burrowing nematode (*Radopholus similis*) have been observed in the root system of affected plants. Butler (1906) reported root-knot eelworm in pepper in Wynad. Recently, we have noticed a high population of *R. similis* in the root system of Panniyur I trained on arecanut palms in Bandadka (Kasaragod) and *M. incognita* in pepper plantations in Alacode (Taliparamba). Root-knot infection is becoming a serious problem in pepper nurseries too. Hubert (1957) observed that *R. similis* caused 90% damage to pepper plantations in Banka. Ting (1975) found that *Meloidogyne* sp. was associated with gradual decline of pepper in Malaysia. There are indications that deficiencies of some plant nutrients like P and K and soil moisture stress also play a role in the

disease incidence. This has been corroborated by the findings of Harper (1974). Ward (1969) reported disorders due to nutritional deficiencies in Sarawak.

Drenching the soil around the vines with 0.1% Ceresan wet in May – June and September–October has been recommended to control the pathogenic fungi. Application of Dasanit granules @ 20 gm / standard has been found to alleviate yellowing symptoms caused by nematodes. To prevent root-knot infestation in nurseries, disinfection of potting mixture with methyl bromide @ 500 gm / tonne of soil under polythene cover for 24 – 48 ha is recommended. Alternatively Nemagon at 40/ a.i. / ha may be used. Out of the many common standards used for pepper, only *Garuga pinnata* has been found to be resistant to root-knot nematode (Koshy, Sosamma and Sundararaju, 1977). Hence great care is to be taken while selecting the standard. Because of the involvement of many factors in the incidence of the disease, this vexed problem is to be tackled on a multidisciplinary approach for evolving effective control schedules.

“Pollu” disease is caused by *Colletotrichum necator*. The fungus infects berries and leaves. Usually the discoloured berries occur in groups of two to five. The affected berries show in the early stages, water-soaked, brown, sunken, linear areas. The lesions turn dark brown and become larger in size. In later stages, the berries may split at the lesion site and acervuli of the fungus develop on the surface. The affected leaves show spots with concentric zonations. The disease was earlier reported by Krishna Menon (1949), as causing more than 25% loss. Vimuktananda and Celino (1940) reported a similar disease in the Philippines. Wilson (1960) recorded *Dioscoria triphylla* as an alternate host of the pathogen. Field screening of cultivars

assembled at the Pepper Research Station, Panniyur, for two seasons (1973 and 1974) showed that the mean disease incidence ranged from 6 to 24%. Spraying with 1% Bordeaux Mixture or 0.2% Dithane Z-78 is recommended to control the disease. Shade regulation also helps in reducing the disease incidence to an extent. The mode of survival of the fungus, the most susceptible stage of the berries for infection, microclimatic factors which predispose the berries to infection, and the critical period at which spraying is necessary are, areas which require further investigations.

“Stump rot” caused by *Rosellinia bunodes* was first noticed in 1895 in Mysore (Butler, 1918). At first, a vine or several in a group appear to be affected by drought. The leaves wither, turn brown and drop off. In some cases, death is very sudden. New shoots rarely arise. Usually, the disease spreads in ever widening circles unless control measures are adopted.

The fungus also infects forest trees like *Grevillea robusta* and *Holigarna longifolia*. Digging trenches 50 cm. deep all around the vine helps to isolate diseased vines from healthy ones, and the affected vines are completely removed and burnt.

Other diseases of minor importance are the sclerotial wilt caused by *Sclerotium rolfsii*, damping off caused by *Rhizoctonia solani*, and red rust caused by *Cephaleuros mycoides*. Chowdhury (1943) observed sclerotial wilt in Assam, causing losses up to 67% in some of the plantations.

Pepper plantations are also prone to several other diseases against which careful vigil has to be observed, especially against the mosaic disease reported from Sarawak (Costa *et al*, 1970).

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