DISEASES OF PEPPER IN INDIA

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Ravages due to diseases play a major role in limiting pepper production in India. Though fifteen 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 in 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 spp. 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. The pathogen was first isolated from India 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, dieback 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 (up to 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 effected vines show yellowing. With the advancement of the disease, the entire foliage turns yellow. Death occurs within 10 to 21 days after infection. The rotting at the collar region progresses downwards to the root system. Exclusive root infection alone also occurs. Often small feeder rots are infected first. By the time the main roots contract infection the feeder roots disintegrate. 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 long range solution for this problem can only be the evolution of resistant types. A few 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 and 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, dieback 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 the Western Ghats in India. With a view to locating any resistance in them screening work has been taken up at the Regional Station, C.P.C.R.I. Vittal. 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. The operation has to be 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 rather 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 the 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 next important disease is "slow wilt". The disease was first reported from Wynad as early as 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 crops. The disease is usually observed after the monsoon. The leaves of the 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 they decay and perish.

Fungi like Fusarium spl, Diplodia sp. and Rhizoctonia sp. have been isolated from roots of affected vines (Krishna Menon, 1949). In the root system of affected plants presence of root-knot nematode (Meloidogyne incognita) and burrowing nematode (Radopholus similis) has been observed. 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). In this connection it is pertinent to note that 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 g per standard has been found to alleviate yellowing symptoms caused by

nematodes. To prevent root-knot infestation in nurseries, disinfestation of potting mixture with methyl bromide @ 500 g per tonne of soil under polythene cover for 24-48 h is recommended. Alternatively Nemagon at 40 l a.i. per 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. 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. Vimuktanandana and Celino(1940) reported a similar disease in the Philippines. Wilson (1960) recorded Dioscorea 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) shows that the mean disease incidence ranges 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 for evolving effective control schedules.

"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, after the first vines die, others

surrounding them show signs of infection, and the disease spreads in ever widening circles unless control measures adopted.

The fungus also infects forest trees like Grevillea robusta and Holigarna longifolia. Digging trenches 50 cm deep all around the vine helps 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).

REFERENCES

Butler, EJ 1906. The wilt disease of pigeonpea and pepper. Agric. J. India, 1: 25.

Butler, EJ 1918. Fungi and diseases in plants, Thacker & Spink, Calcutta, pp. 547.

Chowdhury, S, 1943. A sclerotial disease of black pepper. Indian J. agric. Sci. 13: 566

Costa, AS; Albuquerque, FC de, Ikeda, H. and Cardoso, M. 1970. A black pepper disease caused by cucumber mosaic virus. Instituto de Pesquisas e Experimentacao Agropecurias do Norte, Fitotechnia 1(1); 1_18.

Harper, R.S. 1974. Pepper in Indonesia: cultivation and major diseases. World Crops 26(3): 130-133

Holliday, P and Mowat, WP 1963. Foot rot of Piper nigrum L. (Phytophthora palmivora). CMI Phytopath. Paper No.5 pp. 62.

Hubert, FP 1957. Diseases of some export crops in Indonesia. Indonesia. Plant Dis. Reptr. 41(1): 55-64

Krishna Menon, K 1949. The survey of pollu and root diseases of pepper. Indian J. agric. Sci. 19: 89-136.

Muller, H.R.A. 1936. The Phytophthora foot rot of pepper in Dutch East Indies. Med. Inst. PlZukt. Batavia. 88: 1-73.

Nambiar, KKN and Sarma YR 1975. Quick wilt (foot rot) disease of pepper. Arecanut & Spices Bull. 7(4): 89-91.

Ruppel, EG and N Almeyda 1965. Susceptibility of native Piper species to the collar rot pathogen of black pepper in Puerto Rico. Plant Dis. Reptr. 49: 550-551.

Sam Raj J and Jose PC 1966. A Phytophthora wilt of pepper, Piper nigrum. Sci. & Cult. 32: 90-92

Ting WP 1975. Plant Pathology in Peninsular Malaysia. Rev. Pl. Path. 54(5): 297-305.

Turner GJ 1971 Resistance of Piper species and other plants to infection by Phytophthora palmivora from Piper nigrum. Trans. Brit. mycol. Soc. 57 (1): 61-66.

Venkata Rao, MK 1929 Ann. Report, Department Agric., Mysore, 1927-28, p.29.

Vimuktanandana and Celino 1940 Anthracnose of black pepper. Philipp. Agric. 29(2): 124-141.

Ward, PWF de 1969 Foliar diagnosis, nutrition and yield stability of black pepper in Sarawak. Communication No. 58, Royal Trop. Instt., Amsterdam, Netherlands.