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Incidence of foot-rot disease of black pepper (*Piper nigrum*) in Kerala in relation to cultivation practices

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One of the major constraints in the production of black pepper (*Piper nigrum* L.) is the foot-rot disease caused by *Phytophthora capsici* Leonian 1922, emend. A. Alizadeh & P. H. Tsao (= *Phytophthora palmivora* Butler MF_4). Although infection occurs on all parts of the vine, collar infection is important as it is lethal (Anandaraj *et al.* 1988). The disease causes an estimated loss of 119 and 905 tonnes yield anually in Calicut and Cannanore districts respectively (Balakrishnan *et al.* 1986, Anandaraj *et al.* 1989). The productivity of black pepper in India is 272 kg/ha, which is much low when compared with other countries producing

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black pepper (DCASD, Calicut 1986). A survey was carried out to assess the loss in yield due to foot-rot and to identify the constraints in the cultivation of black pepper that result in low productivity.

The survey was conducted during 1982–83 in Calicut district and 1985–86 in Cannanore district. Stratified multi-stage design was adopted. The villages in each district were classified into different strata based on the number of vines. In Calicut 7 villages and in Cannanore 12 villages, were selected. In each selected village 5 and 4 clusters were chosen at random from Calicut and Cannanore districts respectively. Each cluster comprised 5 contiguous survey subdivisions. From each garden information on cropping pattern, cultural practices, and occurrence of pests and diseases was collected

Black pepper is cultivated mainly as a subsidiary crop in homesteads in these 2 districts. Among the holdings, 47% in Calicut district and 90% in Cannanore district are of less than 1 ha. Holdings of 2 ha and above are more in Calicut (14%) than in Cannanore (1%) district. In almost all gardens more than 1 cultivar of black pepper are cultivated, the predominant being 'Karimunda', 'Arakulamunda' and 'Panniyur 1'. Other cultivars such as 'Kaluvally', 'Narayakodi', 'Balankotta', 'Kuthiravalli' and 'Poonjaramunda' are also cultivated. Mixed cropping system involving coconut (*Cocos nucifera* L.) and arecanut (*Areca catechu* L.) is popular. Monocropping is followed in some gardens. The most commonly used support (standard) for black pepper is *Erythrina indica* Lam. (coral tree), *Garuga pinnata* Roxb. (*ghogar*), *Mangifera indica* L. (mango), *Artocarpus heterophyllus* Lam. (jack fruit), *Moringa oleifera* Lamk. (horse-radish tree) and *Glyricidia sepium* (Jacq.) Steudel (spotted glyricidia) are also used as standards for trailing black pepper vines.

The various cultural operations followed for black pepper are given in Table 1. Since it is grown as a subsidiary crop, little attention is paid to it. Digging (occasionally ploughing) the interspaces and application of organic manures such as farmyard manure @ 5–15 kg/vine/year are common. Chemical fertilizers and plant-protection chemicals are rarely applied. Digging of interspaces although reduces weed growth, it causes damage to the surface feeder roots and facilitates infection by soil pathogens. The absence of cover crops helps in rapid spread of foot-rot disease (Holliday and Mowat 1963). This is corraborated by the survey data. The incidence of foot-rot disease in Cannanore district was 9.4% compared with 3.7% in Calicut district vis a vis 93% holdings in the former district adopting digging compared with 59% in the latter. Shade regulation by lopping of the side branches of standards during rainy period is necessary, as it helps in penetration of sunlight and prevents build up of high humidity—which is congenial for *Phytophthora* infection. Another aspect overlooked is phytosanitation. As it is a perennial crop, the occurrence of *Phytophthora* disease is restricted to south-west monsoon period

Table 1 Cultural practices followed in pepper gardens in Calicut and Cannanore districts and incidence of foot-rot

Cultural operation	Farmers (%) adopting the practices	
	Calicut	Cannanore
Digging	59	93
Shade regulation	11	25
Mulching	2	3
Irrigation	0	4
Organic fertilizers	38	24
Chemical fertilizers	10	4
Insecticide spraying	36	32
Fungicide	9	10
Nematicide	0	1
Foot-rot Incidence	3.7%*	9.4%**
No. of vines lost/year	186 000	1 016 425
Estimated quantity (tonnes)	119	904.9

*Average of 3 years, **average of 2 years

(June-September). The pathogen being soil-borne was found to survive in soil in the infected plant debris, up to 19 months (CPCRI, Kasaragod 1986). Retention of infected vine in a garden serves as a source of inoculum for the next season. During the survey, occurrence of foot-rot was found severe in the plots where the disease had occurred in the previous season and infected vines retained in the plot. No farmer did follow any prophylactic measure for controlling this disease. Only about 10% of the farmers sprayed bordeaux mixture after noticing the disease. Foot-rot caused severe economic loss of estimated 186 000 vines in Calicut and 1 016 425 vines in Cannanore annually, leading to loss in yield of 119 and 905 tonnes of black pepper respectively (Balakrishnan *et al.* 1986, Anandaraj *et al.* 1989). Lack of awareness and fluctuation in prices leads to neglect of black pepper cultivation once the garden is infected. The total neglect of the crop and lack of intensive cultivation are some of the reasons for low productivity. Concerted efforts are required to educate the farmers about scientific cultivation of black pepper, to minimize loss due to the disease and increase the productivity.

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