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Survival of *Colletotrichum gloeosporioides*, the causal organism of anthracnose disease of black pepper

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Abstract

Survival of *Colletotrichum gloeosporioides* (Penz) Penz., & Sacc. the causal organism of anthracnose disease of black pepper was studied at the College of Agriculture, Vellayani, Trivandrum, Kerala. The naturally infected black pepper leaves and spikes of the variety Karimunda collected from black pepper gardens were buried in soil and another set kept in brown paper bags under laboratory conditions to study the mode of survival of the fungus. Samples were taken from these two sets periodically and plated on PDA. Viable colonies of *C. gloeosporioides* were obtained up to 90 days in the case of infected plant parts buried in the soil and up to 150 days in the case of infected materials kept in paper bags. The results indicate that the black pepper anthracnose fungus can survive on the infected leaves and spikes or in the soil and hence warrants strict phytosanitation to reduce the disease incidence.

Keywords: black pepper, *Colletotrichum gloeosporioides*, survival.

Black pepper *(Piper nigrum* L.) is the prime spice crop of Kerala. The crop is affected by a number of diseases caused by fungi, bacteria, mycoplasma and nematodes. Among these, the fungal diseases rank top. Anthracnose of black pepper caused by *Colletotrichum gloeosporioides* (Penz.) Penz. & Sacc., a serious disease, is gaining importance in the recent years (Sarma *et al.* 1990; Sainamole *et al.* 2000). Since the pathogen affects the most economically important parts, the spikes and berries, the losses due to the disease are very severe. The disease is seen throughout the season in plantations. Maximum damage due to the disease is noticed during August - September period (Nair *et al.* 1987). The disease causes 1.93–9.54 per cent spike shedding and the percentage loss due to infection ranges between 0.69–3.74 and total loss was 0.67–137.75 g plant^{-1} (KAU 2001). Survival studies on other anthracnose fungi of strawberries, beans and lentil proved the ability of this fungus to survive for longer time in soil. (Tu 1983; Wilson *et al.* 1992; Dillard & Cobb 1993; Buchwaldt *et al.* 1996). No studies were conducted on the survival of anthracnose fungus in black pepper plantations of Kerala. Hence the present study was made.

The method followed by Yoshida & Shirata (1999) was employed in this study with some modifications. Black pepper leaves and spikes of the variety Karimunda showing the characteristic symptoms of anthracnose disease were collected from the black pepper plantations of the Instructional Farm, College of

Agriculture, Vellayani, Trivandrum during March 2001. They were washed in running water and were then cut into bits of 4 to 8 cm. Earthen pots (35 cm height 30 cm dia) were filled with unsterilised black pepper plantation soil (2 kg approximately). The cut bits (250 g) were then placed in these earthen pots at a depth of 30 cm from the surface. The pots were placed in outdoors and watered alternate days. There were three replications.

The infected plant parts buried in the soil were collected from each pot from 7 days of burial at 30 days interval for a period of 180 days. The materials were surface sterilized with 0.1% mercuric chloride and washed in sterile distilled water thrice. They were then plated on Potato Dextrose Agar (PDA) medium containing streptomycin sulphate (30 g l^{-1}). Three replications were kept. Survival of the pathogen was determined by the development of viable fungal colonies on the medium after incubation for 4-7 days at room temperature 28 ± 5°C.

Another set of infected black pepper leaves and spikes were washed in running water and then air dried on tissue paper for three days. These air dried materials were then placed in brown paper covers (32 cm x 26 cm) and the covers were tightly sealed and kept in the laboratory at room temperature 28 ± 5°C. Sample collection and evaluation were done as described earlier.

The fungus was detected in the infected black pepper plant materials up to 90 days after burial in the soil (Table 1). At 120 days no propagules could be recovered. The recovery of the viable propagules decreased with the increase in days. The survival of the pathogen for shorter periods in the soil may be due to the factors such as soil pH, soil moisture, temperature and soil micro organisms.

Under the laboratory conditions *C. gloeosporioides* survived up to 150 days (Table 1). Eighty three per cent viable colonies were obtained on plating after storage of 7 days. At 180 days no fungal colonies were obtained.

Table 1. Survival of *C. gloeosporioides* in black pepper leaves and spikes

Days after burial/storage	Recovery of the fungus (%) *	
	Soil	Laboratory
7	100.0	83.3
30	75.0	58.3
60	58.1	50.0
90	33.3	33.3
120	0.0	25.0
150	0.0	8.3
180	0.0	0.0

* Means of 3 replications

The recovery of *C. gloeosporioides* from the infected samples for a long period under laboratory conditions indicates that the pathogen is not invaded/masked by other soil fungi and other unfavourable soil conditions as stated above. It was inferred that the propagules could remain viable if they are undisturbed or protected properly. The study also indicates that the pathogen can survive even in the absence of the host plant.

Survival of *C. dematium* in the soil and infected mulbery leaves up to 150 days was reported (Yoshida & Shirata 1999). Survival up to 150 days in the infected plant debris was reported in the case of *Rhizoctonia solani* causing sheath blight of paddy (Pratibha Sati & Sinha 1999).

Many anthracnose fungi belonging to the genus *Colletotrichum*, have been reported to survive on the plant debris such as leaves, roots, fruits etc. (Wilson *et al.* 1992; Dillard & Cobb 1993; Norman & Strandberg 1999).

Under natural conditions, the pathogen survived up to 90 days in the infected plant materials in the soil. The long period of survival is enough to cause fresh infection in the black pepper plantations. During the survey on the incidence of the disease, it was observed that large quantities of the infected leaves and spikes of black pepper were shed due to this disease and they remain in the basins of the black pepper vines. They serve as sources of inoculum for further spread of

the disease. Hence strict phytosanitory measures such as collection and burning of the infected plant materials should be followed to protect this crop from the above disease.

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