Occurrence of *Phytophthora capsici* on cocoa in Kerala*

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Black pod is the most important fungal disease of cocoa (*Theobroma cacao* L.) in India. *Phytophthora palmivora* (Butl.) Butl. was reported as the causal organism of black pod (5) and canker (2) diseases of cocoa in Dakshina Kannada district of Karnataka, India. Work done in other cocoa growing countries showed six distinct *Phytophthora* species viz., *P. palmivora* (Butl.) Butl., *P. capsici* Leonian, *P. megasperma* Dreschler, *P. megakaraya* Brasier and Griffin, *P. citrophthora* (Smith & Smith) (9) and *P. Katsurae* (4) as the causal organisms of black pod disease of cocoa. However, detailed studies were not conducted so far on taxonomic complex of *Phytophthora* associated with cocoa in India. Hence, the present study was undertaken to find out *Phytophthora* species associated with cocoa in Idukki district, one of the major cocoa growing areas in Kerala state where cocoa is grown as mixed crop in existing arecanut and coconut gardens.

Samples showing typical symptoms of black pod disease were collected from a total of 19 cocoa plantations representing different taluks of Idukki district and the causal organism was isolated on carrot agar medium (CA). Out of the 19 isolates of *Phytophthora* collected, 17 were identified as *P. palmivora* based on cultural, morphological and pathogenic characters. Detailed studies were conducted on the other two isolates collected from Devikulam and Udumbanchola areas of Idukki district. Colony morphology was studied on CA after 5 days of incubation in dark at 24 ± 1°C. The sporangia were produced by the solid-agar-plate and agar-disc-in-water methods (1). Chlamydospores were produced by submerging mycelial mats in water and incubating at 18°C (7). The influence of temperature on vegetative growth of the fungus was determined in dark at temperatures from 6 to 36°C at 3°C intervals.

The fungus produced a somewhat petalloid pattern of growth with fluffy aerial mycelium on CA. The average growth rate of isolate is 20 mm day^{-1}. The isolate produced sporangia in an umbellate fashion with agar-disc-in water method in continuous light. The sporangia were elongated or ellipsoidal with tapered base. They were caducous and carried characteristically long pedicels. The mean size of sporangia was 41 × 18 um (solid-agar-plate) and 39 × 19 um (agar-disc-in-water) with an average length-breadth ratio of 2.24 (solid-agar-plate) and 2.02 (agar-disc-in-water). The average pedicel length was 81 um with solid agar plate method and 91 um with agar-disc-in-water method. The chlamydospores were terminal or intercalary in position with an average diameter of 25 um. Cardinal temperatures for growth on CA in darkness: minimum 11-12°C, optimum 24-30°C, maximum 32-33°C. Based on the characters described above, the isolate was identified as *Phytophthora capsici* Leonian emend Tsao and Alizadeh 1988 (6, 8) and is deposited in the CAB International Mycological Institute (IMI (348096).

The pathogenicity of *P. capsici* was established by inoculating detached nearly mature cocoa pods of forestero variety with and without wounds (3). The length and breadth of resulting lesions were measured 7 days after inoculation

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and areas of lesions (less inoculum) were calculated. The isolate produced dark brown lesions of about 108 cm^2 with wound inoculation and 65 cm^2 with surface inoculations. Thus the present study clearly reveals that *P. capsici* also causes black pod disease of cocoa in India in addition to *P. palmivora*. This is the first report of the occurrence of *P. capsici* on cocoa in India.

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References

1. **Al-Hedaithy, S.S.A. and Tsao, P.H.** (1979). *Mycologia* **71** : 392-401.
2. **Chandra Mohanan, R.** (1978). *Plant Dis. Reptr.* **62** : 1080-1082.
3. **Fagan, H.J.** (1983). *Trans. Brit. mycol. Soc.* **91** : 389-401.
4. **Liyanage, N.I.S. and Wheeler, B.E.** (1989). *Plant Pathol.* **38** : 627-629.
5. **Sreenivasan, T.N. and Chandra Mohanan, R.** (1984). *Tropical Agric. (Trinidad)* **61** : 186-187.
6. **Stamps, D.J., Waterhouse, G.M., Newhook, F.J. and Hall, G.S.** (1990). In *Revised Tabular Key to the Species of Phytophthora,* Mycological paper 162, CAB International Mycological Institute, Kew, Surrey, pp 1-28.
7. **Tsao, P.H.** (1971). *Phytopathology* **61** : 1412-1413.
8. **Tsao, P.H. and Alizadeh, A.** (1988). In *Proc. Tenth Int. Cocoa Res. Conf.,* 17-23 May, Santo Domingo, Dominican Republic, pp 441-445.
9. **Zentmyer, G.A.** (1988). In *Proc. Tenth Int. Cocoa Res. Conf,* 17-23 May, Santo Domingo, Dominican Republic, pp 391-395.

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Sclerotia of *Sclerotinia trifoliorum* on seed as source of primary infection of stem rot of berseem

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Stem rot of berseem (*Trifolium alexandrinum* L.) caused by *Sclerotinia trifoliorum* Eriksson is one of the most serious diseases of this crop in Punjab (2) but no information is available on source of primary inoculum for long dissemination of the pathogen to new areas/fields from India. It has been shown that clover seed sized sclerotia of *S. trifoliorum* are capable of producing apothecia as well as mycelium which play an important role in disseminating the pathogen to long distances where the clover has not been grown so far (1). These findings fully support our results as the sclerotia of *S. trifoliorum* admixtured with seed resulted in appearance of disease in the experimental area where berseem had never been grown so far.

The seed of berseem was collected from a field heavily infected with the disease which