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YAMO USSOUKRO, REPUBLIQUE DE COTE D'IVOIRE

18-24

7

1993

**COCOA PRODUCERS ALLIANCE
ALLIANCE DES PAYS PRODUCTEURS DE CACAO
ALIANÇA DOS PAISES PRODUTORES DE CACAU
ALIANZA DE LOS PAISES PRODUCTORES DE CACAO**

Pathogenic variability in isolates of *Phytophthora* species causing black pod disease of cocoa in India in relation to host reaction

P. CHOWDAPPA and R. CHANDRAMOHANAN

Central Plantation Crops Research Institute, Regional Station, Vittal-574 243, Karnataka, India

ABSTRACT : Pathogenic variability in three species of *Phytophthora* causing black pod disease of cocoa was studied on detached pods of 20 cocoa accessions. Mycelial disks were used to inoculate fully developed but unripe pods. Lesion size (cm²), mycelial growth and sporulation on lesion surfaces were recorded after seven days after inoculation. The three species of *Phytophthora* exhibited significant difference in lesion area between species. *P. palmivora* produced larger lesion area, higher amount of aerial mycelium and sporulation on all cocoa accessions. *P. capsici* and *P. citrophthora* failed to sporulate on pods of all accessions. The cocoa accessions exhibited wide variations in degree of resistance to *Phytophthora* species. The cocoa accessions C44 and C79 were found to be highly tolerant to all three species of *Phytophthora* whereas Landas 346 was highly susceptible. Thus, the study not only helped in determining the variability among the *Phytophthora* species but also in identifying in tolerant and highly susceptible cultivars.

Key words : Cocoa, *Phytophthora* spp. pathogenic variability, host reaction

Phytophthora species are the most important pathogens of cocoa, infecting pods, stems, leaves, chupons and seedlings. Of these, pod infection, commonly known as black pod disease, is the most serious disease influencing the cocoa production in India. Studies on taxonomic complex of *Phytophthora* associated with black pod of cocoa in India revealed the *P. capsici*, and *P. citrophthora* also causes the black pod in certain localities of Kerala State in addition to *P. palmivora* (Chowdappa and ChandraMohanana, 1995). *P. palmivora*, *P. capsici* and *P. citrophthora* of cocoa from different countries differed in their pathogenicity (Lawrence *et al.*, 1982). The objective of the present study was to examine the variations in pathogenicity among the three species of *Phytophthora* occurring on cocoa in India in relation to host reactions.

MATERIALS AND METHODS

Nearly mature, but unripe detached pods (14 - 19 cm length) of 20 cocoa accessions such as Redaxil, Landas 364, Landas 356, Landas 358, Landas 365, Jarangan Amel x Pa7, Jarangan Amel x Na 32, Jarangan Pa7 x Na 37, Pa7 x Na 32, Amel x Na 33, Amel x Na 32, P1 x P7, P6 x P4, T 85/5 x Na 32, P7 x P6, T7/12, T86/2, W6/56, C79 and C44 were wound and surface inoculated (Fagan, 1988) with seven days old sporulating cultures of *P. palmivora* (I-CP/122), *P. capsici* (I-CP/23) and *P. citrophthora* (I-CP/92). The area of

lesion, mycelial growth and degree of sporulation were determined seven days after inoculation.

RESULTS

The three species of *Phytophthora* exhibited significant differences in lesion area, mycelial index and sporulation. *P. palmivora* isolate produced larger lesion area, higher amount of aerial mycelium and sporulation on all 20 cocoa accessions than *P. capsici* and *P. citrophthora* regardless of inoculation method used. The 20 cocoa accessions exhibited wide variation in susceptibility to *P. palmivora*, *P. capsici* and *P. citrophthora*. The cocoa accessions C44 and C79 were highly tolerant to all the three species of *Phytophthora* whereas Landas 364 was highly susceptible.

DISCUSSION

As earlier studies indicated the existence of three *Phytophthora* spp. (Chowdappa and ChandraMohanana, 1995), it is important to include all the three species in screening cocoa cultivators for black pod disease. The present study not only helped in determining the variability among *Phytophthora* spp. but also in identifying tolerant and highly susceptible cultivars. From the results, it could be inferred that C44 is highly tolerant to all the three species of *Phytophthora* whereas Landas 364 is highly susceptible. Thus, at present, C44 can be recommended for cultivation in the cocoa growing

areas of India with high black pod disease incidence after evaluating its yield potential. This accession may form the source of resistance in future breeding programme. The identification of Landas 364 as a highly susceptible cultivar is also an important observation not only because of the reason that this cultivar should not be recommended for planting in black pod disease prone areas but also of the view that Landas 364 can be taken as a typical susceptible cultivar for comparison in future screening programme. It has been observed that the reaction of cocoa accessions to the three *Phytophthora* spp. varied markedly. If cultivars that are tested only against the predominant species are used as source of resistance in breeding programme, it is expected that cocoa accessions incorporating little or no resistance to other species will become widely distributed in the cocoa growing regions with the possible result that population of other *Phytophthora* spp.

could eventually assume damaging proportions and cause major epidemics.

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