Pertanika 11(2), 317-321 (1988)

COMMUNICATION I

Cultural Variants of Fusaria from Oil Palm Habitats

ABSTRAK

Variasi dalam ciri-ciri kultur dan moforlogi wujud dalam kedua-dua pencilan induk dan subkultur bagi 8 spesies **Fusarium** *yang diasingkan dari tanah kelapa sawit. Berdasarkan pigmentasi, ciri-ciri miselium dan ukuran konidium, beberapa "morphological types" daripada pencilan induk dalam satu spesies dapat dibezakan. Subkultur berterusan bagi pencilan induk menghasilkan varian kultur. Varian kultur adalah jenis-jenis "slimy-pionnotal", "miselial" dan "ropy" atau dalam bentuk tompok atau bahagian yang pigmentasinya berbeza daripada koloni induk.*

ABSTRACT

Variation in cultural and morphological characteristics existed in both the parent isolates and subcultures of 8 species of Fusarium *isolated from oil palm soils. Based on pigmentation, mycelial characters and conidial measurements, different "morphological types" from parent isolates within a species were distinguished. Constant subculturing of the parent isolates gave rise to various cultural variants. The variants were the slimy-pionnotal, mycelial and ropy types or were in the form of patches or sections which differed in pigmentation from the parent colony.*

INTRODUCTION

Cultural and morphological variation is a common phenomenon in *Fusarium.* The originally isolated parent type with abundant conidia and floccose mycelium seldom remained constant in culture. In most species, strands, small patches or large sectors which differed from the original parent colony soon appeared. Such cultural variants also showed variation in pathogenicity (Armstrong *et al.*, 1940) and were usually significantly less pathogenic than their parent types (Oswald, 1949). Thus it is important to study the cultural variations which exist in the *Fusarium* species before conducting pathogenicity tests as only the parent types should be used. So far, there has been no report on the types of variation encountered in *Fusarium* species from Malaysia.

This paper reports the cultural and morphological variations found in 8 species of *Fusarium* isolated from soils of oil palm habitats in Malaysia.

MATERIALS AND METHODS

The *Fusarium* isolates studied in this investigation were the same as those obtained by Ho & Varghese (1985) from soils of oil palm habitats. These were *Fusarium solani* (Mart.) Sacc., *F. oxysporum* Schlecht, *F. semitectum* Berk. & Rav., *F. moniliforme* Sheldon, *F. longipes* Wollenw. & Reink., *F. equiseti* (Corda) Sacc., *F. heterosporum* Nees ex Fr. and *F. lateritium* Nees, Link. All cultures were derived from single spore isolation and grown on potato sucrose agar (PSA) under optimum conditions for sporulation and growth (Booth, 1971). The original isolates which were freshly cultured from soil were referred to as the parent isolates. Slide cultures (Booth, 1977) were prepared for studying conidial morphology and characteristics. Conidial measurements were made with a calibrated micrometer fitted in an eyepiece of a Leitz microscope. An average of 100 conidia were measured for each culture.

A total of 353 isolates from the 8 species of *Fusarium* were observed through 10 generations of subculturing. Both monoconidial transfer and mass inoculum transfer were employed in the subculturing.

RESULTS AND DISCUSSION

Based on cultural pigmentation, mycelial characters and conidial measurements, different "morphological types" of the parent isolates within a species were distinguished. Even though "morphological types" used here may not have any taxo-

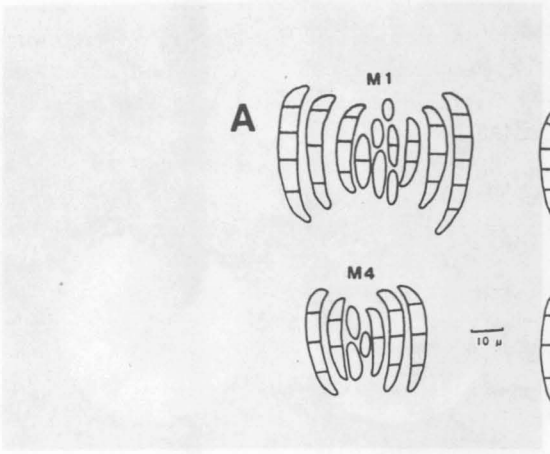
nomic position, it was useful to distinguish them for purpose of evaluating variation within species.

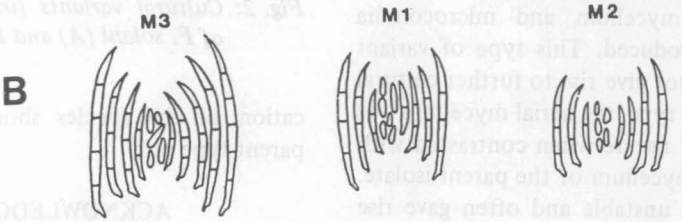
Six "morphological types" were distinguished in *F. solani*, four in *F. oxysporum*, three in *F. moniliforme* and two in *F. semitectum*. The cultural variations in the "morphological types" of each species are given in Table 1 and their range in conidial size are shown in *Fig. 1*. No variation was observed in the parent isolates of the other four species of *Fusarium*. Of the six "morphological types" found in *F. solani*, "morphological type" 1 was predominant (33.6%). In *F. oxysporum*, "morphological type" 3 was most prevalent (75.1 %). For *F. moniliforme* "morphological type" 3 was most abundant (71.8%) and in *F. semitectum* it was "morphological type" 1 (62.5%).

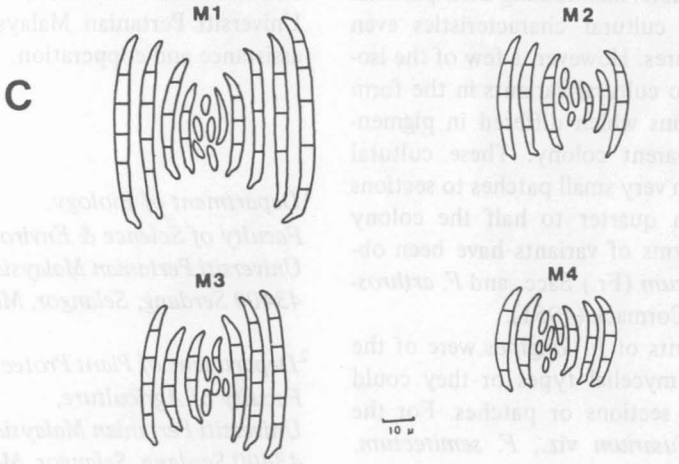
Besides the variations encountered among the parent isolates described above, constant subculturing of these parent isolates in the laboratory resulted in cultural variants. Among the *Fusarium* species studied, *F. oxysporum* showed a tendency to produce cultural variants during subsculturing The parent isolates with floccose mycelium and macroconidia produced in sporodochia could give rise to three cultural variants.

TABLE 1
Cultural characteristics of the various "morphological types" (M) in 4 species of *Fusarium*.

Fusarium spp/ "morphological types" (M)	Agar pigmentation	Mycelium
F. solani		
M1	pale peach to apricot	dense to floccose, white
M2	pale beige to white	sparse, white
M3	cream becoming brown in the centre	dense, white to greyish-white, striate and zonate, greyish-green bands alternating with greyish-white bands.
M4	brown with darker brown bands	sparse in the centre but more dense towards the outside, greyish with a brownish tinge, zonate.
M5	peach with a dark brown centre	dense, floccose, white
M6	brown, becoming dark brown or reddish-brown	sparse, greyish to brownish, zonate.
F. oxysporum		
M1	peach or peach with a violet tinge	sparse or absent, white with a peach tinge, closely appressed to agar.
M2	cream becoming peach	floccose, white with a peach tinge, zonate
M3	peach with a violet centre	dense, white with a purplish tinge.
M4	pale to deep violet	dense, white with a violet tinge, zonate.
F. moniliforme		
M1	cream to peach	floccose, white with a peach tinge.
M2	pale violet	dense, white with a violet tinge.
M3	lilac or pale violet with a purplish centre becoming deep purplish-brown	sparse, white with a lilac or violet tinge, mostly appressed to agar surface.
F. semitectum		
M1	brown	floccose, white, becoming peach and then buff-brown.
M2	brown	dense, white becoming yellow







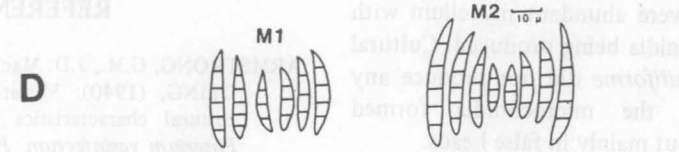


Fig. 1: Range of conidia present in different "morphological types" (M) of ***F. solani*** *(A);* ***F. moniliforme*** *(B);* ***F. oxysporum*** *(C) and* ***F. semitectum*** *(D)*

These were slimy-pionnotal, mycelial and ropy types. In the slimy-pionnotal type, the aerial mycelium was very scant or absent and macroconidia were produced in great abundance in slimy, cream to orange-coloured pionnotes which usually covered the entire surface of the culture. The macroconidia were generally thinner and longer and more uniform in size than those of the parent types. The slimy pionnotal cultural variant was stable and did not give rise to other cultural variants or reverted back to the parent type during mass or single spore subculturing. The stability of the pionnotal variant in *F. oxysporum* has also been observed by other workers (Armstrong *et al.*, 1940; Miller, 1946; Stover, 1962; Meyer & Goethals, 1964). The mycelial type rarely produced macroconidia but mycelium and microconidia were abundantly produced. This type of variant was stable and did not give rise to further cultural variants. In the ropy type, the aerial mycelium was of a coarse or ropy nature when contrasted with the finer, floccose mycelium of the parent isolate. The ropy type was unstable and often gave rise to the pionnotal type.

Unlike *F. oxysporum*, most parent isolates of *F. solani* were stable, maintaining their parental morphological and cultural characteristics even after many subcultures. However, a few of the isolates did give rise to cultural variants in the form of patches or sections which differed in pigmentation from the parent colony. These cultural variants ranged from very small patches to sections comprising about a quarter to half the colony (*Fig. 2*). Similar forms of variants have been observed in *F. avenaceum* (Fr.) Sacc. and *F. arthrosporioides* Sherb by Cormack (1951).

Cultural variants of *F. longipes* were of the slimy-pionnotal or mycelial types or they could be in the form of sections or patches. For the other species of *Fusarium* viz., *F. semitectum, F. equiseti, F. lateritium* and *F. heterosporum* the cultural variants were generally the mycelial type where there were abundant mycelium with few or no macroconidia being produced. Cultural variants of *F. moniliforme* did not produce any macroconidia and the microconidia formed were not in chains but mainly in false heads.

Since the cultural variants differ greatly from the original parent type, caution should be taken to ensure that classification or identification of the species should be based on the parent type only.

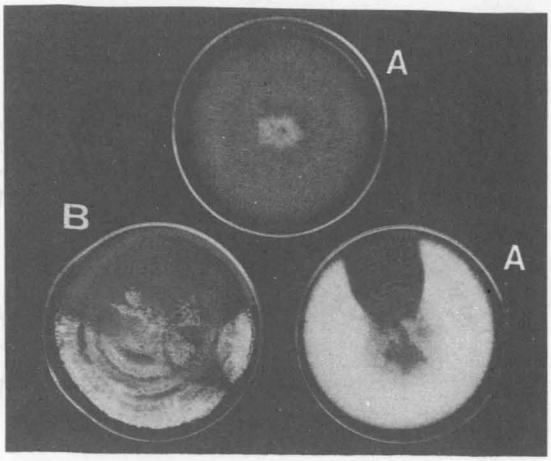


*Fig. 2: Cultural variants (in pitches and sectors) of **F. solani** (A) and **F. longipes** (B).*

ACKNOWLEDGEMENTS

The authors thank Miss Kasmawati Mahmood and Mr Razali Abdullah, Department of Biology, Universiti Pertanian Malaysia, for their technical assistance and copperation.

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(Received 29 January 1988)