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# CULTURAL AND PATHOGENICITY STUDIES ON SOME ISOLATES OF *FUSARIUM SOLANI* FROM DIFFERENT HOST PLANTS

BY

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Cultural and pathological studies on four isolates of *Fusarium solani* obtained from different host plants in West Bengal, namely, wilted guava, bhendi, rain tree and twig blight infected orange have been made. The isolates demonstrated differences in their cultural characteristics on *potato destrose agar*. They were also found to be selective in their pathogenicity. On the basis of host specificity creation of new *formæ specialis* of *F. solani* were proposed for these isolates. Accordingly, the isolates from bhendi, guava, rain tree and orange have been named as *F. solani* f. sp. *abelomoschi*, *F. solani* f. sp. *psidii*, *F. solani* f. sp. *enterolobii* and *F. solani* f. sp. *citri* respectively.

## INTRODUCTION

*Fusarium solani* is a common and widespread fungus causing wilt, foot-rot, twig blight and other symptoms on a wide range of hosts. In West Bengal also the fungus has been reported on a number of hosts, including some new records, such as wilt of guava (Chattopadhyay and Sen Gupta, 1955), wilt of bhendi (Chattopadhyay and Basu, 1957), wilt of rain tree (Bose and Sen Gupta, 1967) and twig blight of orange (Chattopadhyay and Sen Gupta, 1967). In the present paper cultural and pathological relationships of these isolates have been dealt with.

## MATERIALS AND METHODS

The fungus cultures were obtained from the Mycology Section, State Agricultural Research Institute, Calcutta. Monoconidial cultures were made from all the isolates. The sources of the different isolates is stated in Table 1.

Table 1. Sources of isolates of *Fusarium solani*

| *Isolate No.* | *Source from which isolated* | *Locality* |
|---|---|---|
| $F_1$ | Foot portion of wilted bhendi plant (*Abelomoschus esculentus* L.) | Garia (Dist. 24-Parganas) |
| $F_2$ | Roots of wilted guava plant (*Psidium guajava* L.) | Jhargram (Dist. Midnapur) |
| $F_3$ | Roots of wilted rain tree (*Enterolobium saman* Prain) | Calcutta |
| $F_4$ | Twigs of twig blight infected orange plants (*Citrus reticulata* Blanco) | Kalimpong (Dist. Darjeeling) |

Morphological characters of the isolates were studied on *potato dextrose agar* (PDA) after 7 days growth in Petridishes at 25°C. Growth rates of the different isolates were represented by the dry weight of the mycelium, the basal medium being Czapek solution. The isolates were grown in 250 ml. Erlenmeyer flasks containing 50 ml of the medium for 10 days at 25°C. After 10 days incubation the mycelial growth in each flask was filtered through weighed filter papers, the filter papers containing the mycelial growth dried at 60°C in an oven and then weighed. The weight of the mycelial growth was then worked out. Triplicate flasks were kept for each treatment.

Pathogenicity tests were conducted in 8 inch earthen pots. For soil inoculation mass cultures of the different isolates were made separately in conical flasks containing *sand maize* medium. After incubation for 15 days, the inocula were added separately to soil at the rate of 5% (w/w). For ærial inoculation the seedlings were sprayed by an automizer with conidial suspensions ($10^5$/ml.) of the respective isolates in sterile distilled water. The inoculated portions were kept for 48 hours encased in polythene bags to maintain humidity.

## Experimental

### *Cultural studies*

The macroscopic growth characters as well as the conidial measurements of the different isolates in PDA are presented in Table 2.

Table 2. *Cultural and conidial characters of four different isolates of* Fusarium solani

| Isolate No. | Macroscopic growth characters | *Conidial characters* Length × Breadth (μ) | Septation |
|---|---|---|---|
| $F_1$ | Copious, wooly, white mycelium with minute white sporodochia, substratum cream coloured. | 11.6-29 × 3.3-4.3 | 0-3 |
| $F_2$ | Clear centre, sorrounded by very thin mycelial felt of light biscuit colour due to numerous sporodochia which are more numerous as the margin of the culture is approached. Colour of substratum pinkish. | 9.9-38.4 × 3.3-4.8 | 0-4 |
| $F_3$ | Thin, uneven felt of white mycelium mainly in the periphery with very large biscuit coloured sporodochia towards the centre. Substratum cream coloured with occasional white sectors. | 11.6-24.7 × 3.3-6.6 | 1-3 |
| $F_4$ | Dense, even mycelial felt of palc cream colour, occasionally forming sectors of nut brown colour towards the periphery. Sporodochia evenly distributed. Colour of substratum white with tinges of light yellow. | 9.9-36.8 × 1.6-4.8 | 1-3 (rarely 4) |

Two types of mycelial growth on PDA were distinguished :— uneven growth in which the thin ærial mycelium persists mainly in the periphery of the colony (isolates $F_2$ and $F_3$) and even growth of thick ærial mycelium throughout the colony (isolates $F_1$ and $F_4$). All the isolates were sporodochial forms, but differences were noted in the distribution of the sporodochia. These may be restricted mainly to the periphery of the colony (isolate $F_2$) ; to the centre (isolate $F_3$) or evenly distributed (isolates $F_1$, $F_4$). Substratum colour in most cases is white or cream except isolate $F_2$ in which it is pinkish. Most of the isolates showed a constant growth type in a minimum of twelve examinations over a period of two years although occasional sectors were observed in isolates $F_3$ and $F_4$. Some variation was also noted in conidial size. No appreceable difference in growth rate was detected between the isolates in Czapek's medium.

*Pathogenicity studies*

For pathogenicity studies seedlings of several host plants namely, bhendi, guava, rain tree, orange, pea, potato, bean and squash were inoculated separately by different isolates of *F. solani* in two sets—by soil inoculation and by ærial inoculation. All the isolates were found to be strictly host specific. While, isolates $F_1$, $F_2$ and $F_3$ produced wilt symptoms on their respective hosts (i e., bhendi, guava and rain tree respectively) on soil inoculation, these isolates failed to produce infection on ærial inoculation. Isolate $F_4$ on the other hand, produced twig blight in orange only by ærial inoculation and not by soil inoculation. Potato, bean, pea and squash were not infected by any of the isolates.

## Discussion

Extreme variability within the members of the genus *Fusarium* makes their specific determination very difficult. In view of this, Snyder and Hansen (1940) formulated a modification of the older system of classification of the genus *Fusarium* by Wollenweber and Reinking (1935) in which they proposed that the species be based only on morphology and on the basis of pathogenicity *formæ specialis* should be created within the species. The present author found the suitability of this system of classification in his earlier work on the wilt disease of some pulses caused by different *formæ specialis* of *F. oxysporum* (Sen Gupta, 1963 ; Chattopadhyay and Sen Gupta, 1967). In the present study also the same species concept has been followed.

Observations on the isolates of *Fusarium solani* obtained from different host plants in West Bengal demonstrated differences in their cultural characteristics such as amount and distribution of ærial mycelium, substratum colour, distributlon of sporodochia etc. These were also found to be specialized in their pathogenicity and when inoculated on healthy plants could infect their respective hosts only inciting similar types of symptoms as are found in nature.

A wilt disease of guava was first reported from Uttar Pradesh by Prasad, Mehta and Lal (1952) who identified the causal organism as *F. oxysporum* and on the basis of host specialization designated it as a new *formæ specialis* and accordingly named the pathogen as *F. oxysporum* f. *psidii*. In West Bengal guava wilt was reported by Chattopadhyay and Sen Gupta (1955) who observed that a different species, namely *F. solani* was involved in West Bengal in causing the disease. They, however, did not carry out cross inoculation studies and establish its pathogenic specialization which was done in the present studies. On the basis of selective pathogenicity the causal organism of guava wilt in West Bengal should, therefore, be named as *F. solani* f. sp. *psidii*. According to the same principle the isolates of *F. solani* from bhendi, rain tree and orange should be named as *F. solani* f. sp. *abelomoschi*, *F. solani* f. sp. *enbrolobii* and *F. solani* f. sp. *citri* respectively.

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