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Short communication

Reactions of cowpea to infection by *Macrophomina phaseolina* isolates from leguminous plants in Nigeria

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The reaction of cowpea to infection by *Macrophomina phaseolina* isolates, from leguminous plants in Nigeria, was investigated at Ibadan, southwestern Nigeria. *M. phaseolina* isolates obtained from six different leguminous species induced necrotic lesions of varying sizes on two cowpea varieties, IT83D-340 and IT84D-488. Isolate 93-295 from winged bean *(Psophocarpus tetragonoloteu*s) leaf tissues was the most virulent, inducing necrotic lesions of 4.8 mm in diameter on cowpea stem tissues while the smallest necrotic lesion size of 3.2 mm was induced on the same cowpea by isolate 93-52-1. This suggests that cowpea varieties are highly susceptible to *M. phaseolina* isolates from six different legumes. Moreover, the reactions of the two-cowpea varieties to *M. phaseolina* isolates from the six legumes differ significantly. This suggests that differences exist in the susceptibility of cowpea varieties to the pathogen.

Key word: *Macrophomina phaseolina*, pathogenicity, leguminous plant, cowpea diseases, southwestern Nigeria.

INTRODUCTION

Macrophomina phaseolina (Tassi) Goid. is one of the most destructive plant pathogens in the tropics and subtropics causing diseases in a wide range of hosts (Chidambaran and Mathur, 1975; Dhingra and Sinclair, 1977; Reuveni et al., 1983) The most common diseases caused by this pathogen are charcoal rot (damping-off), dry root-rot, wilt, leaf blight and ashy stem blight (Singh et al., 1990; Abdon et al., 1980). Seed, soil, and plant residue are the sources of primary inoculum (Reuveni et al., 1983; Short et al., 1980).

Epidemic outbreaks and yield losses due to charcoal rot of cowpea induced by *M. phaseolina* (Tassi) Goid have recently been observed in many bean growing areas in Nigeria (Singh et al., 1990). This suggests that *M. phaseolina* is host non-specific. There is however likely to be differences in pathogenicity indicating the existence of host specialization. The aim of this study was therefore to determine variability in the pathogenicity of *M. phaseolina* isolates, from different leguminous plants, on cowpea in Nigeria.

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MATERIALS AND METHOD

Macrophomina phaseolina infected samples were obtained from six different leguminous viz Cowpea *(Vigna unguiculat*a), *Crotoleria ochroleuc*a, *P. tetragonoloteus, Labala purpureu*s, *Aechynomene histrix* and Soybean *Glycine max* L plants, found in the International Institute of Tropical Agriculture (IITA) experimental farm located in different agroecological zones in Nigeria (Table 1). Lesions from stems, leafs, pods and seeds of infected legumes were excised, cut into 2 mm pieces and surface sterilized in 10% sodium hypochloride for 30 s.

These were then rinsed in four successive changes of sterile distilled water, blotted dry on sterile paper towel and plated on autoclaved acidified potato dextrose agar (PDA) in 90 mm Petri dishes. The inoculated plates were then incubated at 27°C for five days under 1200 lux.

Infected seeds were also surface sterilized in 10% sodium hypochloride for 30 s rinsed in four successive changes of sterile distilled water and blotted dry using sterile paper towel. These were transferred onto PDA and incubated for 6 days at 27°C under 1200 lux. The associated pathogens were identified using cultural morphological features and pathogenicity of the isolates.

Pathogenicity Test

Paddy rice *(Oryza sativa L)* cultivar ITA 338 was collected from the West African Rice Development Association (WARDA) experimental station based at IITA Ibadan, Nigeria.

Table 1. Isolate *M. phaseolina* from different leguminous plant obtained from 4 agroecological zones in Nigeria.

Isolate No.	Plant Variety	Plant Part	Town/Location	Agroecological Location
93-44	Cowpea (*Vigna unguiculata)*	Seed (Tvx3236)	Ibadan	Transitional forest
93-52-1	Cowpea (*Vigna unguiculata)*	Pod	Ibadan	Transitional forest
93-274-1	*Crotoleria ochroleuca*	Leaf	Mokwa	Guinea savanna
92-295	*P.tetragonoloteus* (winged bean)	Leaf	Onne	Rain forest
93-322	*Labala purpureus*	Leaf	Kachia	Guinea savanna
93-344	*Aechynomene histrix*	Leaf	Alabata	Transitional forest
94-829	Cowpea (*Vigna unguiculata)*	Stem	Kano	Sudan savanna
Samsoy-1	Soybean (*Glycine max*)	Seed	Abuja	Guinea savanna

Table 2. The percentage mortality of 2 cowpea varieties inoculated with *M. phaseolina* from different legumes obtained from 4 agro-ecological zones in Nigeria.

Cowpea varieties		
Isolate Number	**IT8D-488**	**IT83D-340**
	% Mortality of cowpea plants	
93-52-1	2.16d	7.65e
93-274-1	8.07cd	24.25d
93-295	42.00a	68.16a
93-322	10.21c	42.04c
93-344	19.24bc	43.10bc
94-829	32.32ab	53.42b
Samsoy-1	27.94b	50.00b

Values followed by the same letters are not significantly different (P=0.05) by the least significant different test

Thirty rice grains were inserted into each 125 ml conical flask, which were plugged with non-absorbent cotton wool and wrapped with aluminium foil. The flasks were then autoclaved at 121°C for 30 min. Autoclaved PDA (10 ml) was then poured into the conical flasks containing the rice grains. Subsequently an 8.0 mm diameter cork borer was used to cut agar disks from a 5-day-old mycelial culture of *M. phaseolin*a, which was then transferred into the conical flasks containing the paddy rice. Five agar disks were placed in each conical flask and the mixture was incubated at 26°C until the rice seeds were covered with mycelia of the pathogen.

Five-day-old pre-germinated cowpea seedlings of IT83D-340 and IT8D-488 were transplanted into 250 ml pots containing steam sterilized soil and maintained in a glasshouse at 25°C. Cowpea plants at 21-day-old stage were used for inoculation. The rice grains containing the inoculum were inserted into the stems of test plants using the sharp awns to penetrate thereby reducing wounding. Fifty cowpea plants were inoculated per variety per isolate and the experiment was replicated three times. From the day of inoculation onward, the watering regime was altered from one day to two days interval. This alteration was to introduce some drought stress typical of the weather prevailing in the Sudan savannah areas of Nigeria where the disease is more severe. The length of the lesion on the stem and the number of dead plants were recorded for a period of 21 days, and subjected to analysis of variance, and means separated by the Duncan Multiple Range Test (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Macrophomina phaseolina obtained from the six leguminous crops induced necrotic lesions of varying sizes on the two cowpea varieties used. (Figure 1). On cowpea variety IT83D-340, *M. phaseolina* isolate 93-295 from winged bean induced necrotic lesions of 4.8 mm in diameter while the smallest necrotic lesion size of 3.2 mm was induced on the same cowpea by isolate 93-52-1 from cowpea pods. Furthermore, the necrotic lesion sizes found on 1T8D-488 by *M. phaseolina* from legumes ranged from 1.0 mm by isolates from cowpea pods to 3.4 mm by isolates from winged bean. Higher percentage mortality was recorded in cowpea variety IT83D-340 compared with variety IT8D-488 (Table 2). Isolate 93-295, obtained from the winged bean, showed significantly higher mortality on the two cowpea varieties compared to the other isolates of the pathogen. Results of these experiments correlate with the report of Mishra and Sinha (1982) that *M. phaseolina* from different crops are cross-pathogenic.

Results also indicate that agro-ecological locations of the isolate have no significant effect on the pathogenicity of the pathogen on cowpea. Reasons for the above observation might be connected with artificial stress that the inoculated test plant was subjected to during the course of the experiment. Dhingra and Sinclair (1973) reported earlier that variation exists in pathogenicity among soybean isolates from different geographical regions.

Pathogenicity of the isolates obtained from several legumes on the two cowpea varieties correlate with several

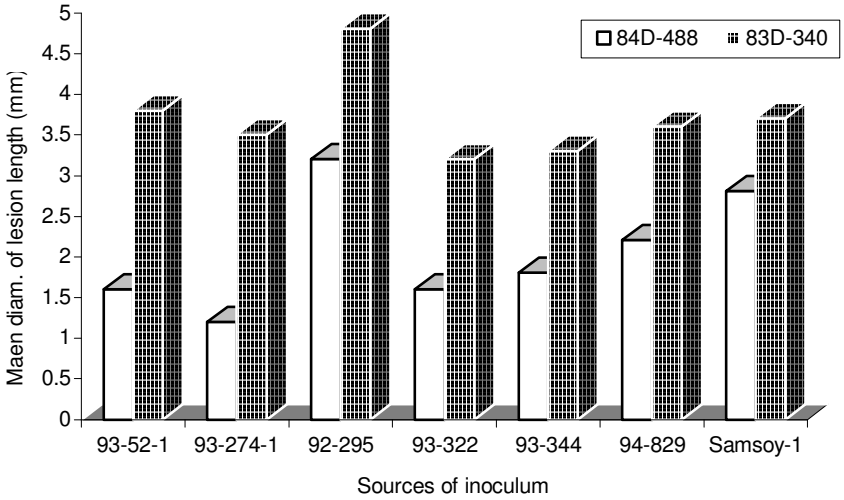

Figure 1. Response of two cowpea varieties to *M. phaeolina* inoculum isolates from different legume

reports that *M. phaseolinia* is a non host specific pathogen (Cook et al., 1973). The pathogen from winged bean induced larger necrotic lesions on the two cowpea varieties compared to those induced by other legume pathogen isolates. This is an indication that there is variation in the pathogenicity of *M. phaseolina* isolated from different leguminous hosts (Cloud and Rupe, 1988). Khan et al. (1976) reported that differences exist in the pathogenicity of two strains of M. *phaseolina* from the same plant. The above observation suggests that when cowpea or other susceptible crops are planted in fields where legumes are either growing or have previously grown, this could lead to an epiphytotic condition of the disease.

Furthermore, besides the isolate from winged bean, which induced a significantly larger necrotic lesion on cowpea IT84D-488, all other leguminous plant pathogen isolates of *M. phaseolina* induced significantly larger lesions on the IT83D-340 cowpea variety. This however indicates that differences might exist in the susceptibility of cowpea cultivars to infection by the pathogen. The knowledge of the above could serve as the basis for screening for resistance against the pathogen in cowpea germplasm as has been reported for soybean (Agarwal and Sarbhay, 1976) and other edible beans (Abawi and Pastor Corrale, 1986).

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