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Original Research Article

Effect of Culture Media on Growth and Pigmentation of *Fusarium oxysporum* f. sp. *udum* Butler Isolated from Different Varieties of Pigeon Pea [*Cajanus cajan* (L.) Millsp.]

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Abstract

The present study was undertaken to find out the suitability of culture media for the study of cultural variability among seven isolates of *Fusarium oxysporum* f. sp. *udum* isolated from seven different varieties of pigeon pea [*Cajanus cajan* (L.) Millsp.] using Czapek's dox agar (CDA), potato dextrose agar (PDA) and glucose nitrate agar (GNA). The growth rate and growth pattern of *F. oxysporum* f. sp. *udum* isolates were different on three types of media. Mycelial colour of the pathogen and substrate colour also different on different media. The pathogen isolates showed variability in pigmentation more on CDA as compared with other and the growth rate of the pathogen isolates per day were high in case of GNA was observed. The colonies grown on CDA and GNA were showed maximum fluffy growth; on PDA it was appressed manner.

Keywords

Culture media
F. oxysporum f. sp. *udum*
Pigeon pea
Pigmentation

Introduction

Pigeon pea popularly known as red gram (Arhar/ Tur) is the second most important pulse crop belonging to the Cajanae sub tribe of economically important leguminous tribe phasealeae. The crop is grown in the world in 4.26 million hectares with the production of 3.05 million tones and average yield of about 716.5 kg/ha. In India, it accounts for 3.73 million hectares of area with a production of 2.90 million tones and yield of about 776 kg/ha (Anon., 2007). Indian sub-continent accounts for almost 90% of world's pigeon pea area and production pigeon pea accounted for about 15% (3.53 mh) of the area under pulses and 17% (2.51mt) of the total production of the country during 2007. (http://faostat.fao.org).

Materials and methods

Seven isolates of *Fusarium oxysporum* f.sp. *udum* were isolated from seven different varieties of pigeonpea [*Cjanus cajan* (L.) Millsp.] wilt samples collected from pulses research center, Badnapur, Dist.

Jalna (M.S.). Isolations were made from infected root samples (Aneja, 2007) and pure cultures were maintained on potato dextrose agar medium slants.

The pathogen isolates were retained for further characterization on czapek's dox agar (CDA), potato dextrose agar (PDA) and glucose nitrate agar (GNA) media using factorial completely design with three replications. Pre sterilized medium was poured separately in sterilized 90 mm Petri dishes @ 20ml/plate. After the solidification of medium 5 mm diameter fungal disc cut from the 7 day old pure cultures of isolates were inoculated at the center of the Petri dish. Inoculated plates were incubated in BOD at 25±1ºC for 7 days. Following cultural characters were recorded to quantify the variability among the isolates.

1. Colony growth rate at 25ºC - slow (<5 mm/day), medium (>5mm/day) and fast growth rate (>10mm/day).
2. Colony growth pattern - Fluffy and appressed.
3. Substrate colour - Light yellow to dark yellow, white to creamy white or dull white.
4. Mycelia colour – White to creamy white or dull white.

All cultural characters recorded in the study were qualitative except the growth rate which was sub-grouped in to slow, medium and fast types.

Results and discussion

Colony growth rate

Growth of the isolates on CDA medium revealed that the isolate of variety BDN-2 was showed slow growth rate and remaining six isolates had medium growth rate. On PDA medium two isolates of variety ICPL-87119, ICP-2376 were showed medium growth rate and the remaining five isolates were showed fast growth rate (Table 1). On GNA medium all seven isolates were showed medium growth rate. Thus the potato dextrose agar favored better growth showing 2 isolates as fast, 5 as medium growth, on CDA, one isolate showed medium growth and 6 as slow and on GNA all the isolates had medium growth rate.

Colony growth pattern

Out of seven isolates except the isolate of var. BDN-2 remaining six isolates expressed fluffy type growth on CDA medium while isolate of BDN-2 produced appressed type of growth pattern. On PDA medium except isolate of var. AKT-9913 remaining were showed appressed type of growth and one isolate produced fluffy type of growth pattern. On GNA medium isolate of var. BDN-708 expressed appressed type of growth rate and remaining were produced fluffy types of growth rate (Table 1). This indicated that growth pattern of isolates varied with the changing nutrient supply through the different media.

Table 1. Growth rate, growth pattern, mycelia colour and substrate colour *F. oxysporum* f. sp. *udum* isolates (isolated from different varieties of pigeonpea) on CDA (I), PDA (II), and GNA (III) media.

Pathogen isolates from pigeon pea var.	Cultural/Morphological Characters											
	Avg. growth rate (mm/day)			Growth pattern			Mycelia colour			Substrate colour		
	I	II	III	I	II	III	I	II	III	I	II	III
PUSA-992	4.8	7.5	8.2	Fluffy	Appressed	Fluffy	Cream white	Dull white	Dull white	Light yellow	Cream white	Light yellow
BDN-2	5.5	7.8	9.2	Appre-ssed	Appressed	Fluffy	Cream white	Dull white	White	Light orange	Light yellow	Light yellow
BDN-708	4.4	8.5	9.1	Fluffy	Appressed	Appre-ssed	Dull white	White	Dull white	Dark yellow	Dull white	Light yellow
ICPL-87119	4.5	10.5	8.8	Fluffy	Appressed	Fluffy	White	White	White	White	Light yellow	Dull white
ICP-8863	4.7	9.2	9.0	Fluffy	Appressed	Fluffy	White	White	White	White	Dull white	Cream white
ICP-2376	4.1	10.5	9.2	Fluffy	Appressed	Fluffy	White	White	White	Dull white	Dull white	Cream white
AKT-9913	3.2	9.2	8.5	Fluffy	Appressed	Fluffy	White	Dull white	Dull white	White	Dull white	Dull white

Mycelia colour

Isolates of var.PUSA-992, BDN-2 produced creamy white colored mycelium while remaining five isolates produced white to dull white colored mycelium on CDA medium. In case of PDA medium three isolates (from var. PUSA-992, BDN-2 and AKT-9913) produced dull white colored mycelium remaining four isolates produced pure white colored mycelium while on GNA medium three isolates (from var. PUSA-992, BDN-708 and AKT-9913) produced dull white colour mycelium and remaining were produced white colour mycelium. Differential response of isolates over the three media indicated that mycelium colour expression was wider on CDA while the remaining two media did not show more variation in mycelium colour. Thus CDA proved better for the differentiation of mycelia colour than the remaining two media.

Substrate colour

Substrate colour was observed as most unstable character and showed great variation on the three media from light yellow to dark yellow, dull white to white or creamy white colour on CDA isolates. On PDA and GNA media also the isolates produced in variation in substrate colour like on CDA (Table 2). This type of differential response of isolates on three media, that substrate colour was again not a stable character and varied according to nutrition of the media used.

Table 2. Distribution of *F. oxysporum* f.sp. *udum* Butler isolates in respect cultural characters on CDA, PDA and GNA media.

Parameters		Number of isolates		
		CDA	PDA	GNA
Growth rate	Slow	6	-	-
	Medium	1	5	7
	Fast	-	2	-
Growth pattern	Fluffy	6	1	6
	Appressed	1	6	1
Mycelium colour	White	4	4	4
	Dull white	1	3	3
	Creamy white	2	-	-
Substrate colour	Light yellow	1	2	3
	Dark yellow	2	-	-
	White	3	-	-
	Dull white	1	4	2
	Creamy white	-	1	2

Thus cultural variation of seven isolates of *F. oxysporum* f.sp. *udum* on CDA, PDA and GNA media expressed great variation in respect of different cultural characters. The results of the experiment revealed that the growth rate was very high on PDA and it is very slow in case of CDA medium. Roushan Islam (2015) and Mahesh et al. (2010) reported similar results with isolates of *F. udum.* Khanzad et al. (2008) with *Microphomina phaseolina*; Farooq et al., (2005) with *F. oxysporum* f. sp. *ciceri*, Chaudhary and Singh (2008) with *Fusarium oxysporum* f. sp. *lentis* isolates. Eshwarareddy and Basu Choudhary (1985) grouped six isolates of *F. udum* into three distinct groups based on radial growth and colony characters. These results are in agreement with Anjaneya Reddy (2002) and Mahesh (2004). Similarly Sataraddi (1998) recorded that the distinct variability among forty *F. udum* isolates with respect to cultural and morphological characters *viz.,* colony diameter and pigmentation, size of spores, He categorized 41 isolates into six distinct groups based on cultural and morphological characters. Different synthetic and non-synthetic media have profound influence on cultural and morphological characteristics of fungi (Shaik, 1974). Vasudeva and Srinivasan (1952) also advocated in case of *F. oxysporum* f. sp. *lentil* to grow on PDA. Khare (1980) differentiated 8 isolates of lentil wilt pathogen on the basis of colour of mycelium. *F. oxysporum* f. sp. *udum* isolates showed variable preference for different nutrients especially carbon, nitrogen, sulphur and phosphorus and therefore the CDA, PDA and GNA media showed variation in cultural characters of these isolates.

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