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EFFECT OF CULTURE FILTRATES OF *FUSARIUM OXYSPORUM* ON SEED GERMINATION AND SEEDLING GROWTH OF PIGEONPEA (*CAJANUS CAJAN*) VARIETIES

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ABSTRACT

Fusarium oxysporum udum isolated from infected roots of different varieties of Pigeonpea (*Cajanus cajan* L. Millsp.) and the effect of culture filtrate was observed on percent of seed germination and root-shoot length. It was found that the culture filtrate obtained from *F. oxysporum udum* isolated from var. BDN-708 increased seed germination (90%) and also root-shoot (root length 2.31cm and shoot length 1.85cm) length as compared to other varieties.

Key words: Pigeonpea, wilt pathogen, culture filtrate, seed germination, seedling growth.

INTRODUCTION

Pigeonpea (*Cajanus cajan* L. Millsp.) is one of the most extensively used pulse crop in India. It was grown all over the country covering an area about 3.85 million hectors with annual yield of about 2.68 million tones (Mishra and Dhar 2005). A large number of micro-organisms are known to produce toxic metabolites when cultivated on synthetic media. Fungal metabolites are substances discharged by fungi in their metabolic processes. The metabolites are products of some amino acids, cyclic peptides, aromatic, phenols, terpenoids and plant growth regulators (Graffin 1981; Madhosing 1995; Nema 1992). *F. udum* is a soil-borne, pigeonpea specific wilt pathogen (Kannaiyan *et al.* 1995) being able to produce a number of biologically active substances. Among both, primary and secondary metabolites, the most studied products of this pathogen are enzymes (Nema 1992), toxins (Pandey *et al.* 1995) and polysaccharides (Thomas 1994). Enzymes are known to be involved in the breakdown of cell wall and maceration of plant tissue, which play an important role in invasion of plants by pathogens (Gothoskar *et al.* 1955). The pathogen produces Fusaric acid toxin that is having phytotoxin properties and its high production has been correlated to virulence of pathogenic strains (Xu *et al.* 1993: Chakrabarti *et al.* 1980).

Fungi of the genera *Aspergillus, Fusarium, Penicillium* and *Rhizoctonia* are commonly known to produce toxic substances (Singh *et al.* 1991). The role of toxic metabolites of pathogenic fungi in plant disease development has been reported by several workers. Anaso *et al.* (1981) reported that toxic metabolites of *Drechslera rostrata* and *Fusarium equiseti* retarded root growth of wheat. Reduction in percentage seed germination of soybean seeds was observed in seeds soaked in filtrates of *Phomopsis phaseoli* Hilty and Lee, 1988).

In the present study, the seed samples of pigeonpea were treated with culture filtrates of *F. oxysporum udum* and their effect on percentage of seed germination and seedling growth was studied.

MATERIALS AND METHODS

Collection of seed samples: Seed samples of seven different varieties of pigeon pea *viz.* PUSA-992, BDN-2, BDN-708, ICPL-87119, ICP-8863, ICP-2376 and AKT-9913 were collected separately in paper bags from Pulses Research center, Badnapur, Dist. Jalna (M.S.) in January, 2009.

Collection of infected root samples and isolation of pathogen: Infected root samples of seven varieties (above mentioned) were collected in sterile polythene bags in the presence of expert person at Pulse research center, Badnapur, Dist.Jalna (M.S.). Samples transported to laboratory and pathogen was isolated by tissue segment method. The roots were thoroughly washed in tape water. These after small pieces measuring about half centimeter were cut using sterilized blade. The pieces were then surface sterilized in mercuric chloride solution (1:1000) for 20-30 seconds followed by three times thorough rising in sterilized distilled water. The pieces were then placed on pre-sterilized blotting paper to remove excess moisture. The surface sterilized diseased pieces were then aseptically transferred on Czapek's dox agar medium plates and incubated at 28±1ºc in BOD incubator for seven days. After incubation colonies were observed and identified on the basis of morphological characters. The pure cultures maintained on PDA slants and preserved at low temperature in refrigerator for use as when required.

Preparation of culture filtrates: Seven different isolates of *Fusarium oxysporum udum* were grown in 250 ml conical flask containing 100 ml Czapek's dextrose liquid

Table.1: Effect of culture filtrates of *Fusarium oxysporum* f.sp. *udum* Butler on seed germination and seedling growth of pigeon pea (*Cajanus cajan* L. Millsp.)

Name of pigeon pea variety	PUSA-992		BDN-2		BDN-708		ICP-87119		ICP-8863		ICP-2376		AKT-9913	
	Test	Cont.	Test	Cont.	Test	Cont.	Test	Cont.	Test	Cont.	Test	Cont.	Test	Cont.
% of seed germination	73.33	100	73.33	100	90.00	100	73.33	100	63.33	100	10.00	100	83.33	100
Root length in cm	1.96	5.0	1.90	5.3	2.31	5.50	1.55	3.85	1.58	4.15	0.06	5.90	1.91	8.5
Standard deviation	1.542	2.00	1.342	2.324	1.349	1.716	1.227	1.203	1.625	1.667	0.210	1.449	1.314	2.461
Standard error	0.28	0.632	0.244	0.734	0.246	0.542	0.224	0.380	0.296	0.527	0.039	0.450	0.239	0.778
Shoot length in cm	0.75	4.30	1.50	4.50	1.85	2.95	1.20	3.15	0.95	2.95	0.00	4.30	1.63	3.65
Standard deviation	0.84	1.636	1.365	1.868	1.020	1.322	1.330	0.709	1.109	0.590	0.00	1.252	1.319	1.334
Standard error	0.15	0.350	0.249	0.563	0.186	0.418	0.242	0.224	0.202	0.189	0.00	0.395	0.240	0.422

medium for ten days at 25±2ºC in BOD incubator. After incubation culture filtrates were filtered in pre sterilized flasks by using Whatman no.50 filter paper and stored at 4±1ºC in refrigerator.

Effect of CF on seed germination and seedling growth: 60 seeds for each variety of pigeon pea were surface sterilized with 0.1% mercuric chloride then washed three times with sterile distilled water. 30 seeds of each variety were suspended in culture filtrates of pathogen isolated from same variety of pigeon pea and incubated at room temperature (28±2ºC) for 24 hours after then seeds were removed from culture filtrate and washed with sterile distilled water. Next these seeds transferred in sterilized Petri plates containing three layered wet blotter paper. Total ten seeds (9+1) plated in each plate. At the same control was also maintained with distilled water for each variety. After seven days of incubation period plates were observed and germination percentage, root length and shoot length were measured.

RESULTS AND DISCUSSION

The culture filtrates of pathogen *F.oxysporum* f.sp. *udum* were inhibited the seed germination and seedling growth. After seven days of incubation period, the percentage of seed germination was very poor in variety ICP-2376 (10%) but in case of BDN-708 it was increased (90%), next to it var. AKT-9913 showed 83.33% of seed germination. Varieties PUSA-992, BDN-2, ICPL-87119 showed 73.33% seed germination. In case of var.ICP-8863 it was 63.33%.

Culture filtrates of the pathogen were also showed effect on root-shoot length of all the varieties of pigeonpea. The root length was very low in var.ICP-2376 (0.06cm) and it was high in BDN-708 (2.31cm). The shoot length also increased in case of BDN-708 (1.85cm) when compared with other varieties but it was 0cm in case of ICP-2376.

The above results conformed the findings of Vidyasekaran *et al.* (1970). The production of secondary metabolites by fungi is known to degrade seed quality and reduce the seed viability (Caster and Frederiksen 1980; Gopinath and Shetty 1988). The similar results were also observed by Arun and Mathew (1991), Gachande and Jadhav (2010) in case of seeds of pigeonpea, gram varieties respectively. Soybean seeds soaked in culture filtrates of *Fusarium solani, F. oxysporum, Aspergillus flavus, A. niger, Alternaria tenuis* and *A. alternata* for 24 hours showed reduction in percentage of seed germination was observed by Ibraheem *et al.* (1987). Filtrate from mycelial cultures of *Varticillium alboatrum* was found to inhibit cell growth and reduced the viability of alfalfa seeds (Frame *et al.* 1991). Abrahum (1978) was also reported the inhibitory effect of culture filtrates of fungi on seed germination.

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