

EFFECT OF FUNGAL METABOLITES OF SOME RHIZOSPHERE SOIL FUNGI ON SEED GERMINATION AND SEEDLING GROWTH OF SOME PULSES AND CEREALS

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ABSTRACT

Rhizosphere fungi of pigeonpea (*Cajanuscajan* (L.) Millsp.) varieties were isolated and effect of culture filtrates of the dominant fungal species of rhizosphere fungi viz. *Aspergillus flavus*, *A. niger* and *A. nidulans* on seed germination and seedling growth of some cereals and pulses was investigated. The secondary metabolites of three species of *Aspergillus* were inhibited the seed germination and root-shoot length of all the selected cereals and pulses. The metabolites of *A. niger* found to be more effective than those of *A. flavus* and *A. nidulans*.

Key words: *Aspergillus* sp., culture filtrates, cereals, pulses, seed germination, and 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 hectares with annual yield of about 2.68 million tons (Mishra and Dhar, 2005). The roots of pigeonpea plants growing in soil provide a unique habitat, the rhizosphere which is particularly favorable for the development of soil micro-organisms. 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). Enzymes of fungi 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). Fungi of the genera *Aspergillus*, *Fusarium*, *Penicillium* and *Rhizoctonia* are commonly known to produce toxic substances (Singh *et al.*, 1991). In the present study, the seed samples of some cereals and pulses were treated with culture filtrates of *Aspergillus* sp. and their effect on percentage of seed germination and seedling growth was studied.

MATERIALS AND METHODS

Collection of seed samples and isolation of rhizosphere fungi: Seed samples of three different

cereals viz. wheat, Jowar, Maize and four different pulses viz. Gram, Greengram, blackgram, Soybean were collected separately in paper bags from Nanded market area. Isolation of rhizosphere fungi was done (Jalander and Gachande, 2011a) and dominant fungi were selected for the present study.

Collection of fungal metabolites: Three different species of *Aspergillus* i.e. *Aspergillus flavus*, *A. niger* and *A. nidulans* were grown in 250 ml conical flask containing 100 ml Czapek's liquid medium for ten days at 25±2 °C. On incubation culture filtrates were filtered in pre sterilized flasks by using Whatman filter paper No.50 and stored at 4°C.

Effect of culture filtrates on seed germination and seedling growth: 60 seeds of each seed sample of pulses (gram, greengram, blackgram and soybean) and cereals (wheat, jowar and maize) were surface sterilized with 0.1% mercuric chloride. 30 seeds of each variety were suspended in culture filtrates of *Aspergillus* sp. and incubated at room temperature (28±2°C) for 24 hours. Seeds were plated at equidistance on moist blotters (9+1) according to ISTA (1966). 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 was measured.

RESULTS AND DISCUSSION

Toxic metabolites in the culture filtrates of all the three species of *Aspergillus* caused reduction in seed germination and root-shoot elongation (Table 1). The filtrate of *A.niger* was found to be inhibitorier. Wheat, gram, greengram, blackgram, were more susceptible to the culture filtrate of *A.niger*. Green gram and soybean was more susceptible to the metabolites of *A.flavus* and *A. nidulans* respectively. Similar results were also

reported by Pangrikar *et al.*, (2009). The culture filtrates of all the three sp. of *Aspergillus* caused reduction in root and shoot length in all the seed samples of cereals and pulses.

The above results conformed to 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).

Table 1: Effect of culture filtrates of dominant rhizosphere soil fungi on seed germination and seedling growth of pigeonpea (*Cajanus cajan* L. Millsp.)

Seed sample		<i>A.flavus</i>	<i>A.niger</i>	<i>A. nidulans</i>	Control	C.D. ($p=0.05$)
Wheat	% germination	86.66	00	80.00	86.66	-
	RL (cm)	8.08	00	5.48	9.35	5.582
	SL (cm)	4.14	00	3.10	6.12	3.520
Jowar	% germination	90.00	80.00	83.33	93.33	-
	RL (cm)	8.96	6.36	6.31	10.70	2.945
	SL (cm)	3.47	8.58	3.67	6.20	3.320
Maize	% germination	83.33	76.66	90.00	96.00	-
	RL (cm)	3.86	10.15	4.55	14.35	6.825
	SL (cm)	3.35	5.46	2.87	10.79	4.994
Gram	% germination	13.33	00	26.66	100	-
	RL (cm)	1.58	00	2.20	4.35	2.469
	SL (cm)	0.45	00	1.04	2.20	1.311
Green gram	% germination	10.00	00	33.33	100	-
	RL (cm)	1.49	00	2.82	5.20	3.036
	SL (cm)	0.32	00	1.52	3.10	1.934
Black gram	% germination	76.66	00	76.66	100	-
	RL (cm)	3.90	00	2.84	11.88	7.009
	SL (cm)	3.04	00	1.45	5.43	3.202
Soybean	% germination	53.33	33.33	13.33	100	-
	RL (cm)	3.90	2.52	1.42	5.52	2.802
	SL (cm)	2.42	1.64	0.39	3.30	1.699

* Average of three replicates with 10 seedlings. RL= Root length (cm) SL= Shoot length (cm)

The similar results were also observed by Bharat and Singh (1977) in case of mustard cultivars. Arun and Mathew in pigeonpea (1991) and Gachande and Jadhav (2010) in case of gram. Soybean seeds soaked in culture filtrates of *Fusarium solani*, *F. oxysporum*, *Aspergillus flavus*, *A. niger*, *Alternaria tenuis* and *A. alternate* for 24 hours showed reduction in percentage of seed germination was observed by Ibraheem *et al.* (1987). Jalander and Gachande (2011b) studied the effect of culture filtrates of *Fusarium oxysporum* f.sp. *udum* on different varieties of pigeonpea and they were also

reported (2011c) the effect of culture filtrates of rhizosphere fungi of pigeonpea on seed germination and seed ling growth of pigeonpea varieties and they found the inhibition of seed germination and reduction in root-shoot length of seedlings.

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