
Effect of culture filtrates of *Aspergillus niger* and *Colletotrichum capsici* on seed germination and seedling growth of chilli

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Experiments were carried out to study the effect of culture filtrates of *Aspergillus niger* and *Colletotrichum capsici* on the seed germination and seedling growth of chilli (*Capsicum annuum* L.). The culture filtrates of *Aspergillus niger* and *Colletotrichum capsici* exhibited inhibitory effect on seed germination in different periods of treatment as compared to the control. With the increase concentration of fungal filtrates, the percentage of seed germination was found to decrease gradually. Culture filtrates of *C. capsici* showed maximum seed germination (average 83.67%) followed by *A. niger* (average 84%) at 5% concentration of filtrates. The culture filtrates of *C. capsici* showed minimum seed germination (average 11%) and followed by *A. niger* (average 18.8%) at the 100% concentration.

The culture filtrates of *C. capsici* and *A. niger* had been found to have some inhibitory effect on seedling growth of chilli and with increase concentration of fungal filtrates the seedling growth gradually decreased over control. Seedling growth was found to be the minimum at 100% concentration of culture filtrates of *C. capsici* (0.70 cm) and *A. niger* (1.01 cm) after 5 days of sowing. Highest seedling growth was recorded at the minimum concentration (5%) of culture filtrates of *C. capsici* (3.60 cm) and *A. niger* (3.79 cm) after 30 days of sowing.

From the results it may be concluded that the fungi affect the seed germination and seedling growth either by lowering the viability of the seed, by making it nutritionally poor or by secreting certain mycotoxic substances unfavourable to the seeds and their growth.

Key words : Chilli, seed germination, seedling, culture filtrate, *Aspergillus niger*, *Colletotrichum capsici*

INTRODUCTION

Majority of plant pathogenic parasites produce substances, like toxins, enzymes and other metabolites in interaction with the host, which exhibit remarkable responses on the germinability of seeds. It has been reported that various seed borne fungi produce metabolites and in certain cases it adversely affect seed germination and seedling vigour (Vidyasekaran *et al.*, 1970; Singh, 2004). In presence of available moisture, optimum temperature and other factors, the fungal spores start to germinate on the seed surface during the sowing period in the soil in response to their mutuality and antagonistic relationship. The culture filtrate of *Colletotrichum capsici* produces some toxic substances, which affect the host tissues of chilli (Narain and Das, 1970; Mathur, 1995). Mehan and

Chohan (1973) have reported that the aflatoxin produced by *Aspergillus flavus* have marked inhibitory effect on the germinability of seeds. The fungal metabolites are known to effect seed germination as well as seedling growth of chilli. Narain and Prakash (1968) have reported that the toxic metabolites produced by *Aspergillus niger* inhibit seed germination of onion. Therefore, the present experiment has been carried out to study the effect of culture filtrates of *Aspergillus niger* and *Colletotrichum capsici* on the seed germination and seedling growth of chilli (*Capsicum annuum* L.).

MATERIALS AND METHODS

The local chilli variety of Assam, (known as 'Dhepa'), which are extensively cultivated in this area, was selected for the present experiment. The

test fungi, viz., *Aspergillus niger* and *Colletotrichum capsici* were grown separately in Czapek's-Dox liquid medium. After 10 days of incubation at $27\pm 1^\circ\text{C}$, the fungal cultures were filtered and the filtrates were taken for the experiments. The filtrates were made into various concentrations (5%, 15%, 25%, 35%, 50%, 75% and 100%) by adding sterile distilled water. Hundred seeds of chilli were surface sterilized with 0.1% HgCl_2 solution followed by washing with sterile water for 4-5 times. For the seed germination test, the seeds were soaked in different concentrations of the culture filtrates for 24 hrs. Three replicates were maintained in each experiment. After 24 hrs. the treated seeds were allowed to germinate on moist blotting paper placed in sterile Petridishes. In control, the seeds were pre-soaked in sterilized uninoculated Czapek's-Dox Agar medium. Percentage of seed germination of chilli treated with the various concentrations of culture filtrates of *C. capsici* and *A. niger* were observed at 4th, 6th, 8th, 10th, 12th, and 14th, days after sowing and the results were recorded.

To study the effect of culture filtrates on the seedling growth of chilli, the germinating seeds on Petridishes were taken out and placed in conical flasks containing different concentrations (5%, 15%, 25%, 35%, 50%, 75%, and 100%) of culture filtrates of *C. capsici* and *A. niger* and allowed to grow. The growth and height of the seedlings were measured regularly after 5th, 10th, 15th, 20th, 25th, and 30th,

days. Three replicates were maintained in each experiment. A control was also maintained and the effects of culture filtrates in seedling growth were recorded.

RESULTS AND DISCUSSION

The experimental results (Table 1) revealed that the culture filtrates of *Aspergillus niger* and *Colletotrichum capsici* showed inhibitory effect on seed germination in different periods of treatment as compared to the control. With the increase concentration of culture filtrates, the percentage of seed germination was gradually decreased. The culture filtrate of *C. capsici* showed slightly higher effect on seed germination in comparison to *A. niger*. Culture filtrates of *C. capsici* showed maximum seed germination (average 83.67%) followed by *A. niger* (average 84%) at 5% concentration of culture filtrates. The culture filtrates of *C. capsici* showed minimum seed germination (average 11%) and followed by *A. niger* (average 18.8%) at the 100% concentration. The experimental results revealed that with increase incubation period the seed germination percentage was increased gradually up to 14 days.

Experimental results (Table 2) showed that the culture filtrates of *C. capsici* and *A. niger* had some inhibitory effect on seedling growth of chilli. With increase concentration of culture filtrates the

Table 1 : Effect of culture filtrates of *Colletotrichum capsici* and *Aspergillus niger* on the seed germination of chilli

Fungal isolates	Concentration of culture filtrates (%)	Percentage of seed germination (in days) after sown						Averages (%)
		4	6	8	10	12	14	
<i>Colletotrichum capsici</i>	Control	90	93	93	95	96	96	93.8
	5	81	83	84	84	84	86	83.67
	15	67	69	71	71	75	75	71.3
	25	50	55	54	58	58	59	55.6
	35	41	42	45	46	47	52	45.5
	50	29	34	34	37	38	38	35.0
	75	17	19	20	23	25	27	21.8
	100	9	9	10	12	12	14	11.0
<i>Aspergillus niger</i>	Control	88	91	93	94	96	98	93.3
	5	80	82	85	85	86	87	84.0
	15	72	72	77	78	79	81	76.5
	25	58	59	62	63	65	66	62.1
	35	46	48	48	50	51	54	49.5
	50	37	38	40	43	43	45	41.0
	75	25	29	29	31	33	34	30.1
	100	13	16	18	21	22	23	18.8

seedling growth gradually decreased over control. *C. capsici* showed the higher inhibitory effect on seedling growth in comparison to *A. niger*. Seedling growth was found to be the minimum at 100% concentration of culture filtrates of *C. capsici* (0.70 cm) and *A. niger* (1.01 cm) after 5 days of sowing. Highest seedling growth was recorded at the

minimum concentration (5%) of culture filtrates of *C. capsici* (3.60 cm) and *A. niger* (3.79 cm) after 30 days of sowing.

Similar results were also obtained by Mathur (1995), who reported that the seed isolate of *C. capsici* inhibited maximum seed germination,

Table 2 : Effect of culture filtrates of *Colletotrichum capsici* and *Aspergillus niger* on the seedling growth of chilli

Fungal isolates	Concentration of culture filtrates (%)	Height of seedling in cm. (after days)					
		5	10	15	20	25	30
<i>Colletotrichum capsici</i>	Control	2.91	3.25	3.73	4.30	4.65	5.20
	5	2.40	2.52	2.90	3.15	3.44	3.60
	15	2.10	2.25	2.62	2.89	3.02	3.25
	25	2.00	2.15	2.30	2.51	2.70	2.90
	35	1.89	2.04	2.21	2.30	2.51	2.77
	50	1.76	1.90	2.03	2.15	2.22	2.43
	75	1.65	1.77	1.90	2.01	2.14	2.22
	100	0.70	0.92	1.04	1.39	1.60	1.72
<i>Aspergillus niger</i>	Control	2.51	3.10	3.23	4.00	4.05	5.00
	5	2.46	2.60	2.90	3.17	3.66	3.79
	15	2.30	2.59	2.70	2.91	3.08	3.41
	25	2.06	2.31	2.35	2.61	2.80	3.09
	35	1.97	2.20	2.25	2.40	2.69	2.84
	50	1.90	2.06	2.21	2.32	2.46	2.60
	75	1.50	1.88	2.04	2.17	2.26	2.31
	100	1.01	1.26	1.51	1.77	2.02	2.10

caused more seedling wilt and fruit damage. *C. capsici* had been reported to produce a thermo stable toxin, (Narain and Das, 1970) unlike enzymes, and probably might have caused injury to the protoplasmic contents of the host tissues and retarded growth. It was also reported that the failure of seeds to germinate in the soil inhibited by the fungi might partially be due to the inhibitory effect of the fungal metabolites exerted in the soil. The results also revealed that with increase concentration of culture filtrates, the germination percentage and seedling growth were decreased gradually. It had been reported that the fungi affected the seed germination and seedling growth either by lowering the viability of the seed, or by making it nutritionally poor or by secreting certain mycotoxic substances unfavourable to the seeds and their growth. The toxic principle exerted by the pathogens are thermostable and act as a protoplasmic poison to the host tissues (Narain and Prakash, 1968). From the results it may be concluded that the toxic metabolites synthesis by

A. niger and *C. capsici* are inhibitory to seed germination and seedling growth of chilli.

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