TOXICITY EFFECT OF CULTURE FILTRATES OF SOME FUNGI ON SEED GERMINATION AND SEEDLING GROWTH OF *SOLANUM MELONGENA* VAR. *ESCULENTA* NEES

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Abstract : Culture filtrate of all the fungi tested, e.g. *Alternaria alternata, Aspergillus flavus, A.niger, Chaetomium brasilense, Curvularia lunata, Cladosporium herbarum, Fusarium oxysporum , Macrophomina phaseoli, Myrothecium roridum* and *Trichoderma viride* adversely affected the seed germination and seedling growth . The maximum reduction in seed germination percentage of seeds was observed in the culture filtrates of *Trichoderma viride* followed by that of *Aspergillus flavus, Myrothecium roridum, Macrophomina phaseoli* and *Fusarium oxysporum.* Boiled filtrates were more effective than the unboiled ones. In general, roots were more susceptible to toxins.

Keywords : Germination, Fungi, *Solanum melongena*

INTRODUCTION

Forgaces (1962) and Forgaces and Carll (1982) summarized the available information on a number of mycotoxicoses, animal diseases caused by ingestion of foods and feeds invaded by fungi that produce toxins. Some of these result in severe illness and death and are caused by common and widespread fungi.

MATERIAL AND METHOD

Solanum melongena var. *esculenta* Nees was taken in the present study which belongs to the family Solanaceae. The seeds of this vegetable was procured from National Seeds Corporation of India, New Delhi and were sown in five experimental plots in the Botanical Garden of Meerut College, Meerut which were well protected from biotic disturbances. The dominant seed mycoflora isolated were *Alternaria alternata, Aspergillus flavus, A.niger, Chaetomium brasilense, Curvularia lunata, Cladosporium herbarum, Colletotrichum dematium, Fusarium oxysporum, Macrophomina phaseoli, Myrothecium roridum* and *Trichoderma viride* and were grown in sterilized Czapek's liquid medium in 250 ml conical flasks. The inoculated flasks were incubated for 30 days at room temperature. The cultures were filtered on 30 days of inoculation through Whatman No. 1 filter paper. Half of the culture filtrate was heated to 100 ^{0}C for 2 min. to inactivate the enzymes. The effect of boiled and unboiled cultrate filtrates on seed germination percentage was studied by soaking the surface sterilized seeds in boiled and unboiled culture filtrate for 24 hrs. Seeds soaked in sterilized Czapek's medium and sterilized distilled water served as control. Ten seeds soaked in the culture filtrate were placed in a sterilized Petri dish containing sterilized blotter paper and 5 ml of culture filtrates of the fungi were added for adequate supply of toxins. In case of control, sterilized Czapek's medium and sterilized distilled water were added into sterilized blotter paper. Seed germination was observed after 5 days and the percentage germination was calculated from five replicates. The length of root and shoot was measured both in the culture filtrates as well as control.

OBSERVATION AND DISCUSSION

It has been reported that fungi produce toxins which inhibit the germination of seeds (Scheffer and Pringle, 1961; Padmanabhan, 1967; Nwigwe, 1974; Sinclair, 1978; Yeh and Sinclair**,** 1980; Hepperly and Sinclair, 1981; Singh *et al*.,1984). The culture filtrates (boiled and unboiled) of all the fungi tested had an adverse effect on seed germination and seedling growth of *Solanum melongena*. In *S. melongena* the maximum reduction in germination percentage of seeds was observed in the culture filtrate of *Trichoderma viride* followed by that of *Aspergillus flavus , Myrothecium roridum, Macrophomina phaseoli* and *Fusarium oxysporum.* The culture filtrate of *Myrothecium roridum* inhibited seed germination by 56.8%. Pawar and Thirumalachar (1966) isolated Necrocitin toxic substance from *M. roridum*. Dake (1980) also observed reduction in seed germination of cotton seeds by *M. roridum.* Singh *et al*. (1984) observed that culture filtrate of *M. roridum* showed considerable reduction of seed germination of *Citrullus vulgaris* and *Luffa acutangula*. The culture filtrate of *Fusarium oxysporum* reduced seed germination up to 41.1% in the present study. The culture filtrates of *Fusarium* spp. are known to be toxic and heat stable (Tripathi, 1974; Brodnik *et al*., 1978; Singh and Gupta, 1984).

The seeds of *S. melongena* showed reduction in germination by 69.5% when treated with the culture filtrate of *Aspergillus flavus* in the present study. Dienner and Davis (1977) and Ghewande *et al.* (1984) reported the production of aflatoxins by the strains of *Aspergillus flavus*. Numerous *Aspergillus* spp. are involved in deterioration of large variety of seeds (Christensen and Kaufmann, 1969) reducing

the germination of seeds to a greater or lesser extent (Field and King, 1962; Kulik, 1973; Rati and Ramalingam, 1974; Brodnik, 1976).There is more reduction in germination percentage in the boiled culture filtrate when compared to both the controls in the present study. Similar observations have been made by Govindaswamy(1955), Vidhyasekaran *et al*.(1970), Rai and Singh(1977), Dhand and Vaidehi(1980) and Kanta(1982).The culture filtrate of *Aspergillus niger* was found to be inhibitory in seed germination of *S. melongena* by 18.4%. Narain and Prakash(1968) reported that toxic metabolites synthesized by *Aspergillus niger* were found to be capable of inhibiting the seed germination and growth in some varieties of onion plants.s

The culture filtrate of *Trichoderma viride* was found to inhibit seed germination by 72.4%. Dennis and Webster (1971) observed that *Trichoderma viride* is known to produce metabolites, Trichodermine which is toxic and harmful to seed germination. Singh *et al.* (1984) also reported inhibition of seed germination by *T. viride*. *Chaetomium* sp. inhibited the seed germination by 21.3%. Such observations were also made by Singh *et al*. (1984) and Singh and Gupta (1984).

Of the two types of culture filtrates (boiled and unboiled) the former was more effective and reducing the germination. In case of *S. melongena*, the culture filtrate of *Trichoderma viride* caused 78.1% and 72.4% reduction in boiled and unboiled conditions respectively. The maximum reduction was observed in the culture filtrate of C*ladosporium herbarum*, here again reduction in both boiled culture filtrate and unboiled culture filtrate was 12.7% and 5.6% respectively.

Apart from the low germination percentage inhibition of root and shoot growth was also observed. The root growth was suppressed maximum when seeds of *S. melongena* were treated with culture filtrate of *Trichoderma viride* followed by *Aspergillus flavus, Fusarium oxysporum, Macrophomina phaseoli* and *Curvularia lunata*. They also suppressed the root growth. The shoot growth was reduced maximum by *M. phaseoli* and *C. lunata* . Mishra and Kanaujia(1973) and Anshosur and Bidari(1974) also reported the inhibition in root-shoot elongation in some oil seeds by toxins and seed-borne fungi. Tripathi(1974), Kanta(1982) and Ghewande *et al*.(1984) reported that culture filtrates of *Aspergillus flavus* was inhibitory to root-shoot growth.

The boiled culture filtrates were more effective in reducing germination and inhibiting root-shoot elongation. Since the enzymes present in culture filtrates were inactivated by heating, the inhibitory effect could be due to fungal toxin and not due to enzymes. This observation are in confirmation with Narain and Das (1970), Tripathi(1974), Kanta(1982) and Singh and Gupta (1984). Root seems to be more susceptible to toxin than shoot as the inhibition of root was more than shoot.

ACKNOWLEDGEMENT

Grateful thanks to the Head of Botany Department for providing laboratory facilities for the work.

Table 1. Effect of culture filtrate of some seed-borne fungi on percentage seed germination and root – shoot growth of *Solanum melongena*.

Fungi	Seed Germination				Root Growth				Shoot Growth			
	U		B		U		B		U		B	
	Percenta-ge Seed Germina-tion	Percentage Reduction	Percentage Seed Germination	Percentage Reduction	Root Length (cm)	Percentage Reduction	Root Length (cm)	Percentage Reduction	Shoot Length (cm)	Percentage Reduction	Shoot Length (cm)	Percentage Reduction
Alternaria alternata	60±5.07	14.2	57 ±4.95	18.46	4.03±2.23	24.10	3.72±1.27	29.93	8.05±4.23	12.01	7.84±3.23	14.30
Aspergillus flavus	21±1.21**	69.58	18±0.78**	73.84	1.03±0.78**	80.53	0.98±0.82**	80.59	7.12±3.02*	22.16	6.04±3.63*	33.96
A. niger	57±5.03	18.46	49±4.98*	29.82	4.34±2.42	18.26	2.13±1.12**	59.87	6.04±3.33	12.12	7.84±2.23	14.30
Chaetomium brasilense	55±4.37	21.3	50±4.53*	28.4	2.89±1.02*	45.56	2.23±1.15**	57.99	7.52±2.32	17.79	7.21±3.42	21.29
Cladosporium herbarum	66±5.65	5.68	61±5.05	12.78	4.52±2.31	14.87	3.52±1.15*	33.70	7.97±2.01	12.88	7.47±3.24	18.34

Colletotrichum dematium	57±4.23	18.46	51±4.29	26.98	5.12±2.35	3.57	5.05±2.32	4.89	8.68±3.27	5.13	7.02±2.32	23.25
Curvularia lunata	49±3.29 *	29.82	41±3.29*	41.18	2.17±1.23**	59.12	1.17±1.02**	77.95	7.14±1.27	21.94	6.12±3.72*	33.08
Fusarium oxysporum	41±1.47 *	41.18	37±1.23*	46.86	1.27±1.01**	76.07	1.05±0.98**	80.21	7.20±1.23	20.63	6.16±3.80	38.65
Macrophomina phaseoli	37±2.37 *	46.85	31±1.23**	55.38	1.20±0.98**	77.39	1.10±0.93**	79.27	6.32±1.67*	30.90	5.71±1.22*	37.56
Myrothecium roridum	30±1.23 **	56.8	27±1.01**	61.06	2.73±1.42*	48.58	2.64±0.23*	50.27	8.27±2.23	9.60	8.16±3.21	10.81
Trichoderma viride	19±0.92 **	72.42	15±0.72**	78.1	1.13±0.91**	78.70	1.02±0.83**	80.78	7.86±1.57	14.08	7.54±13.72	17.58
Control-I (Water)	73±3.21		73±3.21		5.79±3.37		5.79±3.37		9.71±5.27		9.71±5.27	
Control-II (Czapek's medium)	70±2.02		70±2.02		5.31±2.3		5.31±2.3		9.15±2.97		9.15±2.97	

U = Unboiled
B = Boiled
* = Significant at 5% level
** = Significant at 1% level

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