



Biodiversity on Seed-Borne Fungi of Pearl millet (*Pennisetum typhoides*)

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Nat. Env. & Poll. Tech.

Website: www.neptjournal.com

Received: 10-7-2012

Accepted: 27-8-2012

Key Words:

Biodiversity
Seed-borne fungi
Pearl millet
Pathogenicity

ABSTRACT

Twenty three fungal species were found associated with seeds of eight cultivars of pearl millet (*Pennisetum typhoides*). Maximum fungi were reported from seeds of var. BJ-104 and ICMS -7703. *Aspergillus flavus*, *Fusarium moniliforme* and *Penicillium oxalicum* were found pathogenic causing seed rot, seed discolouration and germination inhibition. Captan and Dithane M-45 proved best for bajra seed dressing.

INTRODUCTION

The seed-borne fungi of pearl millet (*Pennisetum typhoides* (Burm.) Stapf. and Hutt) were earlier studied by Sharma & Basuchaudhary (1975), Gupta (1976), Konde et al. (1980), Randhawa & Aulakh (1980), Prasad & Narayan (1981), Girisham & Reddy (1985, 1986), Panchal (1984) and Khairnar (1987). The present investigations were carried out to detect the seed-borne fungi of pearl millet cultivars, viz. African A-1, BJ-104, BK-560, ICMS-7703, Local, MBH-110, X5 and WCC-75 by different seed health testing methods and to study their pathogenic behaviour and control by seed dressing fungicides.

MATERIALS AND METHODS

Seed samples of pearl millet varieties African A-1, BJ-104, BK-560, ICMS-7703, Local, MBH-110, WCC-75 and X-5 were collected in three random samples (half kg each) from fields, various store houses and markets. A composite sample of this was prepared by mixing the individual samples and preserved in cloth bags at laboratory temperature during the study.

Standard blotter and agar plate methods with Wakman's acid agar medium were used as recommended by ISTA (1966) for the isolation of seed-borne fungi of pearl millet (glucose 10g, KH₂PO₄ 1g, MgSO₄ 0.5g, agar agar 20g, distilled water 1000 mL, pH 5.6). Four hundred seeds were used in each case. Seeds used for experiments were untreated and pretreated with 0.1% HgCl₂ solution. In agar plate method, ten seeds were plated in each plate. The plates were incubated at 28 ± 2.0°C under alternate light darkness condition for seven days.

The pathogenicity tests of each fungus on seed during germination were studied by soaking the surface sterilized seeds in spore suspensions of seed-borne fungi for 24 h. Then seeds were used for germination studies on moist blotter.

Table 1: Diversity in seed mycoflora of Pearl millet on agar plate method.

Fungi	% incidence on the seeds		Fungus associated
	Untreated	Pretreated	
<i>Absidia ramosa</i>	10	0	1
<i>Alternaria alternata</i>	10	10	4
<i>Aspergillus flavus</i>	30	10	4
<i>Aspergillus fumigatus</i>	20	0	2
<i>Aspergillus nidulans</i>	20	0	1
<i>Aspergillus niger</i>	30	10	3
<i>Aspergillus ustus</i>	10	0	1
<i>Cladosporium herbarum</i>	10	0	5
<i>Curvularia lunata</i>	40	30	7
<i>Curvularia pallescens</i>	40	10	8
<i>Drechslera longirostrata</i>	10	10	6
<i>Drechslera rostrata</i>	20	10	4
<i>Drechslera spicifer</i>	10	10	3
<i>Drechslera tetramera</i>	50	30	8
<i>Fusarium moniliforme</i>	30	20	5
<i>Fusarium oxysporum</i>	10	30	6
<i>Mortierella exigua</i>	10	0	2
<i>Penicillium oxalicum</i>	10	0	2
<i>Pythium</i> sp.	20	10	5
<i>Rhizoctonia solani</i>	30	10	6
<i>Rhizopus nigricans</i>	20	0	4
<i>Syncephalastrum racemosum</i>	10	0	5
<i>Torula herbarum</i>	10	10	2
Non-sporulating mycelium	30	10	4

Varieties tested: African 1-1, BJ-104, BK-560, ICMS-7703, Local, MBH-110, WCC-75, X-5

Table 2: Effect of artificial infestation on seeds and seedlings.

Fungi	Seeds			Seedlings			
	% germination	Rot	Discolouration	Shoot	Length	Root	Length
<i>Absidia ramosa</i>	40	-	Ash	Normal	5.2	Shortening	3.0
<i>Alternaria alternata</i>	40	-	Blackbrown	Blight	5.0		9.8
<i>Alternaria tenuis</i>	60	-	Brown	Yellow	5.2	-	4.1
<i>Aspergillus flavus</i>	10	+	Brown	Tip rot	2.6	Shortening	1.9
<i>Aspergillus niger</i>	100	-	Green	Yellow	5.4	Root rot	9.0
<i>Cladosporium herbarum</i>	40	-	Brown	Stunted	1.6	Healthy	3.0
<i>Curvularia lunata</i>	30	-	Dull green	Chlorosis	4.9	Shortening	10.7
<i>Curvularia pallescens</i>	50	-	Black	Stunted	2.5	-	9.2
<i>Drechslera longirostrata</i>	40	-	Black	Stunted	5.0	Root rot	10.0
<i>Drechslera rostrata</i>	50	-	Black	Blight	5.2	Root rot	10.2
<i>Drechslera tetrametra</i>	20	-	Black	-	5.0	-	9.2
<i>Fusarium moniliforme</i>	0	+	Black	Blight	-	Root rot	-
<i>Fusarium oxysporum</i>	0	+	White pink	-	-	Root rot	-
<i>Penicillium oxalicum</i>	10	-	White	-	2.8	-	4.5
<i>Rhizopus nigricans</i>	20	-	Blue	White	4.5	-	1.5
<i>Rhizoctonia solani</i>	50	-	Ash	Tip rot	4.9	Curling	9.7
Control	90	-	Normal	Green(Normal)	5.2	Normal	10.1

Seeds treated similarly but without spore suspension served as control. This type of work was done by Panchal (1984) and Khairnar (1987) on jowar and bajra seeds respectively.

The fungicides namely Captan, Dithane M-45, Dithane Z-78, Brassicol, Blitox-50W, Bavistin, Thiram, Zinkop, Ceresan, Zineb75, Wetttable sulphur each (2g/kg seed) were evaluated for their efficacy in reducing the seed-borne fungi of pearl millet. The treated seeds were tested by standard blotter method after 24 hours of the treatment. Untreated seeds served as control.

RESULTS AND DISCUSSION

It is clear from the results summarized in Table 1 that 23 fungal species appeared on the seeds of eight different cultivars tested. In the present investigation three fungi viz., *Mortierella exigua*, *Pythium* sp. and *Torula herbarum* are newly recorded. In untreated seeds, maximum incidence of *Drechslera tetrametra* followed by *Curvularia lunata*, *C. pallescens*, *Aspergillus flavus*, *Fusarium moniliforme*, *Aspergillus niger* and *Rhizoctonia solani*, while *Absidia ramosa*, *Alternaria alternata*, *Aspergillus ustus*, *Cladosporium herbarum*, *Drechslera longirostrata*, *D. spicifer*, *Fusarium oxysporum*, *Mortierella exigua*, *Penicillium oxalicum* and *Syncephalastrum racemosum* were reported poorly.

Seeds treated with surface sterilizer showed complete absence of certain fungi like *Absidia ramosa*, *Aspergillus fumigatus*, *A. nidulans*, *Mortierella exigua*, *Rhizopus nigricans* and *Syncephalastrum racemosum*. On the other hand counts of *Fusarium oxysporum* were found to be increased. It was interesting to note that one phycomycetous

non-sporulating fungus appeared consistently both on treated and untreated seeds. Fungal species, *Curvularia pallescens* and *Drechslera tetrametra* were found on all the cultivars.

It is evident from the results given in Table 2 that complete inhibition of seed germination was achieved due to *Fusarium moniliforme* and *F. oxysporum*, while seed rotting was effectively found due to *Aspergillus flavus*, *Fusarium moniliforme*, *F. oxysporum* and partial seed rot by *Penicillium oxalicum*. Five days old seedlings, blight and retardation of root length and shoot elongation were the common symptoms caused by most of the seed-borne fungi. Panchal (1984) and Khairnar (1987) showed the fungi like *Fusarium oxysporum*, *Penicillium oxalicum* and *Alternaria alternata* are seed rotting of jowar seeds, while *Curvularia pallescens* and *Drechslera longirostrata* are root rotting fungi.

Captan, Dithane M-45, Bavistin and Blitox-50W (each 2g/kg seed) showed broad spectrum effect and eliminated all the fungi from seed and improved germination to the extent of 90-98 percent as compared to 50-60 percent obtained in untreated seeds. The remaining fungicides were less effective in checking the pearl millet seed fungi.

ACKNOWLEDGEMENT

The author is thankful to Dr. Dilip Shinde, Principal of this college for continuous encouragement in the work and providing the research facilities.

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