International Journal of Plant Protection, **Vol. 1 No. 2 : 92-94 (Oct. 2008)**

Survey of the deteriorative effect of fungal pathogens in seeds and grains in and around Burdwan, West Bengal

S. OJHA, M.R. CHAKRABORTY, S. DUTTA **AND** N.C. CHATTERJEE

Accepted : ***August, 2008***

See end of the article for authors' affiliations

Correspondence to:

N.C. CHATTERJEE
Department of Botany,
University of Burdwan
BURDWAN (W.B.) INDIA

ABSTRACT

Different types of cereals, pulses and oily seeds samples were collected from three markets and Crop Research and Seed Multiplication Farm, Burdwan University, Burdwan district, West Bengal to screen the fungal contaminant associated with those seeds under storage condition. Almost all the seeds samples of three markets were found to be contaminated with various fungal pathogens. Growth of maximum fungal colonies was recorded in seeds collected from Durgapur market. Maize and groundnut seeds were appeared to be suitable substrate for the growth of storage fungi. The occurrence of different species of *Aspergillus* especially *Aspergillus niger* and *A. flavus* were found to be more abundant in comparison to the other contaminants.

Key words : Seed, fungal contaminant.

A new paradigm for agriculture in 21st century was proposed (Welch and Graham, 2004) the views that agriculture is an instrument for public health and draws attention to its role in delivering nutrients to humans and animals in balanced amounts that can sustain maximal physical and mental activity of the human beings who are simultaneously the drivers of the food system and its dependents. This is known as the productive, sustainable and nutritious food systems paradigm for agriculture and public health (Graham, 2003).

It is well known that about 90% of all food crops grown in the world are propagated by seeds and grains also constitute the major agricultural commodity for trade (Khetrapal, 2004). Production and distribution of high quality wheat grains have been attributed as an important factor in sustaining the green revolution in India (Nagarajan, 2004). During 1960's spectacular production was witnessed in the seed industry and quality seeds were provided by the National Seed Corporation (NSC) Ltd. (Bhatia, 2004). However, in most developing countries, increased production of grains is not accompanied by a corresponding improvement in post-harvest preservation technology. This problem of food grain storage is still now prevalent and a substantial amount of the storage facilities are unscientific as the grains are kept in open condition.

Several external and internal factors are involved in the deterioration of seeds during storage. Among which seed moisture, temperature, cleanliness of seeds and store- houses, degree of infection already existing in the seeds and insects and mites present in the store houses are important. It has been established that infected or contaminated seed is a primary source of inoculum for a large number of destructive diseases of many important food, fodder and fibre crops (Neegaard, 1977). Fungi play an important role in deterioration of seeds in storage. Although bacteria are also involved in this process but their role is considered to be less important because bacteria damage those seeds which have already undergone considerable deterioration by fungi. Constant uses of the farmer's own seed is an important factor in spreading and repeated occurrence of several fungal diseases.

MATERIALS AND METHODS

The selection of a diagnostic method for evaluating seed health depends on the host to be tested and the type of pathogen that may be carried in the seed (Khetrapal, 2004). Several conventional, serological or molecular techniques are employed for testing seed health (Kumar, 1994; Agarwal and Sinclair, 1997). Salt-malt agar medium was preferably used for growth of a wide range of seed pathogenic fungi and for testing the seed health. In our experiment the seed samples were collected from several markets *viz.*, Burdwan market, Durgapur market, Asansol market, Crop Research and Seed Multiplication Farm (CRSMF, Burdwan University) of Burdwan district. The collected seeds were packed in airtight polypropylene bags and labeled properly for future use. 2% malt agar medium was prepared which was supplemented with 10% sodium chloride salt before solidification and pH of the medium was adjusted to 6. The medium and glasswares were sterilized at 15 lbs for 15 minutes.

15 ml of sterilized salt-malt agar medium was poured in each of the sterilized Petridishes and allowed to solidify. The collected seed samples were surface sterilized by washing thoroughly with sterilized distilled water followed by dipping them in 1% sodium hypochlorite solution and absolute alcohol, respectively for 1 minute in each. Finally

the seeds were washed with sterilized distilled water. After surface sterilization, the seeds were subjected to place in the Petridishes separately and the plates were incubated at $30^0 \pm 2^0$ C for 7 days.

After incubation, the Petridishes were examined and the fungal colonies those appeared in the plates were isolated and subcultured in fresh media. The fungi developed in cultures were observed under microscope and identified.

RESULTS AND DISCUSSION

Seeds are the primary sources for transmission of many fungal pathogens. It is evident from the results that most of seed samples tested showed some degree of fungal contaminations under storage. It is also evident from the results that seeds collected from the market areas of Asansol and Burdwan exhibited greater percentage infection under storage than the seeds collected from the Crop Research and Seed Multiplication Farm (Burdwan University). It is because of the fact that in Crop Research Farm seeds are stored by using modern storage devices.

Among the fungi isolated from the tested seed samples, *Aspergillus niger, A. flavus, Penicillium, Alternaria, Rhizopus, Mucor* spp. were predominant. Out of total 46 Fungi isolated from seeds (Table 1), different species of *Aspergillus* are more frequent. The occurrence of *Aspergillus niger* and *A. flavus* was noticeably high in groundnut. The result is corroborative with the findings of several workers (Nandi and Haggblom, 1984; Sinha and Sinha, 1990). It is apparent that groundnut seeds are the most suitable substrates for aflatoxin production by *Aspergillus flavus* (Muralimohon and Reddy, 1995). Consumption of contaminated grains

Table 1 : Fungi isolated from seeds

Source of Seeds	Type of Seeds	Name of the Seeds	Name of the fungal contaminant present
	Cereals	*Oryza sativa*	_
		Triticum aestivum	*Alternaria* sp., *Curvularia* sp.
		Zea mays	*Rhizopus stolonifer, Aspergillus flavus*
Burdwan Market	Pulses	*Pisum sativum*	*Aspergillus niger, Fusarium* sp.
		Cicer arietinum	*Penicillium* sp.
		Vigna cylindrica	*Mucor haemalis.*
	Oil seeds	*Brassica juncea*	*Alternaria brassicae, Mucor* sp.
		Arachis hypogea	*Aspergillus flavus, Rhizopus* sp., *Penicillium* sp.
	Cereals	*Oryza sativa*	*Helminthosporium* sp., *Alternaria alternata*
		Triticum aestivum	*Aspergillus flavus, Penicillium* sp.
		Zea mays	*Fusarium* sp., *Alternaria* sp., *Aspergillus flavus*
Durgapur Market	Pulses	*Pisum sativum*	*Aspergillus niger*
		Cicer arietinum	*Chaetomium* sp., *Aspergillus* sp.
		Vigna cylindrica	*Mucor haemalis, Penicillium* sp.
	Oil seeds	*Brassica juncea*	*Aspergillus niger, Rhizopus* sp.
		Arachis hypogea	*Aspergillus flavus, Fusarium* sp., *Mucor* sp.
	Cereals	*Oryza sativa*	*Rhizopus oryzae, Aspergillus flavus*
		Triticum aestivum	*Aspergillus niger, Penicillium* sp.
		Zea mays	*Aspergillus niger, Curvularia* sp.
Asansol Market	Pulses	*Pisum sativum*	*Curvularia* sp., *Aspergillus* sp.
		Cicer arietinum	*Penicillium* sp.
		Vigna cylindrica	*Mucor mucedo, Aspergillus niger*
	Oil seeds	*Brassica juncea*	*Alternaria* sp.,
		Arachis hypogea	*Cladosporium* sp., *Aspergillus flavus*
	Cereals	*Oryza sativa*	_
		Triticum aestivum	_
		Zea mays	*Aspergilus* sp.
Crop Research and seed Multiplication Farm (Burdwan University)	Pulses	*Pisum sativum*	_
		Cicer arietinum	_
		Vigna cylindrica	_
	Oil seeds	*Brassica juncea*	_
		Arachis hypogea	*Alternaria* sp.

is also correlated with an increased risk of oesophageal cancer in human beings (Rheeder *et al*., 1992). Seeds are distributed to farmers under the guarantee of quality, in terms of genetic and physical purity and germination capacity. Certification for seed-borne pathogens is followed only as and when required depending on the impact of the pathogen on yields (Khetrapal, 2004). About two thirds of crop losses are due to diseases caused by seed borne pathogens (Cramer, 1967). So it is noteworthy to mention that proper scientific preservation strategy should be taken which may surely minimize the fungal contaminations.

Authors' affiliations:
S. OJHA AND S. DUTTA, Mycology and Plant Pathology Laboratory, Department of Botany, University of Burdwan, BURDWAN (W.B.) INDIA
M.R. CHAKRABORTY, Mycology and Plant Pathology Laboratory, Department of Botany, University of Kalyani, Kalyani, NADIA (W.B.) INDIA

REFERENCES

Agarwal, V.K. and Sinclair, J.B. (1997). *Principles of seed pathology*. CRC Press Inc., Lewis Publ., U.S.A.: 539.

Bhatia, K. (2004). Indian seed industry-status and concerns under WTO regime. In Proc.of seed: A Global Perspective, 26-28th Mar.2004. Indian soc. of seed Tech. and Indian council of Agricultural Res., New Delhi: 45-48.

Cramer, H.H. (1967). *Plant protection and world crop production*, Lever Kusen: Bayer pflanzenchutz: 524.

Graham, R.D. (2003). Biofortification: A global challenge program**.** *Inter. Rice Res.Notes*. IRRN 28.1/2003: 4-8.

Khetrapal, R.K. (2004). A critical appraisal of seed health certification and transboundary movement of seed under WTO regime. *Indian Phytopath*., **57(4) :** 408-421.

Kumar, C.A, Khetrapal, R.K., Singh, S. and Ram Nath (1994). Check-list of seed transmitted viruses: Leguminous hosts. Technical Bulletin, National Bureau of Plant Genetic Resources, New Delhi:14.

Muralimohon, G.U. and Reddy, C.N. (1995). Incidence of aflatoxins and *Aspergillus flavus* in marketed arecanut and sonaput powder in Gulbarga city. *Indian Phytopath*. **48(3) :** 371-373.

Nagarajan, S. (2004). *Sustaining the green revolution in India-a success story of wheat*. APAARI publication 2004/3, FAO Regional Office for Asia and the Pacific, Bangkok: 46

Nandi, B. and Haggblom, P. (1984). Production of aflatoxin in rough rice under different storage conditions. *Acta Agric. Scand*., **34 :** 128-132.

Neergaard, P. (1977). *Seed Pathology*. Vol. I and II. Macmillan, London: 1187.

Rheeder, J.P., Marasas, W.F.O., Shephard, G.S. and Van Schalkwyk, D.J. (1992). *Fusarium moniliformae* and Fumonisins in corn in relation to oesophageal cancer in Transkei. *Phytopathology*, **82 :** 353-357.

Sinha, A.K. and Sinha, K.K. (1990). Insect pests, *Aspergillus flavus* in marked wheat. *Indian Phytopath*., **41:** 44-47.

Welch, R.M. and Graham, R.D. (2004). A new paradigm for world agriculture: productive, sustainable, nutrition, healthful food systems. *Food Nutr. Bull*., **21 :** 361-366.

****