RESEARCH ARTICLE

Studies on indoor Aeromycoflora of Arva rice mill industry with its effects on human beings in and around Desaiganj (Wadsa) district Gadchiroli, MS, India

Seema Nagdeve

Department of Botany, M.G. Arts, Science and Late N.P. Commerce College, Armori, Dist. Gadchiroli, MS, India
Email:seemanagdeve@gmail.com | Mobile No.+91-9422154295.

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Seema Nagdeve (2015) Studies on indoor Aeromycoflora of Arva rice mill industry with its effects on human beings in and around Desaiganj (Wadsa) district Gadchiroli, MS, India, *International J. of Life Sciences*, A3 : 7-10.

ABSTRACT

Monitoring of indoor air of Arva rice mill for airborne fungi at Desiaganj (Wadsa) district - Gadchiroli in respect to effects on human being was undertaken during the period from Jan- 2012 to Dec-2013 using petriplate method and Hi Air sampler. Altogether 64 fungal organisms were isolated and identified from four different sections of Arva rice mill, belonging to Oomycota, Zygomycota, Ascomycota and Deuteromycota.The important fungal types identified were *Aspergillus niger, A. candidus, A. fumigatus, A. sydowii, A. flavus, penicillium notatum, P. glabrum, P. funiculosum, P. citrinum, Alternaria solani, A. alternata, Fusarium monoliforme, F. solani, Curvularia geniculata, C. lignicola, C. lunata, Bipolaris oryzae Cercospora sp.., Mucor sp., Rhizopus sp., Cunninghamella sp., Pithomyces sp., Epicoccum sp. Trichoderma sp., Torula sp., etc. during period of investigation.*

Keywords: Arva rice mill, aeromycoflora,effects on human, indoor air, Desaiganj (Wadsa)

INTRODUCTION

Aeromycology concerns to scientific study of sources, dispersion and effects of airborne micro - propagules of fungal origin. It involves aerial transport of potent fungal micro propagules including variety of magnitude of fungal spores, acervuli, cleistothecia, fragments of sterile mycelia, etc. in many different parts of the world (Wikipedia, 2014). The fungal spores are among the most abundant airborne bioparticles in the atmosphere of the earth and prominent allergens than air borne pollengrains, viruses, bacteria, protozoa, different propagules and vegetative cells of algae, lichens, bryophytes and pteridophytes, insect debris, house dust, mites, animals danger chemicals and food. Airborne fungal spores are ubiquitous in nature and can survive in both wet and dry environment through scavenging nutrients from the atmosphere (Verma et al, 2013). About 80,000 fungal species airborne reported and most of which are cosmopolitan in origin (Kendrick, 2000). The spores of fungal origin surviving in atmosphere are important components of bioaerosol as well as considered to act as indicator of the level of atmospheric biopollution (Ananna et al., 2013). These airborne spores can be cell cultures and have

property to undergo mutation producing genetically modified strains (EFSA, 2011). Human endoparasites may able to provoke any infection, childhood asthma, allergies, mycotoxicity while saprobes play a significant role in biodegradation or organic wastes (Aimanianda *et at*., 2010). This increased awareness has made the study of fungal propagules prevalent in air, important and hence the study of aeromycology has acquired a prominent place in various fields of environmental science.

Fungi produce a number of toxic chemicals such as poisonous compound found in some species of microfungi. Some fungi are known to produce secondary metabolites that are harmful to animals and human when ingested inhaled (Croft et al., 1986; Miller, 1992) or brought in contant with the skin (Schiefer, 1990). These toxic metabolites including alkaloids, cyclopeptides are called as Mycotoxins. The international agency for reseach on cancer, IARC (1993) classified aflatoxin, a toxin discovered in 1961 in *Aspergillus niger and A. parasiticus* as yielding, 'Sufficient evidence for human and animal carcinogenicity'. Peoples in India, working in Rice industries come in contact with grains. All durable and dried agricultural commodities, if not properly dried after harvest, are subject to attack by fungi and nearly 20% of the harvested crops in the developing countries including India have been lost due to post harvest diseases. Paddy Grain have generally high percentage of moisture at harvest becomes mouldy during storage and because high fragrance in milling and other post harvest technological processes. Many moulds colonizing grains besides degrading the grain and making in less palatable, may give rise to health hazards to workers handling the grain with mouldy or dirty grain. The dust when inhaled causes respiratory disorders to workers.

MATERIALS AND METHODS

Study area: Desaiganj (Wadsa) is a town and a municipal council in the Gadchiroli district in the state of Maharashtra, India. There are many small scale industries cropping up, beside some existing one's like a 10 MW power plant, a sugar factory, a medicine factory and two fertilizer plants. It's a center market for rice trading. Shree Sai Arva Rice Mill and Rajmata steam Rice Mill both are located at Lakhandur Road in Wadsa town of Gadchiroli district of Maharashtra. But the present study was orient on selected Shree Sai Arva Rice Mill from its 4 sections (Paddy godown, machine section, rice godown and husk storage section).

Air sampling was conducted inside the four different sections of Arva rice mill Industry at Desaiganj, (Wadsa) district, Gadchiroli for two consecutive years (Jan., 2012 - Dec., 2013) using Hi Air sampler (Mark II), Hi media Laboratories, India,. for five minutes on Agar strips, fortnightly. Simultaneously exposure petriplate method containing CDA (Czapek's Dox Agar) with streptomycin, two times in a month, by keeping them at the height of five feet from the ground level. Petriplates were incubated at room temperature. After 3 - 4 days colonies were observed, counted and sub cultured for identification.

RESULTS AND DISCUSSION:

Near about total 64 species belonging to 24 fungal genera were identified from the four different sections of Arva Rice Mill Industry (Table 1). Out of 64 fungal types trqpped, one fungal type belonged to Oomycota, 8 belonged to Zygomycota, 27 belonged to Ascomycota and 28 belonged to Deuteromycota. The maximum numbers of fungal types were contributed by Deuteromycota which was followed by Asomycota, Zygomycota and Oomycota. The fungal organisms were found present throughout the year in the indoor environment of Arva rice mill Industry.

The concentration of fungal airspora was increased during warmer and humid condition followed by seasonal trend in relative humidity, rainfall & temperature. During the period of investigation (Jan. 2012 - Dec. 2013), 14 species of- *Aspergillus,* 6 species of *penicillium*, 5 species of - *Curvularia,* 4 species of *Fusarium, Alternaria, Mucor* each, 3 species of *Trichoderma, Cladosporium, Rhizopus* each, 2 species of *Chaetomium, Bipolaris, Torula* each, and single species of *Cuninghamella, phytophthora, Drechslera, Epicoccum, Pithomyces, Phoma, Scicaria, Botrytis, Cercospora, Nigrospora, Pyricularia, Tricothecium,* etc were identified. The dominant fungal types identified were *Aspergilhus niger, A. condidus, A. fumigatus, A. sydowii, A flavus, A. versicolar, A. terreus*, *Penicillium notatum, P. glabrum, P. funiculosum, P. citrinum, Alternaria solani, A. alternata, Fusarium monoliforme, F. solani, Curvularia geniculata, C. lignicola, C. lunata, Bipolaris oryzae, Rhizopus stolonifer, R. oryzae, Mucorhiemalis, M. pusillus, Cladosporium sp.*, etc. The present finding clearly showed that *Aspergillus sps* were found to be the dominant among aeromycoflora throughout the year.

Table No. 1. Exposure Petriplate Method: Fungal genera/species identified in four sections of Arva Rice Mill, during Jan. 2012 – Dec. 2013

Sr. No.	Genera/Species	Paddy Godown	Machine Section	Rice Godown	Husk Storage Section
A)	**Oomycota**				
1	*Phytophthora infestans* de Bary	+	-	-	+
	Total	**1**	**-**	**-**	**1**
B)	**Zygomycota**				
2	*Cunninghamella sp.*	+	+	+	+
3	*Mucor hiemalis* Wehmer	+	+	+	+
4	*M. pusillus* Lindt.	+	+	+	+
5	*M. racemosus* Fresen.	+	+	+	+
6	*M. plumbeus Bonord.*	+	+	+	+
7	*Rhizopus stolonifer* (Ehrenb.)Vuill.	+	+	+	+
8	*R. oryzae* Went & Prins.	+	+	+	+
9	*R. oligospora* R. microsporus Tiegh	+	+	-	+
	Total	**08**	**08**	**07**	**08**
C)	**Ascomycota**				
10	*Aspergillus flavus* Link.	+	+	+	+
11	*A. fumigatus* Fresen.,	+	+	+	+
12	*A.niger* Tiegh.	+	+	+	+
13	*A.flavus var. oryzae*(Ahlb.) Kurtzman, Smiley, Robnett & Wicklow.	+	+	+	+
14	*A.versicolor* (Vuill.) Tiraboschi.	+	+	+	+
15	*A. terreus* Thom.	+	+	+	+
16	*A.flavipes* (Bainier sartory) Thom and church	+	+	+	+
17	*A.ochraceus With.*	+	+	-	-
18	*A.glaucus* Link.	+	+	-	+
19	*A.candidus* Link.	+	+	-	+
20	*A.nidulans* Fennell & Raper	+	+	+	+
21	*A.sydowii* (Bainier & sartory) Thom church.	+	+	-	+
22	*A.humicola* Choudhuri & Sachar	+	+	-	-
23	*A.carbonarius* Thom.	+	-	-	+
24	Chaetomium *glabosum* Kunze	+	+	+	+
25	*C.globosum*	+	+	+	+
26	*Drechslera sp.*	+	-	-	-
27	*Epicoccum sp.*	+	-	+	+
28	*Penicillium notatum* Westling.	+	+	+	+
29	*P.chrysogenum* Thom.	+	+	+	+
30	*P.citrinum* Thom.	+	-	+	+
31	*P.glabrum* Westling	+	+	+	+
32	*P. corylophilum* Dierckx	+	+	+	+
33	*P. funiculosum* Thom.	-	+	+	+
34	*Pithomyces sp.*	+	+	+	+
35	*Phoma glomerata* (Carda) wollenw. & Hochapfel	-	+	+	+
36	*Scicaria sp.*	-	-	+	+
	Total	**24**	**22**	**20**	**24**
D)	**Basidiomycota**				
	Total	**-**	**-**	**-**	**-**
E)	**Deuteromycota**				
37	*Alternaria solani* Sorauer	+	+	+	+
38	*A.alternata* (Fr.) Keissl.	+	+	+	+
39	*A. longipes* (Ellis & Everh.) E.W.Masan	-	-	+	+
40	*A.brassicicola(schwein.)* wiltshire	+	+	-	+
41	*Botrytis sp.*	+	+	-	-
42	*Cladosporium cladosporioides* (Fresen.) devries	+	+	+	+

Table 1: Continued…

Sr. No.	Genera/Species	Paddy Godown	Machine Section	Rice Godown	Husk Storage Section
43	B.herbarum (Pers.) Link.	+	+	+	+
44	C.lignicola Link.	+	+	+	+
45	Curvularia geniculata Boedijn	-	-	-	+
46	Bipolaris specifera subram. (Curvularia tetramera)	+	+	+	+
47	C.lunata Boedijn	+	+	+	+
48	C.branchyspora Boedijn	-	-	-	+
49	C.subulata Boedijn ex.J.C. Gilman	+	+	-	-
50	Cercospora sp.	+	+	+	+
51	Fusarium oxysporum Schlecht	+	+	+	+
52	F. monoliforme J. Sheldon.	-	-	+	-
53	F.solani Appel & Wollonweber.	+	+	+	+
54	F.equiseti Saecardo	-	-	+	+
55	Bipolaris oryzae shoemaker	+	+	+	+
56	Bipolaris tetramera Shoemaher	+	+	+	+
57	Nigrospora Sp.	+	+	+	+
58	Pyricularia sp.	+	-	-	+
59	Trichothecium roseeum Link.	+	+	+	+
60	Torula graminis Desm. ex Fr.	+	+	-	+
61	T. herbarum Link.	+	+	-	+
62	Trichoderma Viride Pers.	+	+	+	+
63	T. Koningii Oudem.	-	-	-	+
64	T. Iignorum Tode	-	+	-	-
	Total	**21**	**21**	**18**	**24**
F)	***Other types***				
65	*Sterile mycelia*	+	+	+	+
66	*Unidentified*	+	+	+	+

CONCLUSION

The present study concluded that air borne fungi can play important role in producing respiratory allergies in humans. The most common health hazard due to continuous exposure to such aero-biota which is heavily infested with pollen, fungal spores is allergy. Many workers reported that species of *cladosporium, penicillium, Aspergillus, Mucor, Rhizopus, Fusarium* contain a variety of antigens which induce the synthesis of antibodies in the human beings the allergens, these species are frequently abundant in indoor air of Arva rice mill which causes asthma, allergic rhinitis, respiratory allergies and other allergic diseases.

REFERENCES

Ananna AJ, Hossain KS and Bashar MA (2013) Aeromycoflora of the Dhaka University Campus, Bangladesh Jour. Bot., 42 (2):273- 278.

Aimanianda V, Bayrz. J, Bozza S, Kniemeyer O and Perruccio K (2010): clever cloak prevents Immune recognition of air borne fungal spores, 4th advances against *Aspergillosis, Asp.* News, 460 :117 -1123.

Croft WA, Jarvis BB, Yatawara CS (1986) Trichothecium Air borne outbreak of Atmos. Env. 20 : 549 - 552.

EFSA (2011) Scientific Opinion on the risks for animal and public health related to the presence of *Alternaria* toxins in feed and food. *EFSA Jour*., 9 (10): 2407.

IARC (International agency for research on cancer) 1993: Mono graphs in the evaluation of corcinogenic risk to human. Bull. W. H. O. 56:245 - 523.

Kendrick B (2000): The fifth kingdom. 3rd edn; Focus Publishing, R. Pullins Co. Newburyport MA OP950, USA. XI + 373.

Schiefer H (1990) Health effects from mycotoxins (volatile or absorbed to particulates): A review of the relevant data in animal experiments. Working paper provided to the health and welfare canada working group on fungi and indoor air Environmental health directorate, health and welfare canada ottawa Ontario KIAOLZ.

Verma S, Thakur B, Karkun D and shrivastava (2013) Studies of aeromycoflora of District and Session Court of Durg, Chhattisgarh, *J. Bio. Innov*. 2(4): 146 - 151.

Wikipedia (2014) Indoor aeromycoflora. Org. edn. wikipedia. org/ wiki. Inc. (Retrieved April, 10, 2014).