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Aeromycological studies over Two Rice Mills in the Desaiganj Tahsil of District Gadchiroli of Maharashtra State (India)

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Abstract: *To investigate the impact of airborne fungal spores on indoor air quality of rice mills, the present aeromycological study was undertaken in the two different rice mills of Gadchiroli district. This investigation was carried out for the period of two years i.e. Feb.2012 to Jan. 2014. The indoor aeromycoflora was isolated by Volumetric Sampling using Hi Air sampler and Exposer Petriplate method over Czapek's Dox Agar medium. The recorded fungal diversity was confined to Oomycota, Zygomycota, Ascomycota and Deuteromycota groups. The maximum frequency was found to be of Ascomycota. The members like Aspergillus, Penicillium, Rhizopus, Mucor, Alternaria etc. were seem to be more common in the indoor air rice mills.*

Key Words: *Aeromycology, rice mills, fungal spores, Aspergillus*

1. INTRODUCTION:

In India a large number of studies concentrated on aero-mycological field and other crops with varied objectives. The credit goes to researcher [1] who initiated studies of aerobiology in India. Present study is also studied in this direction in the occurrence of fungal spores in the indoor air of rice mill industries. Study of fungi is essential for anyone collecting or monitoring the any fungi from the study area. In addition to this researcher [2] reported the fungal growth on materials is initiated by conidia from air-spora which have fallen on the surface and germinates. Researcher [3] carried out collecting microorganisms from the Arctic atmosphere. The impact of airborne fungal spores on indoor air quality of rice mills and impact on human health remains poorly understood. So far, no work has been done on the fungal airspora of rice mill industries of Desaiganj (Wadsa). The present investigation was undertaken with to detect the components of fungal airspora, their seasonal variations and possible sources from the indoor air of rice mill industries. Currently there are several centers where work on aerobiology and aero-mycology is underway. Several workers develop the methods to documenting the diversity and distribution from their own way.

2. MATERIALS AND METHOD:

Study Area:

Desaiganj (Wadsa) is a town and taluka place of Gadchiroli district, in the Nagpur division of the Central Provinces. Geographically Desaiganj is situated 20.6202^{0}' North latitude and 79.9654^{0}' East longitude. Aeromycological survey from indoor environment of Two Rice mills (Arva and Steam) of Desaiganj (Wadsa), Gadchiroli district, was conducted at an interval of 15 days (fortnightly) for two years (Feb 2012- Jan 2014).

Sampling:

In the present investigation air sampling was conducted inside the four different sections 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. The identification of spores caught was based on (I) Microscopic characters, (ii) Comparison with parasitic and saprophytic fungal material collected in and around the field, (iii) Comparison with cultural characters. In all possible cases, generic counts were made which are based on colour, shape, size and other diagnostic features of the spores. In general, climatic conditions at this place are favourable for agriculture growth, similarly favourable rain and humidity during most of the days indirectly favours the growth of the diseases.

3. RESULT AND DISCUSSION:

In the present experimental study a total of 13563 fungal colonies were recorded for the period of two years of investigation (Feb.2012 to Jan. 2014). In the first year of investigation i.e. Feb. 2012 - Jan. 2013 a total count of 6764 fungal colonies were recorded from the indoor environment of Steam rice mill where as it was found to be 6799 fungal colonies in the second year of investigation i.e. Feb. 2013 - Jan. 2014. Altogether total 71 fungal species were recorded confined to 29 genera. The isolates were classified into Oomycota, Zygomycota, Ascomycota and

Deuteromycota. No members of Basidiomycota were reported through exposure petriplate method over Czapek's Dox Agar medium. Ascomycota dominated with fungal count of 7629 (56.25%) followed by Deuteromycota (31.64%) and Zygomycota (5.41%). Oomycota contribute only 1.14% with total of 155 colonies. In the first and second year of investigation Ascomycota contribute nearly at same concentration i.e. 28% whereas Deuteromycota contribute 15.62% in first year and 16.03% in the second year of study. In the first year of investigation i.e. from Feb. 2012 to Jan. 2013, the maximum contribution was in the months of July, August and September whereas it was least in the month of May. Out of four sections under study, the maximum colony count was observed in the Husk Storage section i.e. 1759 whereas it was least in the Rice Godown i.e. 1649. In the second year of investigation maximum colony count were also reported in the month of August and September whereas least count were reported in the month of May. In Husk storage section maximum fungal colony count (1764 colonies) was reported in the second year of investigation whereas it was least in the Rice godown i.e. 1630 fungal colonies.

A combination of two techniques, Volumetric Sampling by Hi Media Air Sampler mark II and Exposure petriplate method were used in the present investigation to get a fairly complete picture of aeromycoflora of the rice mill environment. Such a combination for sampling indoors was suggested by researcher [4]. The culture plate exposure technique has proved to be more appropriate over others, was employed for detection of indoor aeromycoflora in present study to record fungal diversity. This is in agreement with the findings of researchers [5, 6, 7, 8, 9] who reported the greatest count of fungal isolates as well as higher fungal colony count of indoor aeromycoflora by culture plate exposure test. This method was preferred for isolation of aeromycoflora in response to certain advantages such as (i) fungal spores with similar appearance can be identified to their generic level (e.g., *Aspergillus, Penicillium, Rhizopus, Mucor* etc.); (ii) fungal species of too small size with sufficient individual characteristics to be used as means of identification (e.g., *Phytophthora, Phoma* etc.); (iii) viable fungal hyphae can also be identified on the slides; and (iv) material on slides does not blow away with strong current of wind [10, 11]. During the present investigation altogether 71 different fungal species were identified from the Arva Rice mill and Steam Rice mill of Desaiganj (Wadsa) which were confined to Oomycota, Zygomycota, Ascomycota, Deuteromycota and some fungi were shown only black, brown, orange and white sterile mycelia (Table 1). After the study of various sites of the same location it was observed that number and types of fungal spores vary in indoor environment. Fungal micro-propagules are responsible for a variety of respiratory disease in humans, plants and animals. Air quality of inside arva and steam rice mills has become an important issue, which is partly related to fungal contamination. It was also noted that the fungal species in existing periodic fluctuations are supported by moderate temperature and high humidity. The present report on aeromycological survey of arva and steam rice mill revealed that the airspora of indoor air has its origin in outdoor air.

4. CONCLUSION:

Airborne microbial analysis revealed total of 13563 fungal colonies were recorded for the period of two years of investigation (Feb.2012 to Jan. 2014). In the first year of investigation i.e. Feb. 2012 - Jan. 2013 a total count of 6764 fungal colonies were recorded from the indoor environment of Steam rice mill where as it was found to be 6799 fungal colonies in the second year of investigation i.e. Feb. 2013 - Jan. 2014. Altogether total 71 fungal species were recorded confined to 29 genera. The isolates were classified into Oomycota, Zygomycota, Ascomycota and Deuteromycota. No members of Basidiomycota were reported through exposure petriplate method over Czapek's Dox Agar medium. Ascomycota dominated with fungal count of 7629 (56.25%) followed by Deuteromycota (31.64%) and Zygomycota (5.41%). Oomycota contribute only 1.14% with total of 155 colonies. The significant contribution of fungal fragments was noted during day time.

Table 1: Isolated fungi from the Study area

Sr. no.	**Fungal taxa**
1	*Alternaria alternata* (Fr.) Keissl
2	*Alternaria brassicae* (Berk.) Sacc.
3	*Alternaria longipes* (Ellis & Everh.) E.W. Mason
4	*Alternaria solani* (Ellis & G. Martin) L.R. Jones
5	*Aspergillus candidus* Link
6	*Aspergillus flavipes* (Bainier & Sartory) Thom & Church
7	*Aspergillus flavus* Link
8	*Aspergillus fumigatus* Fresen
9	*Aspergillus glaucus* (L.) Link,

10	*Aspergillus humicola* Chaudhuri & Sachar
11	*Aspergillus nidulans* (Eidam) G. Winter
12	*Aspergillus niger* Tiegh
13	*Aspergillus ochraceus* K. Wilh.
14	*Aspergillus oryzae* (Ahlb.) Cohn
15	*Aspergillus sulphureus* (Fresen.) Wehmer
16	*Aspergillus sydowii* (Bainier & Sartory) Thom & Church
17	*Aspergillus terreus* Thom
18	*Aspergillus versicolor* (Vuill.) Tirab.
19	*Botrytis* P. Micheli ex Haller
20	*Cercospora* Fresen
21	*Chaetomium cochliodes* Palliser
22	*Chaetomium globosum* Kunze.
23	*Cladosporium cladosporioides* (Fresen.) G.A. de Vries
24	*Cladosporium herbarum* (Pers.) Link
25	*Cladosporium lignicola* Corda
26	*Cunninghamella* Matr.
27	*Curvularia brachyspora* Boedijn
28	*Curvularia geniculata* (Tracy & Earle) Boedijn,
29	*Curvularia lunata* (Wakker) Boedijn
30	*Curvularia subulata* (Nees ex Fr.) Boedijn
31	*Curvularia tetramera* (McKinney) Boedijn
32	*Drechslera* S. Ito
33	*Epicoccum* Link
34	*Fusarium equiseti* (Corda) Sac.
35	*Fusarium moniliforme* J. Sheld
36	*Fusarium oxysporum* Schltdl.
37	*Fusarium solani (Mart.)* Sacc
38	*Helminthosporium oryzae* Breda de Haan
39	*Helminthosporium tetramerum* McKinney
40	*Mucor racemosus* Fresen.
41	*Mucor hiemalis* Wehmer
42	*Mucor pusillus* Lindt
43	*Mucor racemosus* Fresen
44	*Nigrospora* Zim.
45	*Penicillium chrysogenum* Thom
46	*Penicillium citrinum* Thom
47	*Penicillium corylophilum* Dierckx
48	*Penicillium funiculosum* Thom
49	*Penicillium glabrum* (Wehmer) Westling
50	*Penicillium notatum* Westling
51	*Phoma glomerata* (Corda) Wollenw. & Hochapfel
52	*Phytophthora infestans* (Mont.) de Bary,
53	*Pithomyces* Berk. & Broome

54	*Pyricularia* (Sacc.) Sacc.
55	*Rhizopus nigricans* Ehrenb
56	*Rhizopus nodosus* Namysl
57	*Rhizopus oligosporus* Saito
58	*Rhizopus oryzae* Went & Prins.
59	*Rhizopus stolonifer* (Ehrenb.) Vuill
60	*Spicaria*Harting
61	*Torula graminis*Desm.
62	*Torula herbarum*(Pers.) Link.
63	*Trichoderma glaucum*E.V. Abbott,
64	*Trichoderma koningii*Oudem.
65	*Trichoderma lignorum*(Tode) Harz,
66	*Trichothecium roseum*(Pers.) Link
67	Black sterile
68	Brown sterile
69	Orange sterile
70	White sterile
71	*Yeast*

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